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COMMISSION STAFF WORKING DOCUMENT

Annual Single Market Report 2022

Internal market, Industry, Entrepreneurship and SMEs

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PART 1/2

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Executive Summary

The Single Market shows signs of recovery, however the depth of the pandemic shock and the volatile recovery require continued vigilance*. After the big drop in 2020, the confidence indicators across industrial ecosystems have improved considerably throughout 2021, but have slightly declined again in December and in January 2022, amid concerns about new variants and possible containment measures. The economic consequences of the COVID-19 crisis as well as speed of recovery vary considerably across industrial ecosystems. Small and Medium Sized Enterprises (SMEs) will be key for recovering and strengthening the resilience of European industry.*

The Single Market *grants businesses a large reserve of domestic demand and differentiated supply sources. This, together with the EU's integration in the global economy,* ***represents one of the main assets of our economy also in times of crisis.*** *In this context, the implementation and enforcement of Single Market rules remain crucial, both according to long term (e.g. Single Market Enforcement Action Plan) and short-term (e.g. COVID-19-related unilateral restrictions) priorities. The continued efforts to address the persistent barriers, including in the framework of the Single Market Enforcement Task Force, and the promotion of cross-border provision of services are also key.*

During the pandemics and in the volatile recovery phase, supply and demand imbalances have emerged in various markets *such as medical materials, electronic chips, some metals or wood, leading to worries about price pressures. However,* ***the recent challenges in global supply chains point to the need to reinforce them to the benefit of a stronger Single Market****. The approach taken by the Commission during the COVID-19 crisis to secure the supply of protective personal equipment and ramp up the industrial production of vaccines provides an example of action to address severe supply risks for products of strategic importance. Furthermore, the implementation of the Industrial Strategy, as updated in May 2021, already focuses on boosting the resilience of the Single Market and industrial ecosystems by addressing strategic dependencies, ensuring a level playing field, incentivizing investment and international partnerships.*

The green and digital transitions require substantial investment to overcome large-scale challenges*. Bold action is needed to preserve strategic value chains and enable project pipelines. This report outlines* ***the various instruments that have been used at EU level to mobilise the investments needed to achieve the green and digital transition and greater resilience of the Single market.*** For example, *the RRF and the NextGeneration EU play an important role. Public support should be coupled with accompanying reforms to make sure that investments fall on fertile ground and do yield the desired impact. The staff working documents is accompanied by five Annexes. Annexes 1 to 3 presents an overview of the implementation of respectively the SME*

Strategy, the Single Market Enforcement Action Plan, the Industrial Strategy and its update. Annex 4 provides an overview of key performance indicators related to the Single Market. Finally, Annex 5 to this report provides an illustration of investment volumes for a number of industrial areas of relevance that play an enabling role for successful green, digital and resilient transitions and for the competitiveness of tomorrow's industry.

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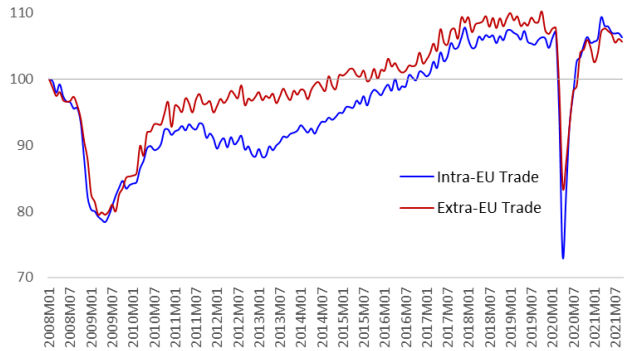
1. The State of the Single Market

Chapter 1 provides an update on the state of the Single Market. It includes information about recovery (including information about price developments) and productivity trends across all industrial ecosystems. It also reports on the supply challenges that occurred in the course of 2021 in several critical areas. These challenges bring renewed attention to the importance of strengthening the resilience of the Single Market and industrial ecosystems, addressing strategic vulnerabilities and better mitigating disruptions. Finally it zooms in on the economic situation of SMEs.

