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COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

A Chips Act for Europe

A CHIPS ACT FOR EUROPE

1. Introduction

Semiconductor chips are the essential building blocks of digital and digitised products. From smartphones and cars, through critical applications and infrastructures for healthcare, energy, mobility, communications and industrial automation, chips are central to the modern digital economy. They determine performance characteristics of digital systems, among them security and energy-efficiency – essential to the EU's digital and green transitions. They are also crucial to key digital technologies of the future, including artificial intelligence (AI), 5G and edge computing, as set out in the EU's 2030 Digital Decade.[1] Put simply, there is no "digital" without chips.

Since the beginning of the pandemic in early 2020, Europe and other regions of the world have been experiencing significant supply challenges, and shortages of chips. As the digital transformation accelerates and penetrates every part of society, a penury of chips undermines industrial production and economic development across all sectors and has potentially serious societal consequences. Supply chain disruptions in semiconductors have focused the world's attention on chips as the heart of the economy and of our daily lives.

The semiconductor sector is both capital and knowledge intensive, and subject to rapid technological evolution. Production of chips takes place in a supply chain that is global, complex and, in some important segments, overly concentrated. For example, today only two companies in the world, located in Taiwan and South Korea, are capable of manufacturing the most advanced chips.

In semiconductors, Europe is strong in some specific areas, such as in the design of components for power electronics, radio frequency and analogue devices, sensors and microcontrollers that are widely used in the automotive and manufacturing industries. Europe is also the world's centre for semiconductor research. It has leading research centres that are advancing global developments of state-of-the-art semiconductor technologies. European technology is in fact a key enabler of miniaturisation[2] in chips; concepts such as FinFET and Gate All Around[3] are required for the production of the next-generation powerful chips, and FDSOI technology[4] is crucial for reducing energy consumption.

Europe is also very well positioned in terms of the materials and equipment needed to run large chip manufacturing plants, with many companies playing essential roles along the supply chain. It has also strong and diversified industrial end user sectors e.g. automotive, industrial automation, healthcare, energy, communication, agriculture etc.

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1 COM(2021) 118

2 Miniaturisation (Moore's law) is a major driving force behind the design of chips - doubling the amount of transistors in a given area of semiconductor, and hence doubling the computing power, every 18 months, has persisted for almost 60 years. Today's advanced chips pack some tens of billions of transistors in each cm^2 of silicon.

3 Gate-all-around field-effect transistors (GAAFETs), successors of Fin field effect transistors (FinFETs) that are used for advanced chips, represent an essential technology to achieve transistor sizes below 3 nm.

4 A process technology such as fully depleted silicon on insulator (FDSOI) provides the benefits of reduced silicon geometries with a simplified manufacturing process and a good compromise between performance and power consumption.

Despite these strengths, Europe has an overall global semiconductors market share of only 10%[5] and largely relies on third-country suppliers. In case of disruption of the supply chain, Europe's chips' reserves in some industrial sectors, such as automotive, may run out in a few weeks,[6] forcing many European industries to slow down or halt production. Moreover, Europe has limited chip manufacturing capabilities, mainly in mature production nodes (at 22 nm and above), and none in leading-edge chips (at 7 nm and below).[7] It has also strong dependencies in design, packaging and assembly.[8]

As the digital transition accelerates and worldwide demand for chips grows rapidly[9] and is expected to double by the end of the decade,[10] semiconductors are at the centre of strong geostrategic interests, and of the global technological race. Leading economies are keen to secure their supply in the most advanced chips as this increasingly conditions their capacity to act (economically, industrially, militarily) and drive digital transformation. They are already heavily investing and rolling out support measures to innovate and strengthen their production capacities. The proposal for a US Chips Act provides for an allocation of USD 52 billion to manufacturing and R&D until 2026.[11] China is accelerating efforts to close its technological gap and, by 2025 it is estimated that it will have invested around USD 150 billion over the past decade in line with a series of plans and initiatives such as the "Made in China 2025".[12] Japan has recently announced USD 8 billion in public funding for domestic semiconductor investment, which is set to be complemented with additional funding.[13] South Korea will bolster its semiconductor industry by supporting, through tax incentives, its domestic companies' private investments in R&D and manufacturing, which are estimated at USD 450 billion until 2030.[14]

Faced with growing geopolitical tensions, fast growth in demand, and the possibility of further disruptions in the supply chain, Europe must use its strengths and put in place effective mechanisms to establish greater leadership positions and ensure security of supply within the global industrial chain. This is the only way for Europe to have the means to achieve the leverage required in times of crisis and keep the global supply chains running

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5 Source: "Strengthening the semiconductor supply chain in an uncertain era", Boston Consulting and SIA (Semiconductor Industry Association)

6 Commission estimates, based on "just in time" manufacturing practices, which minimise waste and increase efficiency by keeping inventories low. Such practices are widely leveraged in the auto supply chain, The semiconductor shortage in autos: Strategies for success | McKinsey. For example in the US chips inventory for the industry have fallen from 40 days in 2019 to less than 5 days of supply. https://www.commerce.gov/news/blog/2022/01/results-semiconductor-supply-chain-request-information

7 In semiconductor manufacturing, the process technology has traditionally been correlated with the transistor dimension and is measured in nanometres (nm); 1 nm is one billionth of a meter. Smaller process nodes deliver higher performance and power efficiency, but are also more complex and expensive to produce. Manufacturing takes place down to 5 nm today, with 3 nm in pre-production and 2 nm under development

8 Packaging and assembly are the last stages in the fabrication of chips. They refer to a number of processing steps necessary to supply the chip in a form factor that can be used in electronic devices. Wafers are cut into dies, interconnections are made, then chips are encapsulated to ensure protection from external factors like humidity, chemicals, etc. In advanced packaging, multiple components are integrated into a single device.

9 Demand was 17% higher in 2021 than 2019, and was not accompanied by commensurate increases in the supply, resulting in major mismatch against supply https://www.commerce.gov/news/blog/2022/01/results-semiconductor-supply-chain-request-information

10 Forecast by SEMI (Semiconductor Equipment and Materials International) and VLSI Research.

11 https://www.congress.gov/bill/117th-congress/senate-bill/1260?s=1&r=52

12 https://crsreports.congress.gov/product/pdf/R/R46767

13 https://www.reuters.com/technology/japan-create-scheme-subsidise-domestic-chip-output-nikkei-2021-11-07/

14 https://spectrum.ieee.org/south-koreas-450billion-investment-latest-in-chip-making-push

despite the new geopolitics of supply chains at play. It means promoting more balanced interdependencies as well as resilient supply chains without single points of failure.

Europe has the assets to become an industrial leader in the semiconductor markets of the future. Its ambition is to reach at least 20% of world production in value of cutting-edge and sustainable semiconductors by 2030.[15] The goal is not only to reduce excessive dependencies, but also to seize the opportunities offered by increasingly digitised markets and technological change. This will improve the competitiveness of the European semiconductor ecosystem and of European industry at large, including SMEs, as industry across the whole EU will have more secure access to performant and energy-efficient chips and will deliver innovative products to Europe's citizens and world markets.

To achieve this, Europe will have to substantially increase its production capacity, and establish capabilities in leading-edge technologies. Without rapid and sufficient investments, Europe's market share will drop to less than 5%, given the doubling of the market and the scale of efforts taking place in other parts of the world. It could also delay the adoption of next-generation chips by European industry, putting its broader competitiveness and technology autonomy at risk.

