European Chips Survey Report

Disclaimer: This document should be regarded solely as a summary of the contributions made by stakeholders in the targeted public survey. It cannot be regarded as the official position of the Commission and its services, and thus does not bind the Commission. Please note that the targeted stakeholder survey contributions cannot be considered as a representative sample of the entire European semiconductor ecosystem.

EUROPEAN COMMISSION

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)

Directorate-General for the Joint Research Centre (DG JRC)

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Table of Contents

EXECUTIVE SUMMARY

The European Chips Survey was launched on 16 February 2022 with the aim to better understand current and forecast demand for chips and wafers, the complexity of the value chain, industry prioritisation for chip fabrication activities, the impacts of the chip supply crisis on European industry and the industry appetite for public support initiatives.

This factual summary report provides an initial high-level analysis of the findings of the European Chips Survey. The report provides a snapshot and delivers key insights into the complex semiconductor market, while uncovering best practices for analyses into sensitive strategic dependencies.

In total, the survey received 141 responses. Over half of respondents were large enterprises, and just under half represented medium, small and micro-sized enterprises. 76 organisations had business activity on the supply side, 22 on the demand side, 16 were active on both the supply and demand side (e.g., automotive original equipment manufacturers producing finished cars and also being involved in semiconductor design), while the remaining did not self-identify as either category.

The ecosystems represented in the survey include the electronics, mobility, digital, health, renewable energy, energy intensive, construction, defence, aeronautics, agri-food, retail, proximity/social economy/civil security, cultural and creative industries, and the chemicals sector.

Guaranteeing the confidentiality of responses was critical in establishing the trust required for companies to reply to the survey. Further to this, the survey balanced question sensitivity with value-add to ease company hesitancy to respond (e.g., when asking about semiconductor procurement, specific geographies were not requested, but rather a simple statement as to whether it was inside or outside of Europe). The key takeaways were as follows:

Chip demand is expected to double between 2022 and 2030, with significant increases in future demand for leading-edge semiconductor technologies.

- Future chip demand across industrial ecosystems is expected to double between 2022 and 2030, alongside a significant increase in demand for wafers. For example, the automotive ecosystem nearly doubles chip demand by 2030 partly due to an increased demand for discrete semiconductors.
- In the short- to medium-term there is an overall increase in demand for smaller chip technology sizes, based on data primarily from the electronic, automotive, digital, health, and renewable energy ecosystems.

Companies establishing new chip fabrication facilities cite qualified labour and government regulations as key when selecting the location, while focusing less on customer proximity.

- Organisations establishing new fabrication facilities (fabs) highly prioritise the availability of a qualified labour force, operational costs, existing infrastructure, IP protection / legal security, levels of bureaucracy and compliance requirements.
- When establishing a new location for a fab companies indicated that government response time, ease of access and levels of bureaucracy were slightly more important than the amount of subsidies or tax incentives.
- When selecting a fab to manufacture chips, companies prioritise the technical aspects of the chip itself, quality of service, delivery time and price.
- Companies operating fabrication facilities or those relying on fabs do not highly prioritise geographical proximity. Neither risk hedging through geographical diversification nor proximity to customers was highly prioritised.

The supply crisis affects all ecosystems, and is expected to last until at least 2024, forcing companies to take costly mitigating measures.

- The chip supply crisis adversely affected overall production for most suppliers surveyed, and for all the respondents from the ecosystems.

- Most respondents do not expect an end to the current disruptions before 2024. The supply side was slightly more optimistic than the demand side, projecting the crisis to end sooner.
- Respondents were overwhelmingly prepared or had already taken mitigating measures to counter the adverse impacts of the chip shortage, such as attaining new suppliers, strategic investments, reducing chip usage, stockpiling etc.
- The survey showed that respondents were reluctant to provide long-term forecasting, probably due to the volatility of the market. A significant number of respondents did not forecast past 2025, leaving some of the findings beyond 2025 with limited data. To reflect this in the summary report, some of the findings do not display data beyond 2025.

Semiconductor research and development funding was mostly relevant for companies on the supply-side, however the support initiatives are also relevant for the demand-side.

- More than 4 out of 10 demand side respondents also had business activity related to the semiconductor supply side, demonstrating the complex nature of the value chain.
- Member State and European R&D funding remains more relevant for activities of businesses on the supply side, as compared to the demand side, however funding was still relevant for more than 15% of demand side respondents.
- A significant majority of supply-side companies, and those operating on both supply and demand sides, found pilot lines to be relevant for their organisation. 1 in 4 demand side companies found pilot lines relevant.
- Most companies on both demand and supply sides deemed innovation in node shrinkage relevant for their business activities.
- Respondents on the supply side were more engaged in selling, purchasing, or both, of semiconductor intellectual property. However, more than 15% of demand side companies also purchase semiconductor intellectual property, with some signalling that they consider custom chips important to stay competitive.

Overall, the findings of the semiconductor survey correspond to similar findings in the Commission staff working document *A Chips Act for Europe*, published on 11 May 2022. For example, with regards to the impacts of the current chips crisis adversely affecting individual industrial ecosystems, the results of the European Chips Survey support the conclusion of the staff working document. The European Chips Survey also complemented these observations, by looking into whether companies had or were taking mitigating measures to address the supply crisis.

The European Semiconductor Expert Group is working to establish a monitoring system for the semiconductor value chain. The European Chips Survey provides key methodological insights that can positively shape and inspire such future monitoring initiatives, on chips and on other strategic components of interest.

1. INTRODUCTION

On 16 February 2022, the European Commission launched a targeted stakeholder survey to gather information on current and likely future chip and wafer demand, alongside other industrial requirements for the semiconductor value chain.

The purpose of the targeted stakeholder survey was to identify the following: i) existing and future demand for chips; ii) prioritisation of companies directly involved with fabrication activities, iii) relevance of EU research and development programs; iv) implications of the supply-side crisis on key European industrial ecosystems; and v) any other issues relevant for the semiconductor value chain.

The targeted stakeholder consultation was launched on EUSurvey, and was closed on 20 March 2022. The European Commission received 141 responses, representing a relatively small sample size however with key industry players responding.

As guaranteed confidentiality was one of the prerequisites for participating in the survey, respondent identities will remain anonymous, and the data collected and presented in this document are aggregated so that company-specific insights will be unattainable.

The purpose of this document – the European Chips Survey Report – is to provide a factual summary of the responses to the targeted stakeholder survey.

2. BACKGROUND

Semiconductors are central to our economy. They make digital products work: from smartphones and cars, to infrastructures in health, energy, automation, and other industrial sectors. Semiconductors are also essential for the acceleration of the green transition, enabling European industry to reduce dependencies on fossil fuels to meet the EU's climate goals. Yet, the world is short of semiconductors – also known as chips.

In this context, the European Commission's President, Ursula von der Leyen, announced in her State of the Union 2021 address the intention to build a state-of-the-art European semiconductor ecosystem.

On 08 February 2022, the European Commission published a proposal for actions ('the EU Chips Act') to address semiconductor shortages and to strengthen Europe's technological leadership. With this package of measures, the Commission aims to build on European strengths – world leading research and technology organisations and networks as well as many pioneering equipment manufacturers – and address outstanding weaknesses. The overarching ambition, as set out in the Commission's Digital Decade communication, is to double by 2030 the EU's share in global semiconductor production.

Together with the proposal of the Chips Act, the Commission adopted a Recommendation on a common Union toolbox to address semiconductor shortages and an EU mechanism for monitoring the semiconductor ecosystem. The Recommendation enabled the coordination mechanism between the Member States and the Commission to commence through the European Semiconductor Expert Group, which held its first meeting in March 2022.

In parallel, the Commission's 2020 industrial strategy launched a series of in-depth reviews of strategic areas. Semiconductors were identified as one the EU's key strategic dependencies, and fundamental for the EU fully to seize the opportunities of the digital transformation.

Against this background, the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) launched the European Chips Survey (see Annex I & II). The aim was to better assess the industrial demand for chips, how the chip shortage was affecting key industrial ecosystems, and what could be done to effectively address these issues.

3. METHODOLOGY AND RESPONDENT TYPOLOGY OF THE EUROPEAN CHIPS SURVEY

To disseminate the survey widely to as many relevant stakeholders as possible, and to ensure receipt of relevant and comprehensive information, leading organisations representing the semiconductor industry across the whole of the EU were asked to share the survey with their membership.

The disseminating organisations were instructed not to focus exclusively on larger players, but also on the vast SME community that underpins the semiconductor industry. In addition, the survey launch was accompanied by a social media campaign and press activity to draw the attention of industry to the European Chips Survey.

From the outset, respondents were assured that all data collected as part of the survey submissions would, except for the small core team assessing the responses, remain confidential and generalised to such an extent that identification of specific companies would be impossible. This was important given the high concentration and specialisation of companies within the industry.

When drafting the questions, there were two main considerations. Firstly, the survey questions needed to be able to attract answers from which policy insights could be drawn. Secondly, upon consultation with relevant stakeholders from academia and industry, the final questions in the survey did not go beyond what was needed to inform European policy. For example, companies were asked whether they sourced integrated circuits or electronics from inside or outside of Europe, without specifically asking the country of origin. This was understood to increase company participation in the survey, and the quality of responses to questions.

The European Chips Survey was aimed at a wide range of respondents, and needed to be sufficiently broad to attain useful, insightful, and actionable responses from the participants. The survey was aimed at companies who both manufacture semiconductor products, as well as the end-users of semiconductor products (e.g., finalised/packaged integrated circuits).