While the semiconductor industry invests more than any other industry in R&D and capital equipment, the risks associated with investment and their very long-term returns, coupled with the strategic relevance of semiconductor technology, have meant that the sector has always been subject to public support.[16] The EU has been supporting the sector mainly through its framework research programmes and has previously set ambitious goals for market share together with industry.[17] However, most of the investments have focused on R&D and were not sufficient to address the scale of the challenge in the sector. A more comprehensive set of actions and financing schemes is needed, and a much closer collaboration of supply and demand side actors.

The impact of the chips shortages on the European economy has highlighted the urgency of taking further steps. Efforts must start now, mobilising all relevant public and private actors, leveraging strengths, diversifying capabilities, addressing structural gaps, embracing new markets and building international partnerships.

On 15 September 2021, Commission President Ursula von der Leyen announced an EU Chips Act in her State of the Union speech[18], pointing out the needs to link together Europe's world-class research capacities and to coordinate EU and national investment along the value chain.

The EU Chips Act proposes to build on Europe's strengths and address outstanding weaknesses, to develop a thriving semiconductor ecosystem and resilient supply chain, while setting measures to prepare, anticipate and respond to future supply chain disruptions.

The Chips Act is a unique opportunity for Europe to act jointly across all Member States and to the benefit of the whole of Europe. In the short term, it will allow to understand and anticipate future chips crises, addressing them through close coordination with Member States and equipping the Union with the instruments that some like-minded countries have at their disposal.[19] In the short- to mid-term, it will strengthen manufacturing activities in the Union

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15 See footnote 1.

16 PCAST report on semiconductors 2017

17 Electronics industry submits plan to make Europe a global leader in micro and nano-electronics

18 State of the Union 2021 - Streaming Service of the European Commission (europa.eu)

19 E.g., the Defence Production Act in the US.

and support scale-up and innovation across the whole value chain addressing security of supply and a more resilient ecosystem. And, in the mid- to long-term, it will reinforce Europe's technological leadership while preparing the required technological capabilities that would support transfer of knowledge from the lab to the fab and position Europe as a technology leader in innovative downstream markets.

This Communication provides the context and proposes a set of measures for strengthening Europe's semiconductor ecosystem for the Digital Decade. To this end, it is accompanied by:

– A proposal for a Regulation of the European Parliament and the Council, to build a resilient European ecosystem and strengthen Europe's technological leadership, to provide an appropriate framework for investment in the production of chips, and to ensure effective coordination between Member States and the Commission in addressing crises in the semiconductor market.

– A Commission Recommendation, addressed to Member States, anticipating key measures foreseen in the proposed Regulation, until the proposal is adopted, and proposing a governance framework that can kick-start immediately to help overcome the current shortage.

– A proposal for a Council Regulation amending Council Regulation (EU) 2021/2085 establishing the Joint Undertakings under Horizon Europe.

2. Europe's perspectives and market opportunities

2.1 Global semiconductor shortage

The current semiconductors shortage is the result of a combination of factors: a strong and accelerating demand for digital technologies, structural features of the semiconductor supply chains – such as long manufacturing cycles colliding with just-in-time production models of semiconductor users, or inflexible and concentrated supply that was further exacerbated by the COVID-19 crisis – as well as geopolitical tensions. Due to the wide digitalisation of the economy and society, the demand for chips had strongly increased even before the pandemic (e.g. in 5G phones and antennas, new video games, sensors and devices for the Internet of Things, etc.). The pandemic has exacerbated the situation and exposed the vital role of chips for modern economies and societies through a number of parallel developments.

Teleworking, home-schooling, and digital entertainment resulting from lock-downs led to a surge in demand for IT equipment, among them PCs, laptops and peripherals, wireless networks, game consoles, as well as data centres, servers and networking equipment, and to a surge in demand for the necessary chips.

A number of chip factories shut down temporarily due to the pandemic as well as to natural disasters in the last two years, straining the global semiconductor value chains. Semiconductor shipments to Europe from East Asia have further slowed down due to general supply chain issues caused by transport restrictions imposed by governments across the globe to fight the pandemic.

Industry's planning and demand forecasting became more difficult. Carmakers were among the ones to bear the brunt of the shortage. In early 2020, automakers cut back chip orders as demand declined. Foundries allocated available capacity to IT equipment. When demand for vehicles recovered in late 2020, foundries were running at full capacity, leaving automakers

with wait times of up to a year or more.[20] As a result, multiple car factories have been shut down across Europe and worldwide, and workers laid off.[21] European carmakers have called for an increase of EU chip production capacity and reduced reliance on foreign imports.[22] Globally, relative to standing orders, due to the chip shortage, 11.3 million cars could not be produced in 2021[23] and in some Member States production decreased by 34% when compared to 2019, back to 1975 levels.[24] The industrial equipment sector was equally hard hit[25].

Supply crunches were also further reinforced by trade tensions between the US and China and it is believed that the fear of additional export bans by the US has led some Chinese companies to stockpile chips.

Most importantly, the surge in demand was not matched by supply, which could not increase with sufficient speed. Production lines are set up for each specific type of chip, a process that takes several months and several billions of Euros. Production lines are also few and concentrated; they always need to work close to full capacity in order to cover the very high capital investment costs, leaving little flexibility for accommodating spikes in demand.

Overall, multiple economic sectors have been affected. Delays in the delivery of specialised chips for healthcare devices such as intensive care monitoring equipment, pacemakers, blood sugar monitors or defibrillators have potential life-threatening consequences.[26] Credit cards cannot be produced in sufficient numbers, consumer electronic devices are out of stock. Strategic sectors such as defence, security and aerospace are also under threat. Unreliable counterfeit chips have begun to infiltrate the markets, compromising the security and reliability of electronic devices[27].

The current shortage is unlikely to phase out before 2023 or even 2024. As demand will further accelerate and production capacities take time to consolidate, shortages for chips will continue, and inflationary pressure will intensify.

2.2 Evolution of semiconductor markets and technology

The value of the global chips market in 2021 was roughly USD 550 billion.[28] The bulk of global demand comes today from end-use applications in computing, including PCs and data centre infrastructure (32%), communications, including mobile handsets and network infrastructure (31%), and consumer electronics (12%). The growth rate is high in segments previously ruled by analogue and mechanical technology, such as automotive and industrial

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20 'Understanding the global chip shortages', J.P. Kleinhans & J. Hess, Stiftung Neue Verantwortung (2021)

21 Shortages related to semiconductors are estimated to cost the automotive industry USD 210 billion in revenues in 2021 - Alixpartners (2021).

22 https://www.acea.auto/message-dg/chip-shortage-auto-industry-calls-for-more-eu-made-semiconductors/

23 Estimates from AutoForecast Solutions.

24 Source: Verband der Automobilindustrie

25 The impact of shortages led to a 5.1 percentage point shortfall in EU-wide industrial production in the period January-October 2021. One-third of this shortfall came from the sectors motor vehicles (0.9%) and machinery and equipment (0.8%). https://voxeu.org/article/impact-shortages-manufacturing-eu

26 A recent survey of the Advanced Medical Technology Association found two-thirds of medical technology companies use semiconductors in at least half of their products. All respondents have experienced some disruption to their chip supply chain. Delays vary significantly, from two to 52+ weeks; Pacemaker, Ultrasound Companies Seek Priority Amid Chip Shortage, The Wall Street Journal (2021).

27 In this context, the November 2021 plenary meeting of Government & Authorities Meeting on Semiconductors (GAMS) discussed the issue of counterfeit semi-conductors.

28 According to IC Insights, sales in 2021 were 26% higher than in 2020 and the expected growth in 2022 is 11%.

manufacturing (12% each), where Europe is strong[29] (Figure 1).

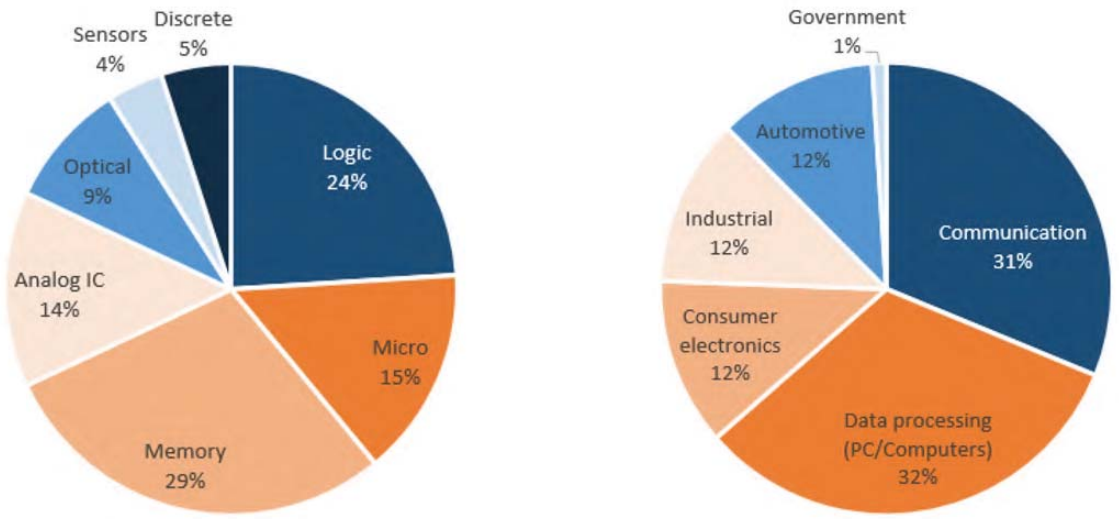

Figure 1: *Semiconductor market segments, by device type and by end-user sector demand*[30]

Driven by the relentless growth in data volumes, and the integration of ever increasing computational power, AI and connectivity into everything, the global market for chips is expected to exceed USD 1 trillion by 2030.

Increasing demand for chips is also driven by new market opportunities that include:

- *Artificial Intelligence:* AI will have an increased impact across many sectors. Dedicated computing and sensing architectures are required to deliver the necessary performance, and the segment of AI chips is by far the fastest growing in microelectronics, with expected annual growth rates above 40% for the coming years.[31]
- *Edge computing*: data processing is gradually shifting from cloud data centres to the periphery of the network, where data is generated. 5G connectivity will further boost the market expansion of the Internet of Things and analysts expect up to 80% of data to be processed at the edge by 2025, driving the annual growth rate at 35% of edge computing markets around industrial Internet of Things and enterprise-generated data,[32] sectors where the EU has core competences.
- *Digital transformation at large and the evolution of verticals:* at the core of the strategy for any industry, a 10-fold increase in connected devices is expected by 2025. This is in particular the case for sectors such as manufacturing and automation, agriculture, telecommunication networks, energy infrastructure or healthcare services. For example, semiconductors in the healthcare sector are expected to grow at an annual growth rate of 10% in 2020-2025.[33] Demand, driven by electrification and autonomous driving, is also

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29 Semiconductor Industry Association Factbook 2021 (figures for 2020).
30 Source SIA / WSTS, IC insights.
31 Forecasts by Technavio, Allied Market Research, Market Research Future
32 IOT Analytics
33 "Semiconductor in Healthcare Market: Industry Insights, Major Key Players and Current Trends Analysis", MarketWatch, 2021.

surging in the automotive sector: by 2026, the electronics market for vehicles is expected to grow at a nearly 15% annual growth rate to USD 78 billion by 2026.[34]

Relevant trends include also custom designs for specific industry sectors' needs. In order to satisfy a variety of use cases in traditional and emerging market segments and achieve higher performance, domain-specific architectures are required, raising demand for custom chips. The increased value of semiconductors is leading user enterprises, such as online platform or automotive companies, to co-design or even produce their own chips.

The sector is also driven by rapid technological evolution bringing miniaturisation to new frontiers while increasing computing performance, reducing costs and limiting power consumption. Representative examples include: new transistor technologies such as Gate All Around and advanced FDSOI; new system integration architectures that enable the bundling of different chips; and emerging, ground-breaking technologies, such as quantum[35] and neuromorphic[36] as well as new computing architectures based on advanced processor cores, including open-source. Furthermore, the use of new wafer materials, such as Silicon Carbide and Gallium Nitride will deliver increased performance for communication and for power electronics applications in electro-mobility and renewable energy.

Finally, keeping electronic products in use for longer, through design for durability and upgrading services, will reduce replacement rates and the need for new products. Microchip materials can be recovered from electronic waste; it is, for instance, technically possible to recycle compound semiconductor materials, although currently only in very small quantities.

2.3 Europe's Position

European industry has many strengths and some weaknesses in the semiconductor value chain. An overview of Europe's position is presented in Figure 2.

The semiconductor sector is characterised by intense R&D activity, with companies reinvesting more than 15% of their revenues into research in next-generation technologies. The EU is home to world-leading research and technology organisations (RTOs) and many excellent universities and research institutes spread across the Union. European RTOs pioneer the techniques behind the production of some of the world's most advanced chips. The computational performance of today's chips is due to the incessant miniaturisation of the FinFET process technology that has in turn been facilitated by Extreme Ultraviolet (EUV) lithography developed in Europe. A complementary process technology, FDSOI, developed and industrialised in Europe, offers substantial performance advantages in energy-efficiency useful for battery-powered devices. Chips based on both FinFET and FDSOI process technologies are present in every mobile handset manufactured today.

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[34] Forecast by Yole Developpement

[35] Quantum technologies hold the promise of unprecedented computing, communication, and sensing capabilities, as stand-alone solutions or integrated with the classical solutions. The first components based on quantum technologies are already appearing on the market.

[36] Neuromorphic architectures emulate the neural structure and operation of the human brain and facilitate learning of the chips over time with significant improvements in energy efficiency.