The European Chips Survey received a total of 141 responses, which were broken down according to company size as follows:

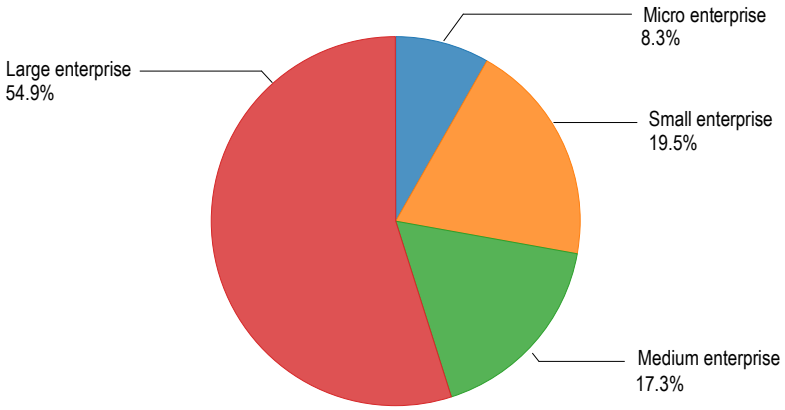

Figure 3.1. The 141 responses broken down by large, medium, small and micro enterprise size.

In total, 136 companies provided information on the location of their headquarters. Of these, 95% indicated that their headquarters were in Europe. The largest group of respondents was from Germany (20.8%), followed by the Netherlands (10.4%) and France (8.8%). Other sizeable groups of respondents came from Spain (7.2 %), Belgium (7.2 %), Finland (6.4%), Sweden (4.8%), Italy (4.0%), Croatia (4.0%), Slovenia (3.2%), Switzerland (3.2%) and Greece (3.2%). Additionally, responses were received from Austria, Czechia, Denmark, Estonia, Hungary, Lithuania, Malta, Poland, Portugal, Romania and Slovakia.

Respondents were asked to identify their position on the semiconductor value chain. In total, 114 respondents did so, and were generally split into two broader categories: (i) suppliers within the semiconductor value chain (supply side); and (ii) end users of semiconductor products (demand side).

A total of 76 respondents identified themselves on the supply side, indicating their position in the supply chain as follows:

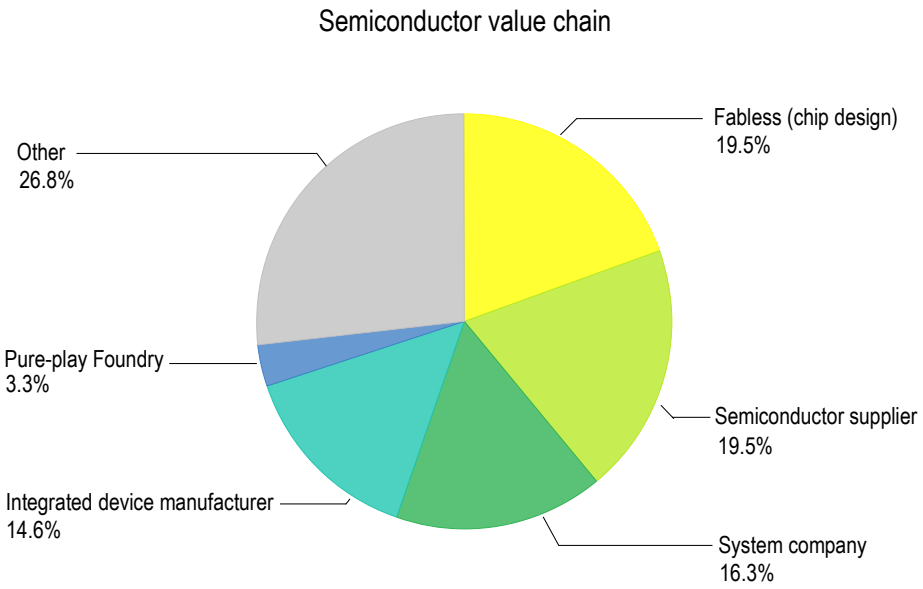

Figure 3.2. The semiconductor value chain with focus on supply side[1]. From 76 respondents, 96 answers were received. The number of answers is higher than the number of respondents due to the multiple-choice option.

Some respondents to the European Chips Survey chose not to identify themselves in these terms and provided no response to the question where they see themselves in the value chain. A check of their identity against the data provided concerning their business operations suggests that the vast majority of 'no response' to this question originated from demand side actors. In addition, 27 respondents classified themselves as 'Other' or did not respond. The 'Other' respondents generally operated in research and academia.

Respondents on the demand side, i.e. those who purchase finished/packaged semiconductor products, were also asked to signal in which ecosystem they primarily operated. Of these, 22 companies identified themselves solely as end-users within the various ecosystems, including aeronautics, agri-food, construction, chemicals, cultural and creative industries, defence, digital, electronics, energy intensive industries, energy renewables, health, mobility/transport/automotive, proximity/social economy/civil security, retail, textiles, tourism and other ecosystems.

Interestingly, 16 companies identified themselves as being involved in activities on both the supply and demand sides, confirming the observation of a broader trend that some large end-users of chips are increasingly also involved on the supply side, for example, in chips design.

[1]Definitions: Fabless companies focus on chip design and outsource their fabrication to foundries. Pure-play foundries specialise in semiconductor manufacturing. Integrated device manufacturers (IDMs) design their own chips and have their own facilities for fabrication and assembly. System companies integrate software and hardware components and subsystems in a single solution or system. Semiconductor suppliers include companies selling input materials, such as raw materials, chemicals, or wafers to semiconductor manufacturers.

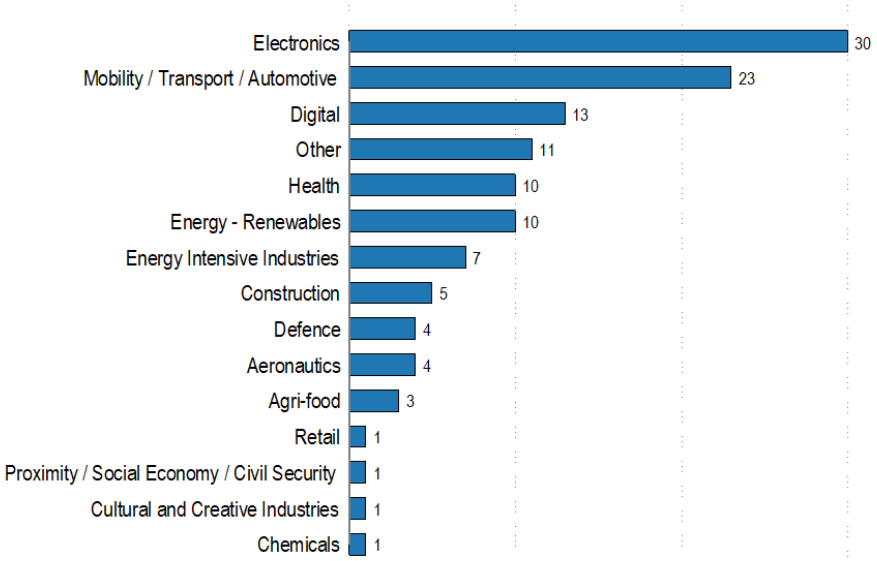

Figure 3.3. End-users per industrial ecosystem on the demand side

It is important to note that companies operating on the demand side, i.e. those acquiring finalised semiconductor products, could tick multiple ecosystems in response to the question in which industrial ecosystem they predominantly operate. Indeed, our analysis showed that several companies operate in multiple industrial ecosystems, illustrating the complexity of the semiconductor market. We observed a number of overlaps, in particular between the energy renewables and energy intensive industries ecosystems (65.6%), and the electronics and digital ecosystems (43.7%).

4. WHAT INFORMATION DID THE EUROPEAN CHIPS SURVEY PRODUCE?

This European Chips Survey summary report presents the findings in the chronological order by which respondents submitted their data. Due to the nature of the survey, not all questions were relevant for all respondents. For example, SME chip end-users did not respond to questions concerning the operation of semiconductor fabrication facilities.

This summary report has been split into four sections representing the main sections of the European Chips Survey itself.

Section 4.1. provides a breakdown of responses relating to wafer and chip demand from European semiconductor suppliers, end-users (including a deep dive into the automotive and energy renewable industrial ecosystems) and enterprise size.

Section 4.2. explains the prioritisation organisations who operate fabs make when establishing a new facility, and the prioritisation of the selection criteria for those who require a contract-manufacturer to produce semiconductor products.

Section 4.3. presents an analysis on the relevance of research and development. This is again broken down looking separately at semiconductor suppliers, end-users, and those who see themselves operating on both sides, and according to the size of the enterprise in question.

Section 4.4. focuses on the impact of the semiconductor supply crisis on end-users and suppliers operating along the semiconductor value chain. This section touches upon business impact and future expectations.

As mentioned before, to protect the confidentiality of responses, the findings in the summary report are aggregated to a degree that does not enable identification of individual or small groups of respondents.

SECTION 4.1: Current and projected wafer and chip demand

The main findings for Section 4.1. are as follows:

1. Aggregate demand significantly increases for both wafer and chip demand in the coming years
2. Demand for leading edge technology nodes increases significantly in the short and medium term

The main aggregated analysis is followed by a short deep dive into the automotive and energy renewables ecosystems.

1. Aggregate demand significantly increases in both wafer and chip demand

Current and projected wafer demand

The first step in the demand analysis was to uncover to what extent respondents that had a stake in the manufacturing of semiconductors had a demand for wafers (measured in units), and what the companies expected in terms of future wafer demand. The results were the following:

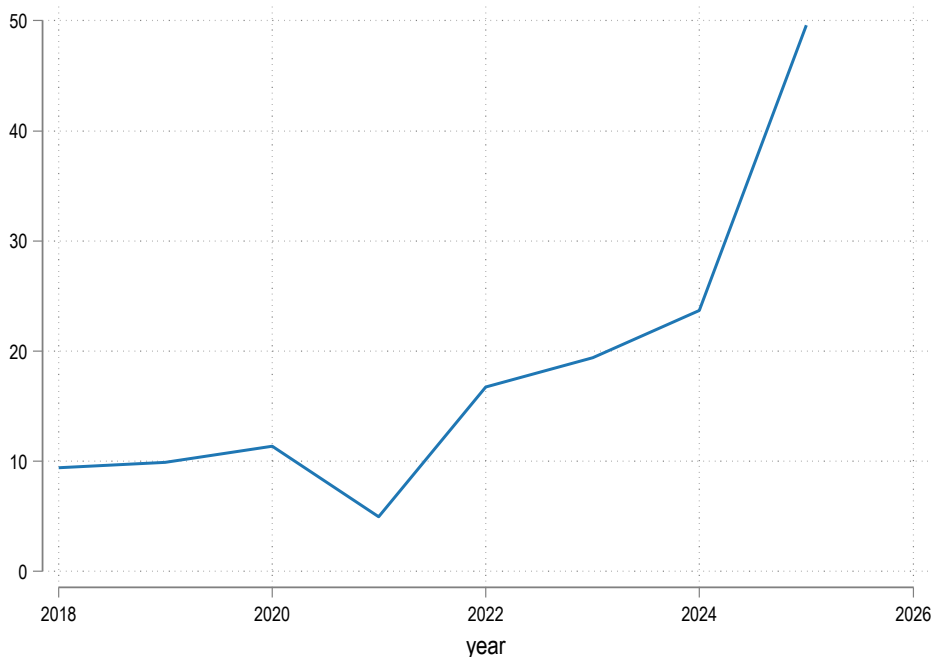

Figure 4.1. Aggregate current and projected wafer demand (5 respondents)

- Demand for wafers is expected to grow significantly

European companies operating in the semiconductor value chain with a **demand for wafers** expect a significant increase in their wafer demand over the coming years. (Please note the 2021 and 2024 reduction was affected by single companies reporting a drop in their overall wafer demand)

It is important to note, however, that the sample size of respondents who provided forecast data for wafer demand was small. As a result, the findings are not generalisable across industry or the European economy. With that said, they serve as anecdotal evidence of a significant increase in wafer demand.

With regard to wafer material, respondents indicated that wafer purchased were 80% silicon, 18% compound material, and 2% other. Some 53% of wafers were sourced from outside of Europe, and 47% were sourced from within Europe.

- Demand for chips is expected to grow significantly, doubling between 2022 and 2030

The **demand for finalised/packaged chips** from companies operating in the semiconductor value chain is also expected to grow significantly between 2022 and 2030. It is important to bear in mind that the figures from 2020, 2021 and, to a degree 2022 may have been affected by the COVID-19 pandemic.

It is also noteworthy that some companies did not forecast beyond 2025, whereas some respondents have made forecasts up to 2030 (explaining the perceived slower growth rate after 2025). Nevertheless, in all enterprise size groups, the projections indicate a clear growth in chip demand.

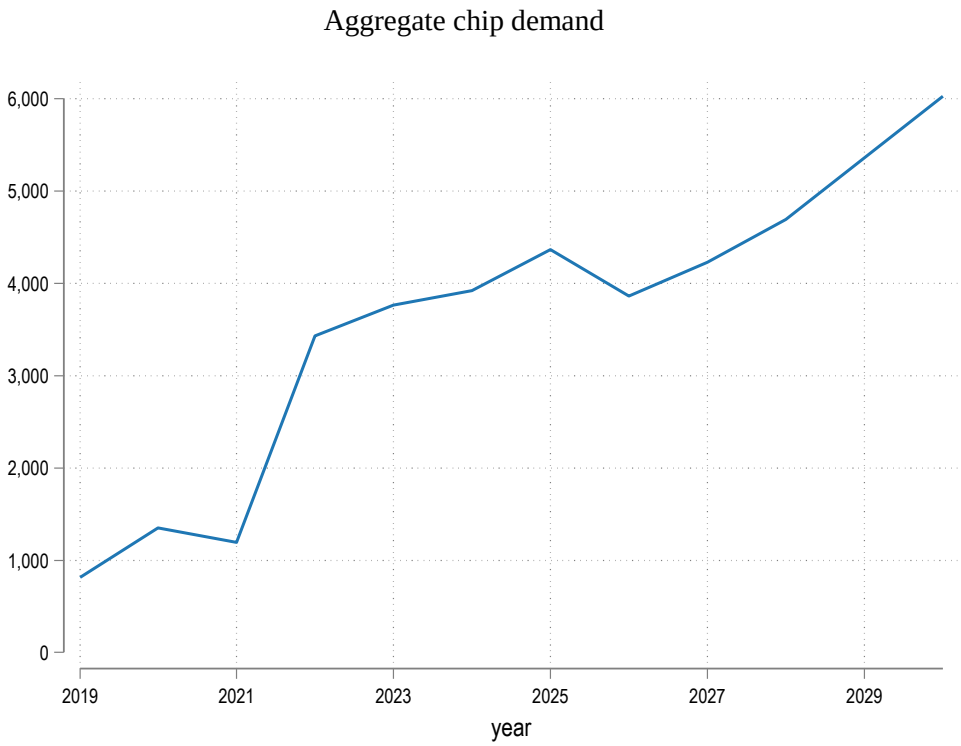

Figure 4.2. Aggregate current and projected chip demand (53 responses)

The current and projected chip demand broken down by chip typology

The group of companies that identified themselves as purchasing chips or semiconductor products were then asked to specify which **chip typology** they purchased. The findings below in Figure 4.3. indicate that respondents primarily purchased discrete semiconductors, followed by analog and optoelectronics.

In general, the figures did not change significantly over time (from 2021 to 2025), with the notable exception of sensors which appear to see a large growth from 1.1% in 2021 to 7% in 2025.

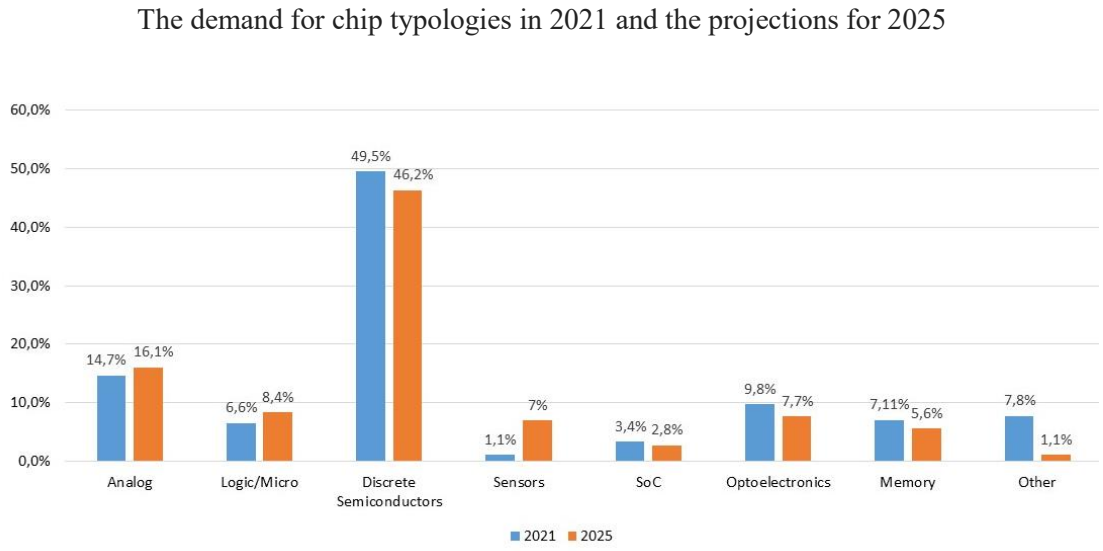

Figure 4.3. The aggregate demand for chip typologies in 2021 and 2025 (43 respondents)

2. Aggregate demand for leading-edge technology nodes increases significantly

Respondents also projected an **increased demand for smaller chips** between 2022 and 2024, with exponential growth for the smallest technology node (5-7nm). Several companies were unable to forecast beyond 2025 to 2030, partly due to the volatility of semiconductor markets and uncertainties associated with long-term forecasting.

However, the general short-term trend indicates a clear growth in demand for smaller technology nodes (categories: 5-7nm, 11-22nm, and 28-45nm).

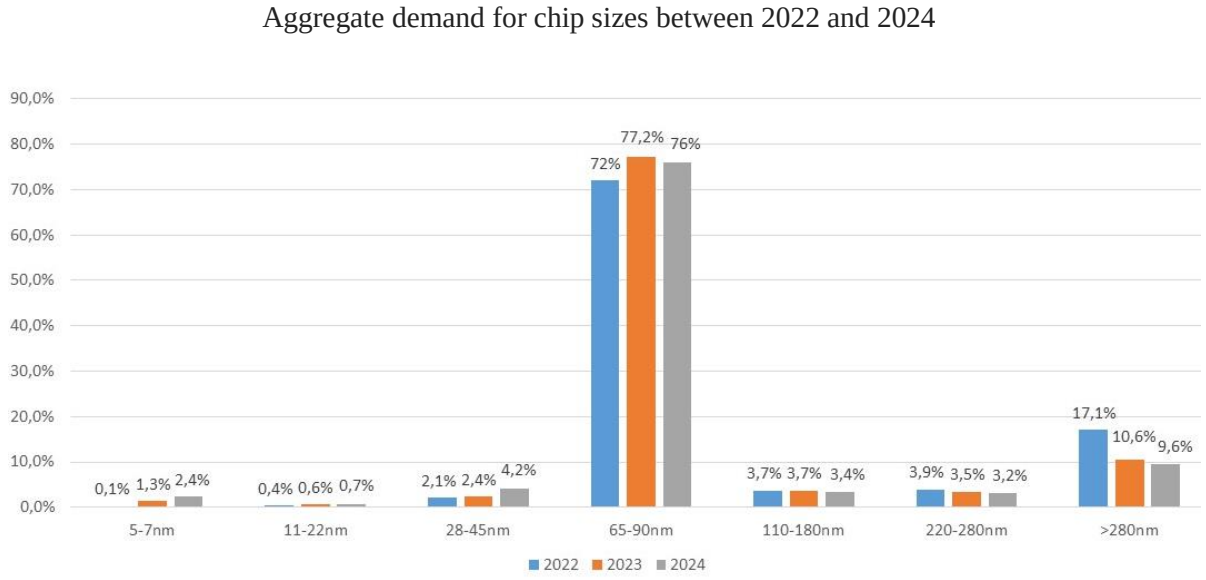

Figure 4.4. Demand for chip sizes between 2022 and 2024 (43 respondents)

Mobility/Automotive/Transport ecosystem breakdown

The European Chip Survey enables a deep dive into the market dynamics of key industrial ecosystems. The automotive ecosystem had the second highest number of respondents, and accounted for a significant proportion of total aggregated demand for chips and/or semiconductor products (i.e. goods containing integrated circuits).