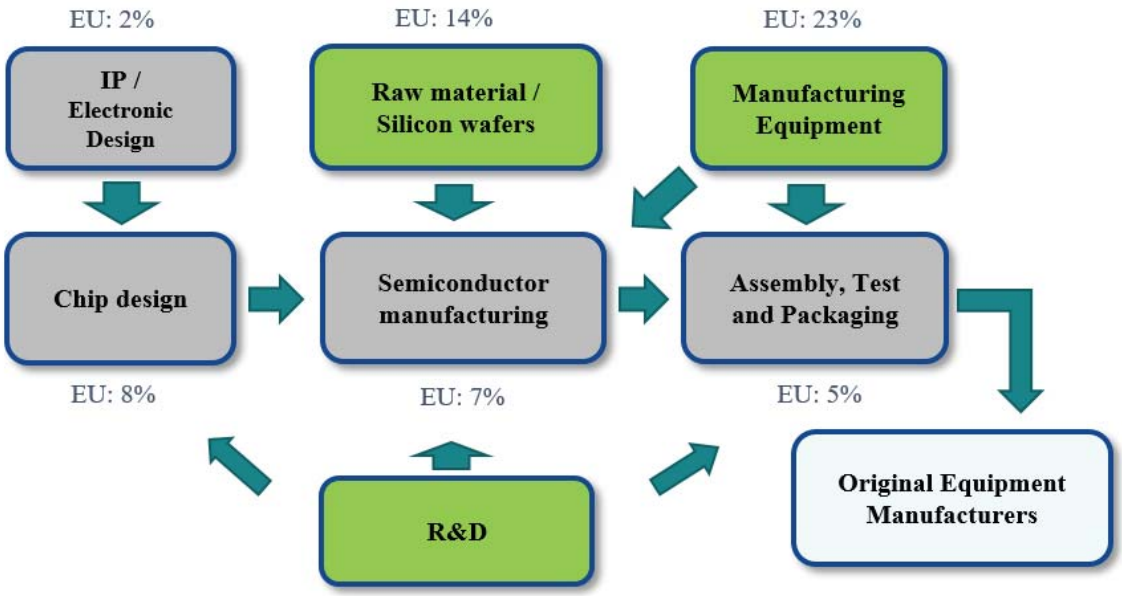

***Figure 2**: Semiconductor supply chain: EU global market shares of relevant segments*

Semiconductor manufacturing requires huge numbers of unique materials, chemicals and sophisticated equipment provided by specialist vendors for each stage of the manufacturing process. Europe is home to world-leading suppliers of equipment and raw materials such as substrates and gases[37]. In this part of the supply chain, certain European manufacturing equipment players are very strong in their respective market segments, to the point that no advanced chip in the world can be produced without equipment made in the EU, such as EUV lithography machines.

Europe also has leading chipmakers specialised in the design of specific semiconductor components. EU semiconductor suppliers are global leaders in chips for automotive and for industrial equipment, which are two high-growth markets[38].

Europe is also home to industrial sectors that represent a strong user base and will be among those driving the demand for the future, including – but not restricted to – demand for more advanced nodes. Semiconductor companies increasingly co-design chips with end-user companies for improving system performance; a trend where Europe has room for improvement.

Despite these strengths, today, the EU share of global revenues for semiconductor chips is around 10% overall while it was more than 20% in the 1990s.[39] Manufacturing in Europe declined in part due to the absence of large computing companies and the fading of mobile handset manufacturers that could justify the very sizeable investments. The high costs of manufacturing also led to its being offshored to Asia, benefitting from lower costs and higher public support. Over the past few years the European semiconductor industry has been

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37 Despite these strengths, Europe is dependent on third countries on certain materials, such as photoresist or silicon metal. To help build resilience in raw materials, the European Commission established the European Raw Materials Alliance (ERMA).

38 EU companies are strong in the design of chips for automotive, but part of production takes place also in other regions.

39 Source Decision / Carsa

investing in manufacturing again, but not to a scale that is sufficient to sustain the expected growth of the future.

Today most companies run their businesses based on fabless (or fab-lite) models whereby they outsource all (or some) of their manufacturing to foundries. Europe's chipmakers have focussed on production for the markets where they are strong, such as analogue, and which do not yet require the leading edge-nodes demanded by computing and communications. Even if equipment for manufacturing below 7 nm is made in Europe only, Europe has no foundries producing below 22 nm process nodes, whereas the markets of the future will increasingly move towards chips below 5 nm process nodes. As for assembly, test and packaging of chips, these have been traditionally outsourced to East Asia.

With billions of transistors in a single chip, a new design can require several years of effort by hundreds of engineers, making use of external IP and Electronic Design Automation (EDA) software. The major vendors are located outside Europe. However, there is considerable design talent across the Union and more recently, a growing number of small European companies are active in the design of advanced processors and accelerators, notably for AI chips.

3. A chips strategy for the Digital Decade

3.1 Europe's vision and strategic assets to realise it

Given the central role that chips play in the digital economy, their geopolitical dimension and the current strong concentration in production capacity, the Union has to urgently reinforce its semiconductor ecosystem, increasing its resilience as well as security of supply and reducing its external dependencies.

In December 2020, 22 Member States signed a Declaration on *A European initiative on processors and semiconductor technologies*.[40] They took note that Europe's share of the global semiconductor market is well below its economic standing. They agreed to undertake "a particular effort to reinforce the processor and semiconductor ecosystem and to expand industrial presence across the supply chain, in order to address key technological, security and societal challenges". Building on that, the Commission's Digital Compass[41] published in March 2021 **set an objective that by 2030 "the production of cutting-edge and sustainable semiconductors in the Union is at least 20% of world production".** The Proposal for the 2030 Policy Programme "Path to the Digital Decade"[42] has reaffirmed this ambition.

Europe has very strong assets, which are diversified and spread across many Member States, and can fulfil this ambitious vision with the necessary effort and a critical mass of investment, both from the public and private side.

Europe must and can mobilise an unprecedented level of investment given the high positive spill-over effects the sector has across the economy and many areas of public interest. Major public investment will be essential to attract high levels of private investment, which in the case of European companies is already of the order of EUR 6 billion per year. Increased investment in semiconductors will serve all industrial sectors and society at large, bringing benefits to all Member States.

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40 Joint declaration on processors and semiconductor technologies | Shaping Europe's digital future (europa.eu)
41 COM(2021) 118
42 COM(2021) 574

Working even more closely together will be another success factor. Europe must and can mobilise all its talents and assets. A close collaboration between many of the relevant public and private stakeholders is already taking place in the Key Digital Technologies (KDT) Joint Undertaking.[43] This needs to be strengthened and further expanded to involve all the actors of the value chain, the leaders of the research community, through European projects addressing Member States' collective interest.

Moreover, the value that Europe accords to security, including that of critical infrastructures, data protection, and energy efficiency should be leveraged, for example through the application of certification requirements in public procurement, which can help in driving demand.

While Europe is leading in research with important organisations across the continent, it must and can close the gap from the lab to the fab by leveraging its strengths in (i) equipment and materials, (ii) systems solutions and systems integration, (iii) strong presence in high-growth market segments like automotive, medtech, communications, energy and machinery, and (iv) research and academic excellence, where technology capacities should be further reinforced. Successful outcomes crucially depend on joint efforts and close collaboration of all sides – industry along the value chain, public sector and research organisations.

Finally, Europe's efforts must focus on the opportunities ahead. First, by looking at what the growth market and circular economy needs, i.e., low power components, a new generation of processors that are more powerful and adapted to data analysis, AI and edge computing, radio frequency and 5G/6G components for terabit communications, and more integrated power electronics, including recyclability and broader sustainability aspects. Second, by focusing on what technology is offering to address these needs: 2 nm and below in FinFET and Gate-all-around and below 10 nm in FDSOI, quantum, neuromorphic but also EUV lithography for production. Europe must advance its capabilities in these areas, lead technological developments and their industrialisation, leveraging investments and facilitating the adoption of these new technologies by the European industry, in particular by SMEs, to ensure that it stays competitive in the technological race, including for industries traditionally more focused on mature chips.

3.2 Strategic objectives

To fulfil this vision, the European strategy for chips is articulated around the following five strategic objectives:

First, Europe should **strengthen its research and technology leadership**. This is an imperative to preserve Europe's current assets in several break-through technologies, including in equipment manufacturing and advanced materials, needed to build next-generation production facilities serving all its sectors.