For the automotive ecosystem, a clear increase in the aggregate demand for chips is expected over the period 2022 to 2030, with a near doubling of demand, as seen in Figure 4.5. below:

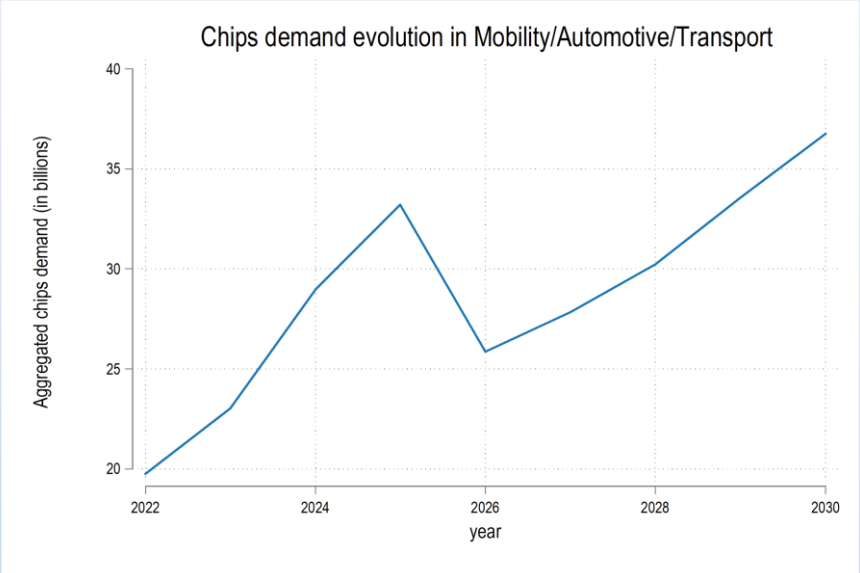

Figure 4.5. Aggregate demand evolution for the Mobility/Automotive/Transport ecosystem (17 respondents)

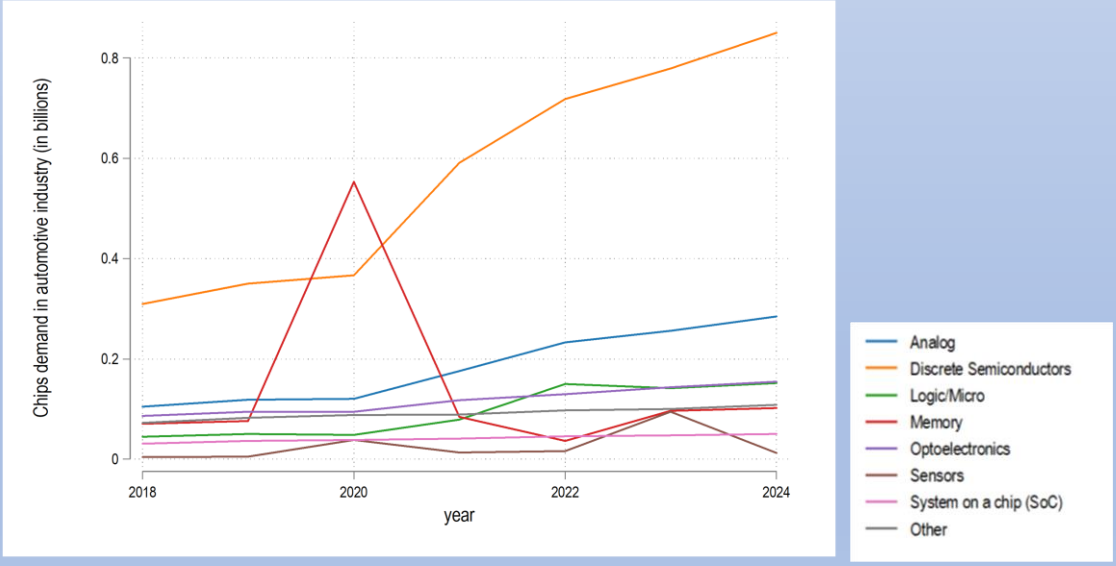

Figure 4.6. Aggregate automotive demand broken down by chip typology (5 respondents)

Respondents suggested that current and future demand for discrete semiconductors[2] was the highest, but that there was also significant demand for other chip typologies. Finally, the data was also broken down by enterprise size, showing that the largest real terms growth for chip demand came from large enterprises, while the highest percentage growth was observed in medium-sized enterprises.

[2]Definition: A discrete semiconductor is a device that is specified to perform an elementary electronic function and is not divisible into separate components functional in themselves.

Renewable energy ecosystem breakdown

The energy renewables ecosystem had a significant growth in chip demand. Companies in the ecosystem forecast a six-fold growth rate by 2030, led by a significant increase in demand for both analog and discrete semiconductors.

This exponential growth rate is shown in the graphs below, Figure 4.7. and Figure 4.8:

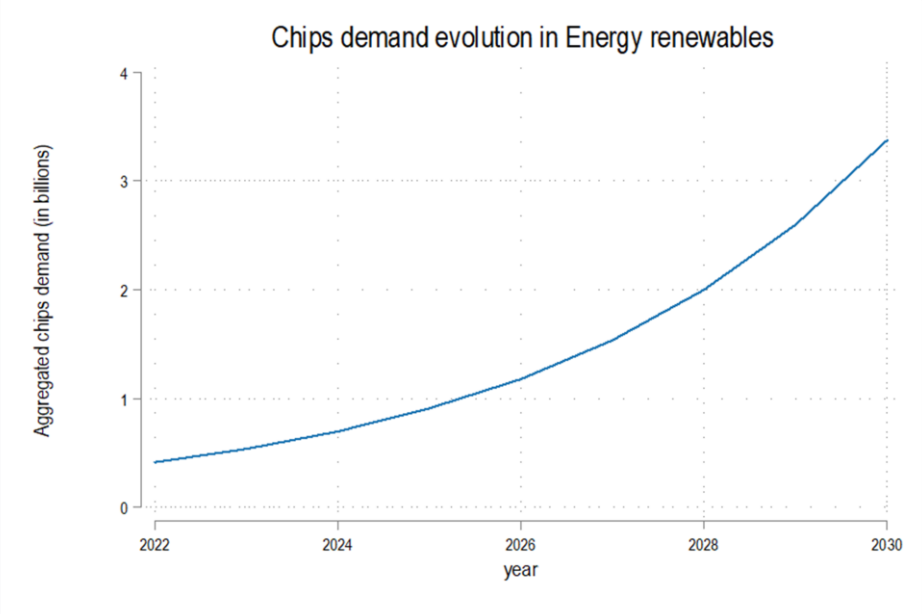

Figure 4.7. Aggregate demand evolution for the Energy Renewables (7 respondents)

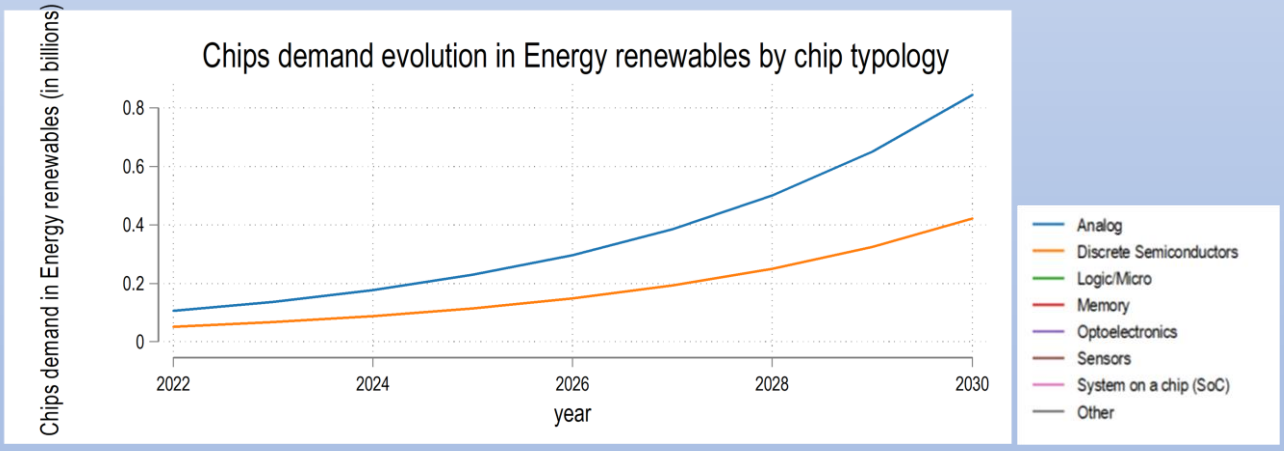

Figure 4.8. Aggregate energy renewable demand broken down by chip typology (5 respondents)

There was a higher response rate in the aggregate demand evolution for the energy renewable ecosystem than those responding to the chip typology. This could suggest that either companies are reluctant to disclose the chips they are purchasing, or that the organisations may not be aware of the chip typology within their products.

When the renewable energy ecosystem was asked to what degree there was engagement in either the purchasing or selling of semiconductor intellectual property, a total of seven companies responded with one (14.3%) indicating that they do purchase semiconductor intellectual property.

SECTION 4.2: Priorities for establishing chip production facilities or choosing a contract-manufacturer and technology node.