Second, **Europe should build and reinforce its own capacity to innovate in the design, manufacturing and packaging of advanced, energy-efficient and secure chips, and turn them into manufactured products.** This will guarantee the supply of chips in the longer term, serving industry and public sector needs and stimulating innovation in the wider

[43] The KDT Joint Undertaking (https://www.kdt-ju.europa.eu) was launched in November 2021. It is a tri-partite effort shared by Commission, Participating States (Member States and associated countries) and industry. It mobilises up to EUR 3.6 billion of public investment (EU and Participating States) until 2027. In addition, it is envisaged that the private stakeholders will invest an equal amount.

economy. For this, investment in pilot lines as well as in advanced design and testing and experimentation facilities and tools is essential. Pilot lines will be available for access to actors of the supply chain on open and non-discriminatory terms; as unique world-class facilities, they will make Europe a strong partner on the global stage, and provide a strong basis to the strengthening of international cooperation.

Third, Europe **should put in place an adequate framework to increase substantially its production capacity by 2030.** As the market is expected to double by 2030, quadrupling the production is necessary to reach Europe's objectives. This is not only a volume question. It is also about being in a position to produce in Europe the most advanced chips, serve users' needs and diversify access to markets, addressing those where Europe is not present today, while ensuring chip production considers also its possible environmental footprint. Further, it is necessary to strengthen security of supply, notably for critical sectors such as those relevant for public safety. For this, Europe needs to attract investments in production facilities on its territory that can come both from inside and outside the Union, and set up the right conditions and a favourable framework for private investment to take place.

Fourth, Europe should **address the acute skills shortage, attract new talent and support the emergence of a skilled workforce,** as current shortages are limiting efforts aimed at strengthening the ecosystem.

Overall, Europe should **develop an-in-depth understanding of global semiconductor supply chains** to monitor its functioning, understand future trends, anticipate disruptions, build international partnerships based on more balanced capabilities and mutual interest, react in time to prevent international supply chains from breaking down and enable the EU to take appropriate measures when necessary.

To achieve all the above, the Union should work closely with Member States and all relevant public and private stakeholders to coordinate efforts**,** pool knowledge and resources and create a vibrant and resilient semiconductors ecosystem in Europe. In addition, given the globalised semiconductor value chain the Union should establish strong international partnerships, in particular with like-minded partners. This will enhance coordination and minimise potential conflicting objectives. Such partnerships will provide for a close assessment of third country's policies in the sector as well as for joint approaches to address supply challenges, including through mutually beneficial diversification strategies.

Implementing the above should enable Europe to build a dynamic ecosystem across the EU, to the benefit of all Member States, attracting investments in production, design and R&D as well as the best talents worldwide that will be able to deliver on the vision. These developments will strengthen Europe's capabilities to achieve its environmental goals, accelerate the digital and green transitions while improving the Union's security. This requires decisive action now and is the reason why the Commission proposes a package of measures as outlined in this Communication.

3.3 Delivering on the ambition

The European chips strategy sets out a number of measures and initiatives combined with substantial investment to deliver on the vision and objectives set out above.

The overall level of policy-driven investment[44] in support of the EU Chips Act is estimated to be in excess of EUR 43 billion up to 2030, on the basis of announcements to date. This is

[44] Public investment and leveraged equity support

likely to attract and leverage further long-term private investments of a commensurate volume.

This public investment includes EUR 11 billion foreseen for the Chips for Europe Initiative[45] to finance technology leadership in research, design and manufacturing capacities up to 2030. It will require pooling investment from the Union and the Member States, to which private actors are also expected to participate. It will be complemented by equity support to start-ups, scale-ups and other companies in the supply chains, through investment facilitation activities described collectively as the 'Chips Fund' with a projected overall investment value of at least EUR 2 billion. These different actions, in combination, should result directly in public and private investments well in excess of EUR 15 billion. This will come on top of the loans that the EIB could offer to the entire semiconductor ecosystem.

Additionally, Member States' support to the Chips for Europe Initiative may also come from measures addressing microelectronics in their recovery and resilience plans, or from national or regional funds. Member States can also consider taking advantage of unused loan capacity under the Recovery and Resilience Facility to provide further support

Member States are for example already planning to invest in a new IPCEI, supporting cross-border innovative projects along the microelectronics value chain, including through the Recovery and Resilience Facility and Structural Funds. This investment complements the upcoming support to the set-up of large manufacturing facilities.

The above investments will complement existing programmes and actions in R&I in semiconductors such as Horizon Europe and the Digital Europe Programme. When it comes to the support to technological leadership, the scope of the Digital Europe programme will be enlarged. Additionally, the KDT Joint Undertaking will be reinforced and reoriented towards the objectives of Europe's chips strategy and will be renamed 'Chips Joint Undertaking'. The Joint Undertaking will step up its efforts to combine the financial and technical means that are essential to master the escalating pace of innovation in the semiconductor arena, generate important spill-overs for society, and share risk-taking by federating strategies and investments towards a common European interest. It will partner with Member States to facilitate a coherent alignment with national programmes, and support innovative large-scale projects. It is designed to cater for Member States' collective interest in the development of infrastructure and strengthened capacities to the benefit of actors in the value chain across the Union. Its success can therefore only be built on a collective effort by Member States, with the Union, to support both the significant capital costs and the wide availability of virtual design, testing and piloting resources and diffusion of knowledge, skills and competences. Under its renewed mission, the Joint Undertaking will become the lighthouse of the Union's efforts in semiconductors.

The following sections describe the specific measures and initiatives for delivering the objectives.

[45] Including the existing KDT Joint Undertaking

3.3.1 Leadership in research, innovation and equipment manufacturing

To preserve and strengthen its leadership in research and innovation as well as in equipment manufacturing, Europe has already planned to invest in next-generation technologies under the Horizon Europe programme.

Future research activities to be supported under the Chips Joint Undertaking will contribute to reinforcing support to the future needs of vertical industries, and ensuring that societal and environmental challenges are addressed. Research efforts will focus for example on technologies to achieve transistor sizes below 2 nm, disruptive technologies for AI, ultra low-power energy-efficient processors, novel materials[46], as well as heterogeneous and 3D integration of different materials, and emerging design solutions, for instance based on the open-source RISC-V computing architecture.

The Joint Undertaking may also engage with other relevant European partnerships addressing for example materials, manufacturing, smart networks and healthcare, or users industries using chips.

In addition, the EUR 1 billion Quantum Technologies Flagship[47] under Horizon Europe is supporting research in quantum chips, given their disruptive potential for complex computational tasks or in ultra-secure communication.

Further support to industrial research and innovation comes from Member States through Important Projects of Common European Interest (IPCEIs). A second IPCEI addressing microelectronics is currently under preparation[48]. The IPCEI is expected to involve over 100 prospective participants from about 20 Member States. All major market segments are addressed, with particular emphasis on innovation in areas such as AI processors, edge computing, electric mobility, security and energy efficiency. The IPCEI also includes projects in communication, an important vertical market that would reinforce European competences in 5G and 6G technologies. The projects will follow a holistic approach involving the whole semiconductor supply chain.

3.3.2 Leadership in the design, manufacturing and packaging

A new 'Chips for Europe' initiative will aim at reinforcing the EUs semiconductor technology and innovation capacities and ensuring semiconductor technology leadership in the mid to long term. It will ensure the deployment across Europe of advanced semiconductor design tools, pilot lines for next generation chips and testing facilities for innovative applications of latest semiconductor technology. It will also foster technology and engineering capacity in quantum chips by building advanced technology and engineering capacities in this field.

The Initiative will expand and build on Europe's leadership in research, including on the capabilities of its RTOs and of key production equipment providers, integrated design manufacturers[49] and strong users' sectors.