The following two tables indicate the prioritisation organisations make when either establishing a new chip fabrication facility (fab), or selecting a fab for specific contract-manufacturing requirements. It is important to note that the number of respondents is small, and that they vary in size and type of business activity. The respondents indicated that:

1. Organisations establishing new fabs highly prioritise the availability of a qualified work force, operational costs, existing infrastructure, IP protection / legal security, levels of bureaucracy and compliance requirements. Proximity to customers is not highly prioritised.
2. When selecting a fab to manufacture semiconductor devices, organisations prioritise the technical aspects of the process node itself, quality of service, delivery time and price. Geographical proximity and risk hedging through geographical diversification are not highly prioritised.

What are deciding factors for choosing a new location for a production facility?	Average response
Availability of qualified work force	9
Existing infrastructure	8.7
Government subsidies (total amount of subsidies, tax incentives, etc)	7.6
Government subsidies (speed, ease of access / level of bureaucracy)	8.1
IP protection / legal security	8.5
Level of bureaucracy and compliance	8.5
Operational costs	8.8
Proximity to customers	5.6
Risk hedging through geographical diversification	7.1
Water supply	7.6

Figure 4.9. Deciding factors when choosing new locations for production facility [Scale: 1 = not relevant, 10 = highly relevant] *(13 respondents)*

What are deciding factors for choosing a foundry & technology node?	Average response
Technical aspects of process node itself	9.2
Existing business relationship	6.5
Geographical proximity	4.2
IP ecosystem including process development kit	7.8
Independent, non-competitive supply (pure-play foundry)	6.4
Lock-in with existing foundry/vendor	5
Price	8.2
Risk hedging through geographical diversification	4.9
Quality of Service (e.g. customer relationship management)	8.6
Fab capacity	6.9
Delivery time	8.5

Figure 4.10. Deciding factors when choosing new foundry and technology node [Scale: 1 = not relevant, 10 = highly relevant] *(23 respondents)*

On average, the industry players that have direct relationships with fabrication facilities do not highly prioritise proximity or geographical diversification when establishing or choosing a fab. Operational costs, quality of service, and price appear to be more important, alongside public subsidies (especially ease of access).

SECTION 4.3: Relevance of research and development in the semiconductor value chain

Respondents operating in the semiconductor value chain were also questioned as to their interactions with research and development facilities, and their requirements for R&D. Due to the nature of the research and development requirement per respondent, this section splits respondents up based on their business activity.

The main findings for Section 4.3. are as follows:

1. Member State and European R&D funding was more relevant for respondents on the supply side than those on the demand side.
2. Pilot lines are relevant for the supply side and for companies operating on both supply and demand sides, but they are currently less relevant for demand side actors
3. Most respondents found node shrinkage to be relevant within their business operations
4. Most supply-side companies buy or sell semiconductor intellectual property, or do both. Interestingly, more than 15% of the demand side respondents purchase semiconductor IP.

The following analysis splits the findings into (i) companies that identified themselves as operating solely on the supply side; (ii) those operating solely on the demand side; and (iii) companies that see themselves as operating on both sides. As a result, the category for both sides is not an average of supply and demand sides but represents respondents who have identified that their activities fall within both the supply and demand side (i.e. they are involved in chip manufacturing and are an end-user).

1. Member State and European R&D funding was relevant for the supply side

There are stark differences between supply and demand R&D requirements. This was to be expected as targeted semiconductor R&D tools are not generally sought by end-users, but rather by semiconductor manufactures. The key findings from the closed questions in the R&D section are set out below:

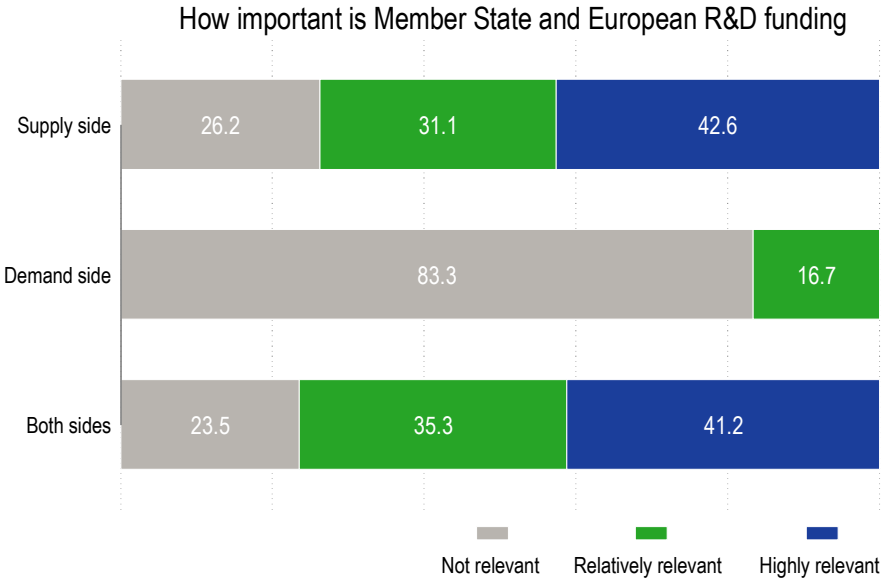

Figure 5.1. Importance of Member State and European R&D funding (90 respondents - supply side 61, demand side 12, both sides 17).

A large percentage of total respondents answered the R&D questions, including 90 for the importance of R&D funding. Nearly 75% of respondents on the supply side deemed Member State or European R&D funding relevant or highly relevant for their business activities, as well as more than 75% of respondents operating on both supply and demand sides. End-users suggested that R&D funding was not generally relevant for them, raising questions as to why the difference between those involved in the supply side and end-users is so significant and whether there is a trend over time towards increased end-user engagement with research and development.

2. There is significant support for access to pilot lines[3] from the supply side

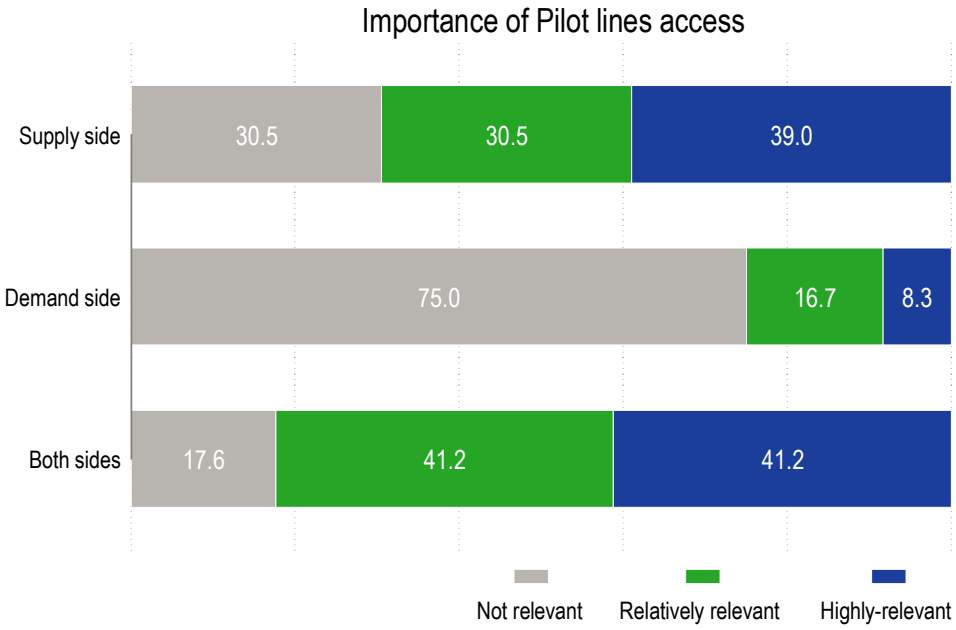

Figure 5.2. Importance of access to pilot lines (88 respondents – supply side 59, demand side 12, both sides 17)

A similar demand and supply side trend can be seen with regards to pilot lines. Nearly 70% of the supply side deemed access to pilot lines to be relevant or highly relevant for their operation, reaching more than 80% of respondents operating in both supply and demand sides. Pilot lines clearly appear less relevant for end-users, but still more than 20% deem the initiative relevant for their business activities. These findings also highlight a notable gap between the importance of R&D activities for the supply side as compared with the demand side, a consistent theme throughout.

3. Most respondents found node shrinkage to be relevant

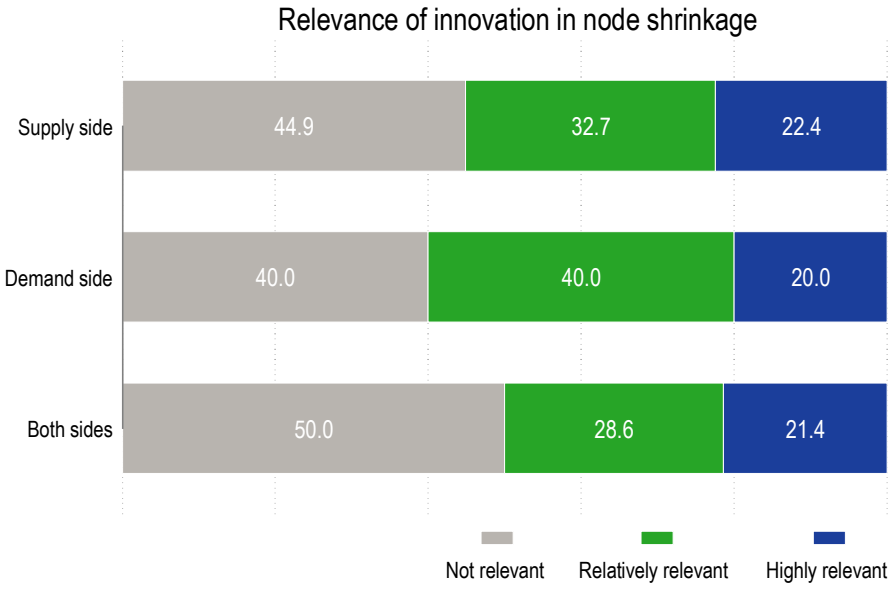

Figure 5.3. Relevance of innovation in mode shrinkage (68 respondents – supply side 49, demand side 5, both sides 14)

[3] Definition: Pilot lines carry and bring together research from various competences in an industrial setting, on a pre-industrial deployment scale, in a way that is applicable in a production environment.