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[46] On 7 February 2022, major players of industry and research organisations presented the "Manifesto proposing a Systemic Approach of Advanced Materials for Prosperity: a 2030 Perspective" highlighting that the next generation of semiconducting materials will boost new "innovation markets" in Europe.

[47] The Quantum Flagship is a long-term research initiative developing quantum technologies such as in quantum computing and simulation, quantum communication networks and in quantum sensing and metrology.

[48] https://ec.europa.eu/commission/commissioners/2019-2024/breton/blog/ipcei-microelectronics-major-step-more-resilient-eu-chips-supply-chain_en

[49] Semiconductor companies that cover chips design and manufacturing and sell them to their clients.

The Initiative will pool investments from the Union and the Member States to leverage additional investments from private investors. This undertaking complements the already planned research activities, the results of which will be constantly fed into the pilot lines and the design infrastructure. The Initiative will help consolidate fragmented efforts and significantly scale them up to bridge the gap from the lab to the fab and to create the future-proof ecosystem for translating Europe's R&I excellence into industrial innovation capacity.

The Initiative will nurture a vibrant and resilient semiconductors ecosystem in Europe, including technology innovation actors as well as supply and user industries, fostering early adoption and sharing benefits across Europe. Close collaboration between supply and demand side actors will be a key success factor. The European Alliance on Processors and Semiconductor technologies[50] will play an advisory role for the Initiative, together with other relevant stakeholders.

The implementation of the new Chips for Europe Initiative will take place mainly through the 'Chips Joint Undertaking'. The combination of R&I activities and capacity building in the Chips for Europe Initiative within the same Joint Undertaking will lead to mutual benefits thanks to synergies between the Initiative and the scope and objectives of the existing Joint Undertaking.

Design strategy

Design is a key capability in semiconductors for conceiving novel systems adapted to different application and users' needs. To strengthen Europe's capacity to innovate in the design, manufacture and packaging of advanced chips, a large-scale *design infrastructure for integrated semiconductor technologies* will be built through a virtual platform available across Europe. Stakeholders including innovative SMEs and RTOs will have access to the design infrastructure, with clear IP rules.

This platform will build on existing and new design libraries integrating a large number of cutting-edge and new technologies. In combination with existing Electronic Design Automation tools, the platform would allow to design novel components and systems demonstrating new functionalities such as low energy, security, as well as new system integration and 3D assembly capabilities. It will be continuously upgraded with new design capabilities as it will be integrating more and more technologies and design for processors, including open source. Innovative design requirements will also target the durability and upgradability of electronic products.

The Alliance and the Chips Joint Undertaking will bring together chips producers and users to design and develop dedicated processors in areas such as industrial automation, automotive or communications, as well as the many SMEs in Europe that are active on the design front. International cooperation will also be important to access state-of-the-art design tools. The Platform will stimulate a wide cooperation of users' communities with design houses, IP and tool suppliers, designers and RTOs and will help ensure that the IP of next generations of chips comes from Europe.

Pilot lines for preparing innovative production and for testing and experimentation

The middle stages of chips product development can be very costly and risky, becoming real bottlenecks to industrialisation. The Initiative will therefore create and use extended *pilot*

[50] https://digital-strategy.ec.europa.eu/en/policies/alliance-processors-and-semiconductor-technologies

lines to prototype and scale up innovation, to bridge from demonstration in a lab to production in a manufacturing facility.

The Initiative will build on existing pilot lines, developing an infrastructure capable of bringing new advanced technologies to a higher level of maturity, facilitating accelerated industrial take up and commercialisation. Such leading-edge facilities will provide the means for industry to test, experiment and validate novel prototype system designs, integrating new breakthrough technologies such as e.g. quantum, AI or neuromorphic, as well as new functionalities such as security or energy efficiency. This will help provide immediate feedback to designers to refine and improve their design models before the transfer to manufacturing, allowing them to significantly shorten the development cycle.

The Initiative will support the development of new pilot lines such as one on FDSOI (10 nm and below), one on leading edge nodes (below 2 nm), and one for 3D heterogeneous systems integration and advanced packaging. These pilot lines will foster European IP in production technology and in advanced manufacturing equipment and materials. They will strengthen partnerships with equipment suppliers for advanced technology development, and will support industry-driven projects that centre on the transition from the lab to the fab for prototypes, on validating proof of concepts, and on technology transfer to production lines. These pilot lines – and in particular the one on FDSOI – will enable to develop highly energy efficient chips which are central for the green transition in sector like automotive, ICT, or mobility.

Pilot lines and the design platform above will be linked, as the pilot lines will enable the design community to test and validate technology options before these become commercially available. This link ensures that new chip and system designs fully exploit the potential of new technologies and deliver cutting-edge innovation.

This technology infrastructure is fundamental to expand Europe's knowledge, capacity and capabilities closing the innovation gap from research to commercially funded manufacturing, and to increase both demand and production in Europe by the end of the decade.[51] Strong synergies can be attained through combined development of the different pilot lines, e.g. through a European Chips Industry Consortium, pooling the Union's contribution with the collective resources of the Member States and other participants.

Additionally, Quantum is a highly promising emerging technology for computing, communication, and sensing. The Initiative will support building technology and engineering capacities for accelerating the development of quantum chips (i.e. chips exploiting quantum effects). Activities will include the development of pilot lines for quantum chips as well as for their testing and experimentation.

Certification of chips

Future smart devices, systems and connectivity platforms will have to rely on advanced electronics and they will have to meet energy efficiency, trust and cybersecurity requirements, which will largely depend on the features of the underlying technology. Member States have already agreed to "work towards common standards and, where appropriate, certification for trusted electronics, as well as common requirements for procurement of secure chips and embedded systems in applications that rely on or make extensive use of chip technology."

[51] The investments in design infrastructure and pilot lines may require co-financing by Member States, which will need to respect state aid rules where relevant.

Building upon its world-leading position in the development of green, trusted and secure chips,[52] Reference certification procedures for specific critical sectors and technologies with potential high social impact are necessary. Certification of these chips for green, trust and security should cover the value chain up to integration in end products and would be reflected in public procurement and promoted in international standardisation activities.

The Commission, in consultation with public and private stakeholders, including through the Alliance on Processors and Semiconductor Technologies, will identify and prioritise sectors and products with relevant green, trust and security issues in need of certification processes, taking into account legally applicable requirements emanating from harmonised Union law, and relevant activities within the European cybersecurity certification framework[53].

3.3.3 Boosting Europe's ecosystem and ensuring the security of supply

Investment in new advanced production facilities is imperative to safeguard the Union's security of supply and supply chain resilience while generating significant positive impacts to the wider economy. Positive impacts take place both when production evolves towards more advanced technologies (e.g. scaling, functional integration or performance, including energy performance), and when innovative technology processes are put in place.

Private investment in these advanced facilities may likely require significant public support. In light of the extremely high barriers to entry and the capital intensity of the sector, the Commission recognises the need for a case-by-case assessment, where public support includes State aid that does not fall under existing guidelines. In such cases, as already announced in the Communication on a competition policy fit for new challenges,[54] it may be justified to cover with public resources up to 100% of a proven funding gap, if such facilities would otherwise not exist in Europe. Such cases are to be assessed by the Commission directly under Article 107(3)(c) TFEU. Under this provision, the Commission may consider aid to facilitate the development of certain economic activities or of certain economic areas to be compatible with State aid rules, where it does not adversely affect trading conditions to an extent contrary to the common interest, weighing the positive effects of such State aid against its likely negative impact on trade and competition.

In the overall balancing of the positive effects of the aid against its negative effects on competition and trade, the Commission will take into account the fact that new production facilities are *first-of-a-kind* in the Union, in that they are established with a view to producing technologies that go beyond the Union's state-of-the-art, for instance in terms of technology node, substrate material, such as silicon carbide and gallium nitride, and other product innovation that can offer better performance, process technology or energy and environmental performance. The Commission will also consider the long-term viability of those facilities without continued operating support as well as clear commitments to continued innovation in the Union's semiconductor ecosystem[55].

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[52] A number of common criteria certificates was issued in 2020 by a set of leading EU manufacturers.

[53] Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act) (Text with EEA relevance).

[54] COM(2021) 713 final.

[55] Such additional investment in R&D for future technologies would take the form of independent contribution from beneficiaries and would not be part of the funding gap calculation.

The proposed Chips Act Regulation provides for a definition of *first-of-a-kind* that the Commission will take into account in its State aid assessment. The proposed Chips Act Regulation also introduces two types of first-of-a-kind facilities: *'Open EU Foundries',* devoting a significant amount of their manufacturing capacity to production for other industrial players; and *'Integrated Production Facilities',* designing and producing components serving their own markets. The recognition as either type of facility triggers a number of benefits. It allows access to fast-track permit granting and prioritised access to pilot lines set up under the proposed Chips for Europe Initiative. In addition, it confirms that the investment in the production facility contributes to the security of supply of semiconductors in the Union and is therefore in the public interest. The procedures for the recognition of 'Open EU Foundries' or 'Integrated Production Facilities' and for authorisation of State aid, where applicable, will be conducted in parallel. The Commission services will coordinate these parallel assessments to accelerate the decision making with the goal of taking simultaneous decisions.

The aid must have an incentive effect and be necessary, appropriate and proportionate. This means in particular that aid must not be granted for investments that have already been decided upon before an application for aid has been submitted, that the investment would not take place without the aid, that public financial support is a suitable tool and no less distortive alternative exists, and that undue competition distortions are minimised. The conditions according to which facilities under the Chips Act need to be *first-of-a-kind* plays a role also in this context, to the extent that it ensures to limit support to areas where sufficiently reliable supply is not available in the Union and that no existing or planned private initiative would be crowded out[56]. An additional factor to limit competition distortions and ensure proportionality is to avoid overcompensation. State aid amounts up to the sufficiently proven funding gap could accordingly be accepted.[57]

Depending on the merits of each individual case under review, additional positive effects to offset remaining risks of competition distortion will be considered. Such effects include the positive impact of the supported project on the semiconductor value chain with regard to ensuring the security of supply and increasing qualified workforce, or its positive impact on the innovation potential of SMEs and verticals that can access innovative products at their doorsteps, or any other benefit that can be shared widely and without discrimination across the EU economy. The conditions set out in the proposed Chips Act for the recognition of Open EU Foundries and Integrated Production Facilities in addition to *first-of-a-kind* are relevant in this respect, notably the commitment to invest in the next generation of chips[58] and the guarantees provided to avoid any extraterritorial application of public service obligations that may undermine the requirement to implement priority-rated orders. Positive contributions to cohesion and cross-border cooperation can also be considered relevant.

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[56] It may be the case that several parallel projects are recognised as first-of-a-kind, as long as it can be proven that State supported activities do not crowd out existing or planned private activities. Each State aid proposal will be assessed based on its merits to avoid undue distortions of competition. This includes a comprehensive view on necessity, to avoid situations of overcapacity.

[57] This means that the funding gap to secure establishment of the facility in the Union must be sufficiently proven, i.e. by comparing expected production costs in Europe using realistic assumptions as part of a credible business plan, including benchmark returns on capital in the sector, and comparing those to realistic sourcing or production alternatives (also globally) based on concrete evidence from beneficiaries, and/or by safeguards to ensure a fair distribution of additional gains that were not forecasted in the notified funding gap analysis.

[58] The investment in research, development and innovation would be independent of the funding gap analysis under a possible State aid assessment covering the manufacturing capacities.

For projects for which State aid is notified before the proposed Chips Act is adopted, the Commission will take into account their compliance with the criteria for Open EU Foundries and Integrated Production Facilities as set out in the proposed Chips Act with the expectation that such projects would apply for formal recognition once the Chips Act enters into force.

Investing in an innovative and vibrant semiconductor ecosystem

The semiconductor industry tends to be less attractive for investors than other sectors because of high capital intensity, high risks, complex technical projects and longer times for return on investment. As a result, this industry has been facing significant shortages in access to finance, including through equity and loans. In particular start-ups and SMEs often find it difficult to secure adequate market financing for investments into innovative high-tech or digital technologies, despite good growth prospects and sound business plans.

To facilitate access to finance and support the development of a dynamic and resilient semiconductor ecosystem, the Union will undertake activities, to be described collectively as '*Chips Fund*' activities, through two investment opportunities.[59]

Firstly, a dedicated semiconductor equity blending facility will be set up under InvestEU in close cooperation with the European Investment Bank Group. It will provide equity and quasi-equity financing, notably through venture capital funds, to support scale-ups and SMEs excelling in semiconductor and quantum technologies to ease their market expansion, in view of the need to underpin Europe's economic resilience. The EIB is also ready to step up its financing in the semiconductor value chain in line with the EU ambitions. EIB loans can support up to 50% of investments across the entire value chain from RDI to equipment, including pilot and testing centres, from design to large scale manufacturing and advanced chip capacity extensions.[60]

Secondly, the European Innovation Council (EIC) of Horizon Europe will provide, notably through its Accelerator scheme, dedicated investment possibilities in the form of grants and equity to support high-risk, innovative SMEs, including start-ups, with market creating innovation potential in the semiconductor and quantum technologies sector, and help them mature their innovations and attract investors.

3.3.4 Skills & Competences

Demand for talent in electronics has been increasing in the last 20 years, with the microelectronics industry in Europe being directly responsible for 455,000 high-skilled jobs in 2018. However, female participation in electronics education and employment is low, and shortages in the workforce are an important barrier to further growth in the sector.

The main challenge for the sector is to attract and retain highly skilled talent. To do this, access to state-of-the-art design and manufacturing equipment used by the industry, as well as more training for students on real-life business problems are needed.

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[59] Member States can co-fund projects supported by *the Chips Fund* in compliance with EU State aid rules. Member State's co-funding can occur through State bodies or vehicles using State resources, such as national promotional banks and institutions, and in blending operations or in the Member State compartment under the InvestEU Regulation.

[60] Additional financing by the EIB would be subject to demand and to due diligence.

The Chips for Europe Initiative will support education, training, skilling and reskilling initiatives. Action will support access to postgraduate programmes in microelectronics, short-term training courses, job placements/traineeships and apprenticeships, training in advanced laboratories, etc. Additionally, the Initiative will support a network of competence centres, located across Europe, that will provide access to technical expertise and experimentation in the area of semiconductors, helping companies, SMEs in particular, to approach and improve design capabilities and developing skills. The competence centres will become poles of attraction for innovation and for new talent.

The above would require close collaboration with the relevant actors, such as education and training providers, industry and Social Partners, to increase the availability of internships and apprenticeships, raise students' awareness of the opportunities in the field and support dedicated scholarships for masters and PhDs, also aiming at increasing female participation, among others via the EU STEM Coalition.

The activities will draw on the experience of the European Institute for Innovation and Technology (EIT) and will consider the European strategy for universities and the Digital Education Action Plan.

Member States should also strengthen their national skills strategies in microelectronics, including in those reflected in the national reform plans, as well as through European Regional Development Fund and the European Social Fund Plus.