Supporting the findings in Section 4.1. that demand for leading-edge technology nodes is increasing significantly, a majority of companies on both demand and supply sides indicated that node shrinkage was relevant or highly relevant for their business activities.

4. **Companies on the supply side are greatly involved in the selling and purchasing of semiconductor intellectual property**

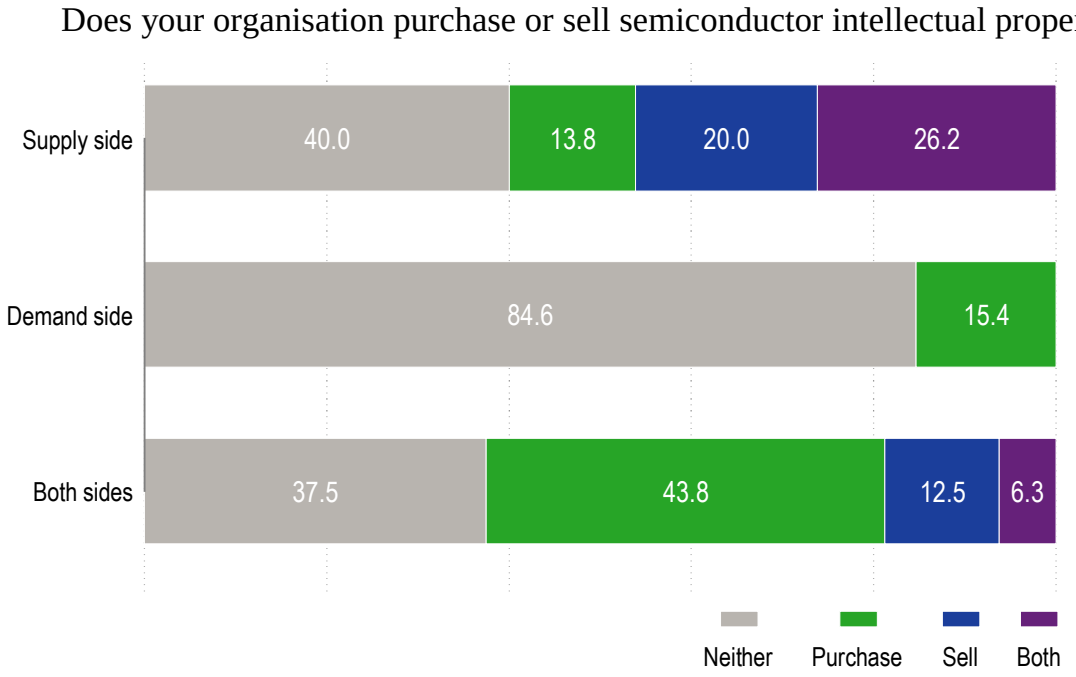

Figure 5.4. Does your organisation purchase or sell semiconductor intellectual property? (94 responses – supply side 65, demand side 13, both sides 16)

Finally, respondents were asked whether their organisation purchases or sells semiconductor intellectual property (e.g. patents, licenses, designs, trade secrets, legal protection of topographies of semiconductor products). Respondents on the demand side did not sell any semiconductor intellectual property and bought a small amount. On the supply side, however, the majority of companies were involved in purchasing or selling intellectual property, or both at the same time. For companies that operate on both supply and demand sides, almost two thirds were involved in purchasing intellectual property.

In conclusion, the supply side deems the relevance of R&D within the semiconductor industry (highly) relevant, whereas end-users tend to be less engaged with R&D. The European Chips Survey, however, only took a snapshot; it did not ask what the trend over time would be to see whether the relevance of R&D is likely to increase for end-users. The survey did also not go in-depth into R&D-related activities for end-users, to better understand why the demand side is not engaging to the same extent with R&D support for the development of their product portfolio.

SECTION 4.4: The semiconductor supply chain crisis

In the final section of the survey, the focus was on the impact of the semiconductor supply crisis on the various end-users and on suppliers operating in the semiconductor value chain. The key takeaways from this Section include the following:

1. The chip supply crisis adversely affected the overall production of most respondents
2. Most respondents expect the semiconductor shortage to last at least until 2024/2025
3. Most companies are taking out measures to mitigate sourcing challenges

1. The chip supply crisis adversely affected the overall production of the majority of respondents

Respondents were asked whether the observed shortage of chips adversely affected production lines of their business. The responses were the following.

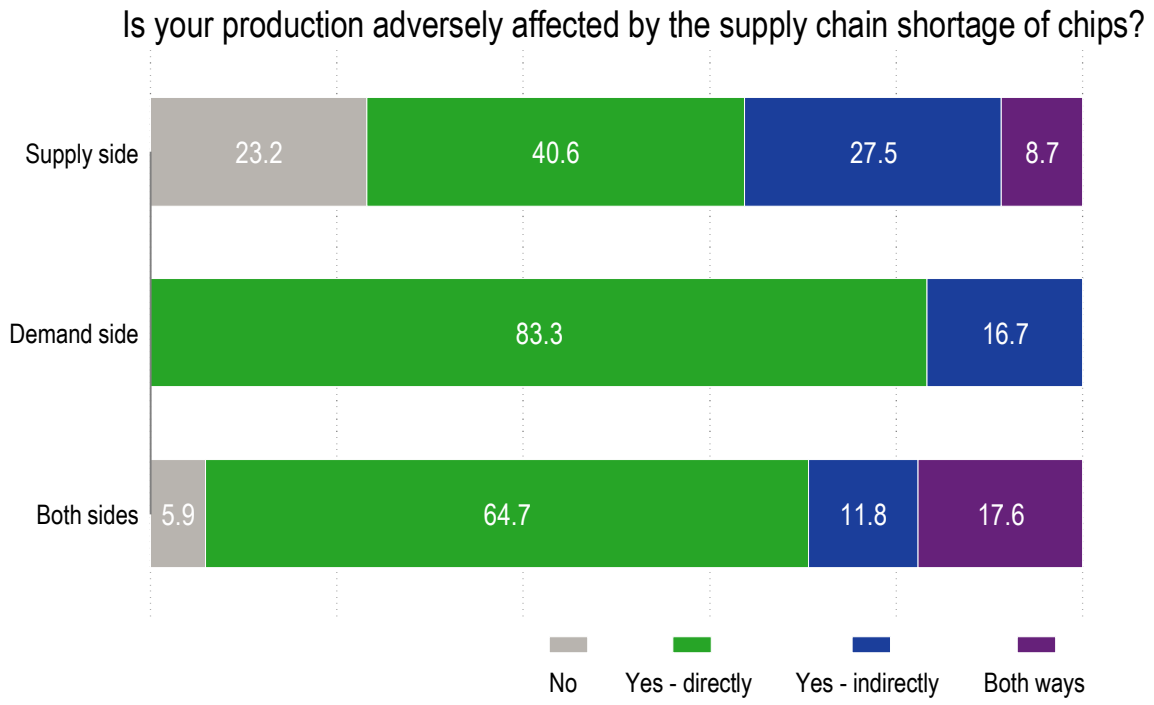

Figure 5.5. Effect of supply chain shortage of chips on businesses (104 respondents – supply side 69, demand side 18, both sides 17)

On the demand side, all respondents signalled that their businesses were either directly (83.3%) or indirectly (16.7%) adversely affected by the current shortage in chips. Only on the supply side did a small percentage (23.2%) of respondents indicate that semiconductor supply chain shortages had not has an adverse effect on their current business operations.

2. Most respondents expect the semiconductor shortage to last until 2024/2025

In response to the question on expectations as to when disruptions in the semiconductor value chain may come to an end, respondents stated that they did not expect the current shortages to be resolved in the near future.

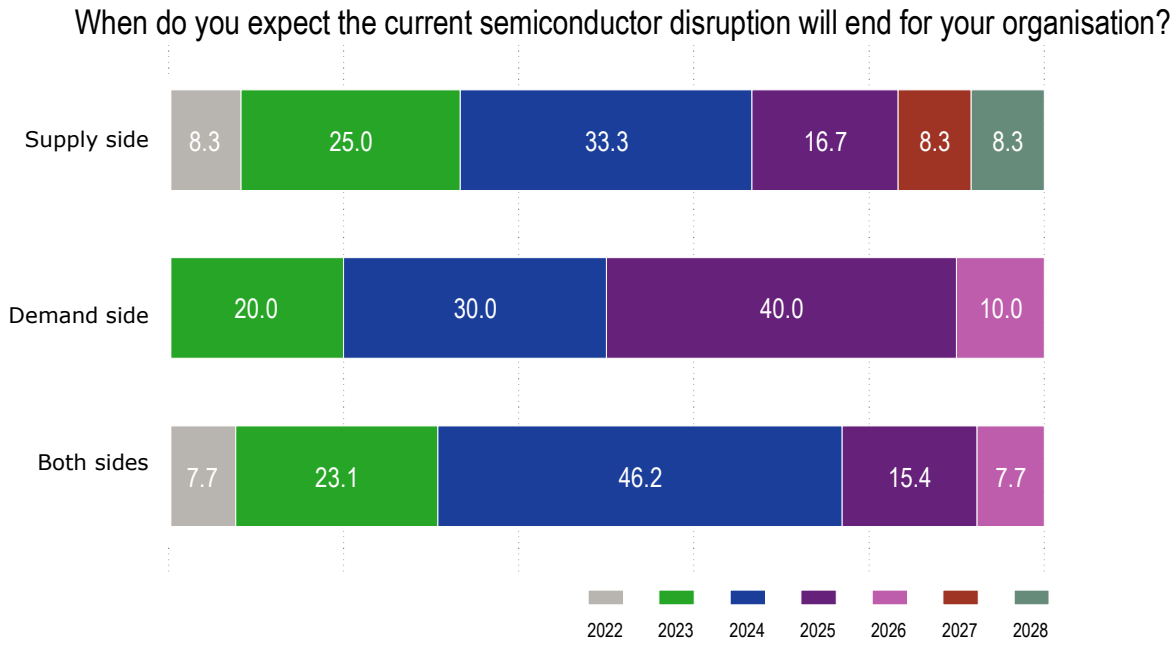

Figure 5.6. Expectations for end of disruptions (107 respondents – supply side 72, demand side 18, both sides 17)

Indeed, most respondents expected the current disruptions in the semiconductor value chain to last well into 2024, with those stakeholders operating only on the demand side being the most pessimistic (only 20% of demand-side stakeholders expected an end to disruptions already in 2023). A notable minority of respondents on the supply side (over 15%) expected disruptions to last as far as 2027 and beyond.

3. The vast majority of companies are taking measures to mitigate sourcing challenges[4]

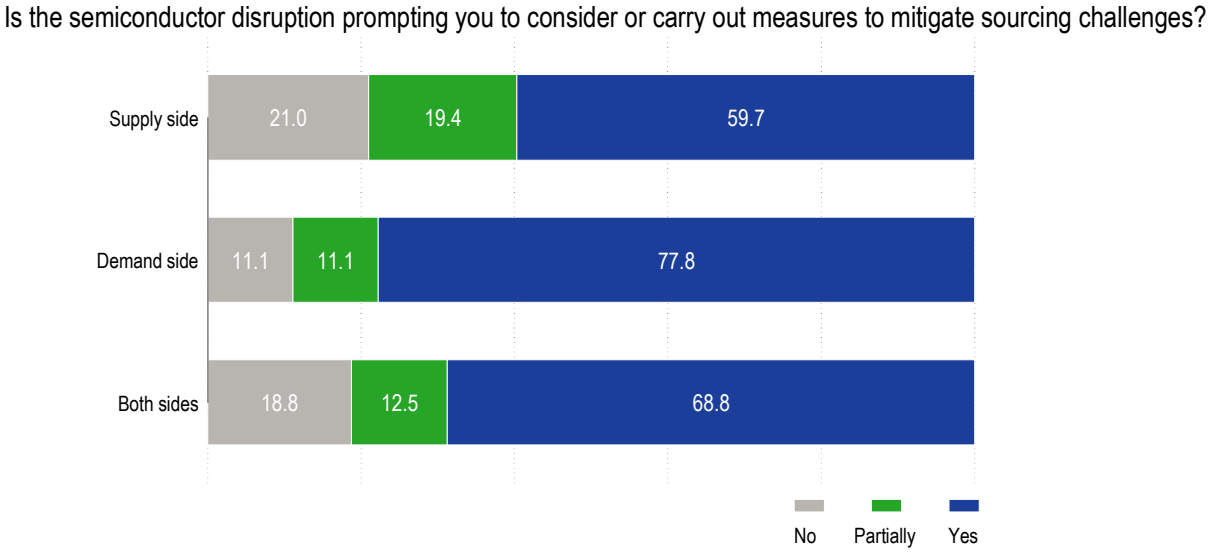

Figure 5.7. Preparedness to take mitigating measures (96 respondents – supply side 62, demand side 18, both sides 16)

[4] Sourcing challenges used as examples in the survey included attaining new suppliers, diversifying suppliers, strategic investments, reducing chip usage, stockpiling chips, bringing outsourced elements (e.g. chip design) in house.

A significant majority of all respondents indicated that they have already taken or are considering to take counter-measures to mitigate the expected adverse impact that the semiconductor shortage may have. This is in addition to a further 19.4% on supply side and 11.1% on demand side who would consider at least partial mitigating measures (including cost-inducing actions such as sourcing new suppliers, reducing numbers of chips in final products, and reducing output). For respondents with business activity linked to both the supply and demand sides, only 18.8% did not take out mitigating measures.

Annex I – Chips Survey Questionnaire

European Chips Survey

Fields marked with * are mandatory.

1 Introduction

Background for this consultation

Semiconductors are central to the digital economy. Semiconductors – also known as chips – make everything work from smartphones and electric scooters to trains or entire smart factories. However, the world is short of semiconductors. The global chip shortage has very concrete consequences on the EU economy, jobs and even leisure. Carmakers have postponed production of vehicles. Broadband providers have run out of internet routers. Gamers cannot get their hands on next-generation consoles.

Chips are at the core of our European digitalisation agenda, but global supply is currently struggling to meet the increasing demand, which is only expected to further accelerate given the growing use of connected cars, industry 4.0., internet of things, and other new and advanced technological solutions. As Europe further digitalises, this increased demand for chips is set to continue.

In her 2021 State of the Union address, European Commission President Ursula von der Leyen announced the European Chips Act, with the ambition to jointly create a state-of-the-art European chip ecosystem. There is a need to ensure security of supply to support both European industry and consumers, while developing new markets for ground-breaking European technology.

The semiconductor value chain is complex. Players enter the market at differing stages, and end-users can demand a range of unique chips and semiconductor products. To capture and understand this complexity, the Commission carries out this European Chips Survey. This targeted stakeholder survey focuses on existing and future European chip demand in order to identify potential supply bottlenecks. The survey is aimed at organisations who operate in the semiconductor value chain, supply end products containing microelectronic components, or simply purchase finished packaged products.

See below for more background information on:

- The Commission Proposes EU Chips Act
- State of the Union address 2021 by President von der Leyen
- The EU Alliance on Processors and Semiconductor Technologies
- The European Industrial Strategy

Structure of this consultation and how to respond

The European Commission has launched a targeted stakeholder survey to gather information on current chip and wafer demand, and concrete business projections for future demand. For the purposes of this consultation, the questionnaire has been split into the following categories: i) the identification of your organisation, ii) the demand for chips, iii) research and development, iv) supply-side issues, v) any other related issues.

The first section contains general questions to help identify your type of organisation, the ecosystem(s) you mainly operate in and your position in the semiconductor value chain. The second section aims at gathering input on current wafer or chip demand within the organisation, and projections for future demand. The survey then touches upon research and development activity and relationships with research and technology organisations, before finally covering ongoing supply side issues - such as sourcing challenges.

Views are welcome from all stakeholders.

You are invited to provide feedback on all the questions raised in this online questionnaire. Please explain and elaborate on your responses as much as possible and, as far as possible, illustrate them with concrete examples and substantiate them numerically with supporting data and empirical evidence. This will allow further analytical elaboration and ensure that your response is as useful as possible.

All information provided is strictly confidential. We do not publish any organisation specific information.

Please be advised, in order to avoid misuse, anonymous contributions to the consultation may not be accepted. We also invite you to add any documents and/or data that you would deem useful to accompany your replies at the end of this questionnaire, and only through the questionnaire.

The exercise is carried out in line with the better regulation principles, and is only available in English. You are requested to read the privacy statement attached to this consultation for information on how your data and contribution will be dealt with.

The consultation will be open until March 20th 2022.

Please note: In order to ensure a fair and transparent consultation process only responses received through our online questionnaire will be taken into account and included in the generalised and anonymous report summarising the responses. The information in the report will not allow for the identification of specific organisations. Should you have a problem completing this questionnaire or if you require particular assistance, please contact GROW-CHIPS@ec.europa.eu.

The European Union is committed to user privacy. The policy on protection of individuals with regard to the processing of personal data by the Community institutions is based on Regulation (EC) N. 45/2001 of the European Parliament and of the Council of 18 December 2000.

The relevant privacy statement can be viewed from the link below:

1.1 Privacy Statement
privacy_statement.pdf

*
☐ I understand and accept the terms of the privacy statement.

2 Identification of Organisation

2.1 Enter the name of your organisation

2.2 Enter your organisation's headquarter location.

2.3 If possible, please provide your business website (URL):

2.4 If possible, please provide an email associated to your organisation (or organisation's department):
@

2.5 Do you agree to be potentially contacted in the future for other survey or communication related material related to the European Chips Act?
- ○ Yes
- ○ No

2.6 Is your organisation on the European Transparency Register?
- ○ Yes ↓
- ○ No

↑ 2.7 Please enter your organization's European transparency register number below.

If your organization is not on the transparency register, you can receive a number by visiting the following site:
https://ec.europa.eu/transparencyregister/public/homePage.do

2.8 Please identify the size of your organisation:

- Micro-enterprise (staff headcount < 10)
- Small-enterprise (staff headcount < 50)
- Medium-sized (staff headcount < 250)
- Large enterprise (staff headcount >250)

2.9 If your organisation has a stake in semiconductor manufacturing, please identify yourself on the semiconductor value chain.

You can tick multiple options, but please be as selective as possible.

- Fabless (chip design), relies on contract manufacturing
- System company (chip design for internal products), relies on contract manufacturing
- Integrated device manufacturer (owns and operates fabs)
- Pure-Play Foundry (owns and operates fabs)
- Semiconductor value chain supplier (e.g. equipment, chemicals, wafers)
- Other (please specify)

2.10 Other (please specify)

2.11 If your organisation purchases finished/packaged semiconductor products (e.g. from chip wholesalers or others), please identify the sector/industrial ecosystem you predominately operate in.

Multiple answers possible, but please be as specific as possible.

- Aeronautics
- Agri-food
- Construction
- Chemicals
- Cultural and Creative Industries
- Defence
- Digital
- Electronics
- Energy Intensive Industries
- Energy - Renewables
- Health
- Mobility / Transport / Automotive
- Proximity / Social Economy / Civil Security
- Retail
- Textiles
- Tourism
- Other (please specify)

2.12 Other (please specify)

2.13 Please specify your type of business activity, regardless of whether your organisation is involved in semiconductor manufacturing, or purchasing packaged products:

3 The Chip Demand

To fill in the section on wafer demand and chip demand, please download the excel below ("Your_Organisation.xlsx"). You will see the excel under 3.1. Please follow the instructions within the excel.

Once you have filled in and completed the excel, then upload it the EUSurvey upload tab below (3.2.).

When you download the excel, it will be called "Your_Organisation.xlsx". Once you have completed the excel, please save the excel with the name of your organisation before uploading it. For example, upload the filled in excel document called "ABCsemiconductor.xlsx".

Please ensure that the excel file your organisation uploads is a **.xlsx** file.