Finally, the European Alliance on Processors and Semiconductor technologies could be instrumental in ensuring industry's commitment in the framework offered by the Pact for Skills[61] by organising awareness raising in relevant education institutions, but also by pledging to increase the offering of internships and apprenticeships. Erasmus+ also offers opportunities for students undertaking internships in another European country.[62]

3.3.5 Understanding the global supply chains and anticipating future crises

The semiconductor value chain is subject to risks of shortages; the increase in demand is strong, some market segments are concentrated, costs are high and supply is not flexible. Moreover, supply and demand are not transparent. In the presence of shortages, these factors expose Europe to geopolitical tensions. To mitigate the risks, the Union and the Member States should coordinate their actions and develop capabilities to monitor the functioning of the chips supply chains, including gathering intelligence, as well as to detect and respond to crises through correcting measures.

For this, the Union and its Member States will carry out a coordinated risk assessment that will identify early warning indicators and anticipate major risks for the supply chain. There will be two types of measures: those belonging to permanent monitoring (preparedness) and those that may be activated only under a crisis (crisis response). In case of a supply shortage, measures will be taken to ensure Europe's security of supply. Coherence and coordination with other crisis instruments such as the Health Emergency Preparedness and Response

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61 EU Pact for Skills: upskilling and reskilling initiative for those training and working in the microelectronics industry | Shaping Europe's digital future (europa.eu). The Pact for Skills is one of the flagship initiatives under the European Skills Agenda (europa.eu) and was launched on 10 November 2020. In microelectronics, it represents a public and private investment of EUR 2 billion providing upskilling and reskilling opportunities for more than 250,000 workers and students (2021-2025) in Europe's electronics clusters.

62 https://myinternship.eu/

Authority (HERA)[63] and the upcoming Single Market Emergency Instrument (SMEI)[64] will be ensured.

Regarding preparedness, Member States would provide evidence on relevant national markets in order to carry out a risk assessment and put in place early warning for anticipating semiconductor shortages. The Commission would also launch targeted stakeholder surveys targeting companies involved in manufacturing as well as purchasing semiconductors.

These inputs would allow the Commission to assess relevant factors, including choke points, trends and events, which could lead to disruptions of the semiconductor supply chain in the Union. Furthermore, Member States should offer the possibility for relevant stakeholder organisations, including industry associations and representatives of the main user categories, to provide information regarding atypical changes in demand and supply, and known disruptions of their supply chain, including the unavailability of critical semiconductors or raw materials, longer than average lead-time, delays in delivery and exceptional price surges.

The analysis of the situation based on the data collected in the monitoring phase, and through discussions with international partners, is crucial to anticipate possible disruptions of the value chain. Such information is vital in order to build on international partnerships with specific initiatives that may help to forestall, or at least mitigate the effects of, such disruptions. To increase the potential for trustful and mutually beneficial solutions, the EU's chips strategy will be instrumental to reduce not only asymmetry of means and of negotiating power, but also asymmetry of information on industry developments. Where a supply chain potential crisis is detected, the Union will seek to enter into consultation with partners with a view to seeking cooperative solution to address the situation.

In case of significant disruptions affecting critical sectors of the economy and society, a crisis response would be triggered, so as to enable a rapid, efficient and coordinated Union response.

A crisis response toolbox would be activated through a set of measures that are proportionate to the crisis situation. The toolbox would include measures such as mandatory information gathering, prioritization of orders for critical sectors, and common purchasing schemes. In addition, the Board may express its views to the Commission whether the introduction of exports controls is suitable. Such a Union response is without prejudice to further possible initiatives, in parallel, in conjunction with international partners.

To address the above and facilitate a smooth, effective and harmonised cooperation, a European Semiconductors Board will be established. It will be composed of high-level representatives of the Member States and the Commission. It will provide advice to and assist the Commission in addressing preparedness and monitoring issues related to the security and resilience of the supply.

To activate immediately such a coordination mechanism and enable a rapid, effective and coordinated Union response to the current chips shortage, the Commission puts forward a Recommendation to Member States, which encourages Member States to work together with the Commission to monitor the semiconductor supply chain and anticipate potential disturbances. Member States are encouraged to gather and provide information on the current state of the semiconductor crisis in their national markets and to discuss and adopt appropriate, effective and proportionate crisis response measures on national and Union level.

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[63] COM(2021) 576 final
[64] COM(2021) 350 final

This immediate coordination mechanism can take important steps to overcoming the current shortage until the proposal for a Regulation is adopted.

4. International Cooperation

By enhancing its security of supply and its capacity to design and produce powerful and resource-efficient semiconductors, the EU is contributing to the rebalancing of the semiconductors global supply chain. The aim is to improve its capacity throughout the supply chain, including at leading edge, and avoid any geographical segmentation or concentration in selected parts of the supply chain, in order to be in position to rely on an efficient negotiation power to leverage in time of crisis. Additionally, the EU has as an overall objective to serve the global demand, which will increase substantially, and to win its share of the growing market.

To achieve this ambition, the EU will need to proactively manage its interdependencies with the rest of the world, with a twofold objective: (i) to ensure a reliable global marketplace for European products, and (ii) to ensure security of supply, including in crisis situations.

Securing these objectives will require building balanced semiconductor partnerships with like-minded countries. The aim of these partnerships would be to set out cooperative frameworks on initiatives of mutual interest and seek a commitment to ensure continuity of supply in times of crisis. For such a commitment to be meaningful, a strong factual basis with input from supply and demand side industry stakeholders is needed.

The following elements could be part of the partnerships, as regards security of supply: better visibility of potential shocks, by regularly sharing information, best practices and intelligence on mitigating upcoming shortages; effective early warning mechanisms, to strengthen preparedness in moments of crisis; exchange of information on long-term investment strategies; international standardisation activities; and, coordination on export controls, ensuring prior consultation and managing unintended consequences. Other relevant topics for resilience, in particular workforce development; best practices to reduce the environmental impacts of production, and enhanced research cooperation, could be part of a balanced partnership with clear mutual benefits in terms of resilience and security of supply as well as reciprocity[65].

As a first step, the above will be explored – using existing or new fora – with like-minded partners, such as the United States, Japan, South Korea, Singapore, Taiwan and others.

Additionally, the EU will establish strong cooperation with neighbouring countries, in view to enhance the resilience of the semiconductor supply chains.

Europe's aim will be to establish a cooperative approach that addresses its security of supply. At the same time, the EU should be prepared for a possible failure of such an approach, a sudden change in the political situation or unforeseen crises, which could threaten the EU's security of supply. The crisis response toolbox within the EU Chips Act would give the EU the necessary means to address such situations and, in the last resort, to ensure Europe's overall resilience.

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[65] The Union research programme Horizon Europe, which will partly fund the Chips Joint Undertaking, is already the most open in the world to third country partners. In the context of a broader partnership with one or more key like-minded partners on factors relevant to Union resilience and security of supply, the Union should be ready to examine opportunities for enhanced cooperation with such partners, including in the context of the Joint Undertaking, on the basis of reciprocity and of the strategic interest of the EU.

5. Conclusion

Reinforcing Europe's leadership capacities in semiconductors is a precondition for its future competitiveness, and a matter of technological sovereignty and security. Implementation of the Chips Act Package will be a major step in addressing Europe's structural weaknesses in semiconductors and reinforcing its place in a global and interdependent ecosystem. The Council and the European Parliament are invited to support this approach, turning ambition into reality in the shortest possible timeframe.