3.1 Download
Your_Organisation.xlsx

3.2 Please upload your file(s)

Select file(s) to upload

3.4 If you operate a semiconductor fabrication plant: What are deciding factors for choosing a new location for a production facility?

Scale: 1-10 [1=not relevant, 10=highly relevant]

	1	2	3	4	5	6	7	8	9	10
Availability of qualified work force	○	○	○	○	○	○	○	○	○	○
Existing infrastructure	○	○	○	○	○	○	○	○	○	○
Government subsidies (total amount of subsidies, tax incentives, etc)	○	○	○	○	○	○	○	○	○	○
Government subsidies (speed, ease of access / level of bureaucracy)	○	○	○	○	○	○	○	○	○	○
IP protection / legal security	○	○	○	○	○	○	○	○	○	○
Level of bureaucracy and compliance (e.g. construction, environmental, permits, etc.)	○	○	○	○	○	○	○	○	○	○
Operational costs (e.g. electricity, materials etc.)	○	○	○	○	○	○	○	○	○	○
Proximity to customers	○	○	○	○	○	○	○	○	○	○
Risk hedging through geographical diversification	○	○	○	○	○	○	○	○	○	○
Water supply	○	○	○	○	○	○	○	○	○	○

3.5 Please insert any additional context to the above question.
5000 character(s) maximum

3.6 If you rely on contract-manufacturing: What are deciding factors for choosing a foundry & technology node?

Scale: 1-10 [1=not relevant, 10=highly relevant]

	1	2	3	4	5	6	7	8	9	10
Technical aspects of process node itself	○	○	○	○	○	○	○	○	○	○
Existing business relationship	○	○	○	○	○	○	○	○	○	○
Geographical proximity	○	○	○	○	○	○	○	○	○	○
IP ecosystem including process development kit	○	○	○	○	○	○	○	○	○	○
Independent, non-competitive supply (pure-play foundry)	○	○	○	○	○	○	○	○	○	○
Lock-in with existing foundry/vendor	○	○	○	○	○	○	○	○	○	○
Price	○	○	○	○	○	○	○	○	○	○
Risk hedging through geographical diversification	○	○	○	○	○	○	○	○	○	○
Quality of Service (e.g. customer relationship management)	○	○	○	○	○	○	○	○	○	○
Fab capacity	○	○	○	○	○	○	○	○	○	○
Delivery time	○	○	○	○	○	○	○	○	○	○

3.7 Please provide any additional context to the above question.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

3.8 Which areas and/or process steps in innovation does your organisation deem most relevant for your product development?

Scale: 1-10 [1=not relevant, 10=highly relevant]

	1	2	3	4	5	6	7	8	9	10
Chip design	○	○	○	○	○	○	○	○	○	○
Advanced packaging techniques (back-end)	○	○	○	○	○	○	○	○	○	○
Technology node shrinkage	○	○	○	○	○	○	○	○	○	○
Innovation in wafer materials (e.g. compound semiconductors)	○	○	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○	○	○

3.9 If other, please elaborate as much as possible.

5000 character(s) maximum

3.10 Please provide any additional context to the individual answers in the above question (3.8).

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

3.11 What is your organisation's semiconductor strategy in the short-term (until 2025) and in the long-term (until 2030)?

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

4 Research and Development

4.1 What role does cooperation with European Research and Technology Organisations play for your own product development?

Scale: 1-10 [1=not relevant, 10=highly relevant]

	1	2	3	4	5	6	7	8	9	10
Relevance	○	○	○	○	○	○	○	○	○	○

4.2 Name and rank (in descending order) the three (3) European Research and Technology Organisations that are most important for your own product development.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

4.3 How important is Member State and European R&D funding (e.g. Key Digital Technologies (KDT) partnerships or Horizon Europe) for your own product development and research?

Scale: 1-10 [1=not relevant, 10=highly relevant]

	1	2	3	4	5	6	7	8	9	10
Relevance	○	○	○	○	○	○	○	○	○	○

4.4 How important is access to Multi Project Wafer Runs (such as through EUROPRACTICE) for your own product development?

Scale: 1-10 [1=not relevant, 10=highly relevant]

	1	2	3	4	5	6	7	8	9	10
Relevance	○	○	○	○	○	○	○	○	○	○

4.5 How important would access to advanced Pilot Lines (i.e. for production, testing, and experimentation facilities bridging the gap from lab to fab) be for testing and prototyping your own product development?

Scale: 1-10 [1=not important, 10=highly important]

	1	2	3	4	5	6	7	8	9	10
Importance	○	○	○	○	○	○	○	○	○	○

4.6 How important would access to a design platform with electronic design automation, validation tools, design kits, an IP library and support services be for your product development?

Scale: 1-10 [1=not important, 10=highly important]

	1	2	3	4	5	6	7	8	9	10
Importance	○	○	○	○	○	○	○	○	○	○

4.7 Does your organisation purchase or sell semiconductor Intellectual Property (e.g. patents, licenses, designs, trade secrets, legal protection of topographies of semiconductor products, etc.)?

You can select multiple answers.

- ☐ Purchase
- ☐ Sell
- ☐ Neither

4.8 What role does purchasing or selling semiconductor Intellectual Property play for your organisation?

Please elaborate as much as possible.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

4.9 If applicable, please elaborate on how your organisation could be supported in purchasing or selling Intellectual Property (e.g. patents, licenses, designs, trade secrets, legal protections of topographies of semiconductor products, etc).

5000 character(s) maximum

5 The Supply Crisis

5.1 Is your production adversely affected by the supply chain shortage of chips?

- Yes - directly
- Yes - indirectly
- No

5.2 Which chips have been affected?

- Analog
- Discrete Semiconductors
- Micro/Logic
- Memory
- Optoelectronics
- Sensors
- System on a chip (SoC)
- Other (please specify)
- Unknown

5.3 If other, please specify.

5.4 Please indicate areas where your organisation has experienced capacity constraints and/or disruption.

Multiple answers available.

- Front-end constraints
- Back-end constraints
- Supply constraints (e.g. chemicals, materials, equipment etc.)

5.5 Please elaborate as much as possible on the areas where your organisations has experienced disruption (e.g. supply issues, bringing products to market, delays in orders, affects on revenue etc.).

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

5.6 When do you expect the current semiconductor disruption will end for your organisation?

Move the slider or accept the initial position.

Short-term Long-term

2022

2022 2030

5.7 Indicate any factors that may contribute to the prolongation of the semiconductor shortage for your organisation.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

5.8 Is the semiconductor disruption prompting you to consider or carry out measures to mitigate sourcing challenges?

- Yes
- Partially
- No

5.9 If so, please explain action(s) e.g., new suppliers, diversification of suppliers, strategic investments, reducing chip usage, stockpiling chips, bringing outsourced elements (such as chip design, etc.) in house, etc. Elaborate as much as possible, including which actions are short-, medium-, and/or long-term.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

5.10 Does your organisation have problems with sourcing any input materials (e.g. rare-earths, chemicals, etc)? Please specify as much as possible.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

5.11 What role should governments play to strengthen the resilience of the semiconductor supply chain?

5000 character(s) maximum

6 Other Related Issues

6.1 Are there any other related issues important for your organisation, not addressed in the above questions? This can include further recommendations for public authorities to support your semiconductor related business activities.

5000 character(s) maximum

0 out of 5000 characters used. Character limit reached.

6.2 Please upload any relevant supporting material. Ensure that any material uploaded either clearly states your organisation's name, or EU transparency register number.

Select file(s) to upload

Annex II – Chips Survey Excel

As indicated in the EU Survey, this excel gives your organisation the opporunity to input your semiconductor product demand.

The first table is aimed at organisations that have a stake in the manufacturing of semicondcutors.

The second table is aimed at organisations that purchase finished/packaged semiconductor products.

Should your organisation fit into both categories, then you should fill out the tables to the best of your ability, and be as specific as possible.

Before doing so, please fill in your Organisation Information (under Point of Contact, below), as provided on the EU Survey page.

Point of Contact			
Organisation Name	European Transparency Number (if applicable)	Website	E-Mail

Table 1: The Wafer Demand.

This table is aimed at companies that have a stake in the manufacturing of semiconductors.

In the table below, please state the historic and forecasted **global** (including Europe) wafer demand of your organisation per technology node and year.

1. Choose your organisation's technology node, material, wafer diameter, and indicate whether the wafer was fabricated in Europe from the drop-down menu.

2. Please specify **your organisation's total global wafer demand (per unit) per year** independent of where and by whom (in-house, foundry) these wafers are processed (you can only insert absolute numbers).

					Global Wafer Demand (per unit)									
	Technology Node [nm]	Wafer Material	Wafer Diameter [mm]	Where is your wafer fabrication location?	2014	2016	2018	2020	2022	2024	2026	2028	2030	Additional Comments
1														
2														
3														
4														
5														
6														
7														
8														
9														
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11														
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22														
23														
24														
25														

Table 2: The Chip Demand.

This table is aimed at organisations that purchase finished/packaged semiconductor products (e.g. from chip wholesalers).

In the table below, please state the historic and forecasted **global** (including Europe) chip demand of your organisation per product and year.

1. Select which sector/ecosystem your products contraining semiconductors are predominately intended for from the drop-down menu.

2. Identify what typology of chips you aquire for your products containing semiconductors from the drop-down menu.

3. Please approximate what percentage of the final/packaged chips you purchase that are aquired by suppliers based in Europe.

4. Then specify **your organisation's total global chip (per final packaged device unit) demand per year** independent of where and by whom (in-house, foundry) these devices are processed (you can only insert absolute numbers).

					Global Chip Demand (per unit for final packaged devices)									
	What sector/ecosystem are your products predominately intended for?	What chips do you aquire for your specific products?	Approximately what percentage of the chips you purchase are aquired by suppliers based in Europe?	2014	2016	2018	2020	2022	2024	2026	2028	2030	Additional Comments
1													
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6													
7													
8													
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The EU Open Data Portal (http://data.europa.eu/euodp/en) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.