1.1. Economic Trends in the Single Market

The Single Market is Europe's most valuable economic asset, but it is also vulnerable to sudden disruptions. The elimination of barriers to the free movement of goods, services, people and capital across Member States has provided more important and more diversified sources of funding, a more dynamic business environment, the critical mass to achieve economies of scale and a more efficient allocation of factors of production. It has also granted businesses a larger reserve of domestic demand and supply sources, together with the EU's trade integration with the rest of the world. The COVID-19 crisis, however, has shown that this asset is not a given: disruptions in the Single Market, such as border closures and breaks in integrated value chains, can rapidly escalate, deeply affecting citizens and businesses. In fact, the initial pandemic shock has hit intra-EU trade even harder than extra-EU trade (Figure 1). The access of EU operators to Third Countries markets has helped the EU economy to cushion the impact of the crisis and helped the recovery both from a supply and demand perspective.

Figure 1: Volume index of trade within and outside the Single Market

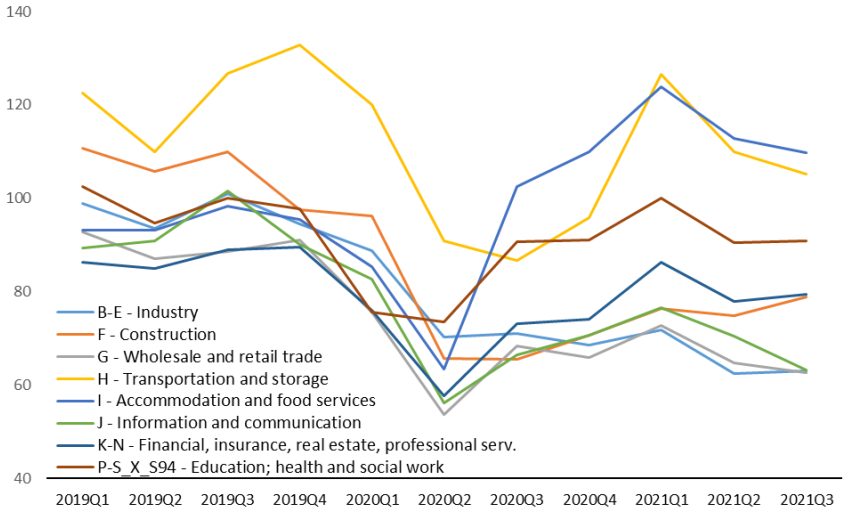


Source: European Commission services, based on Eurostat data. Note: the indicator shows the monthly volume index of trade in goods, with base January 2008 = 100, until September 2021; data are seasonally and working day adjusted.

The crisis has had uneven consequences across the economy, as shown for instance by the number of declarations of bankruptcies (Figure 2). While industry coped relatively well, accommodation and food services recorded a significant increase in the number of bankruptcies in the third and fourth quarters of 2020. Retail and wholesale services have also recorded more

bankruptcies than before the crisis. The national and EU support to companies has certainly reduced the number of bankruptcies, particularly in the second quarter of 2020. Transportation and accommodation suffered much more than the other sectors, in the course of 2021.

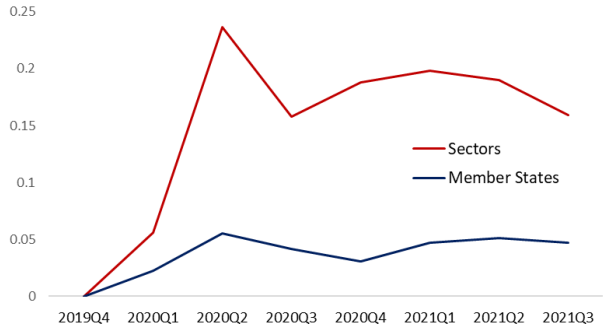
Figure 2: Declarations of Bankruptcy



Source: Eurostat, [sts_rb_q], index 2015=100

Data also show that the variation of turnover across sectors has been greater than the variation of GDP across countries (Figure 3); while country-level analysis remains useful, the industrial ecosystem perspective offers an insightful understanding of the state of the Single Market.

Figure 3: Divergences in sectoral value turnover vs Member States GDP



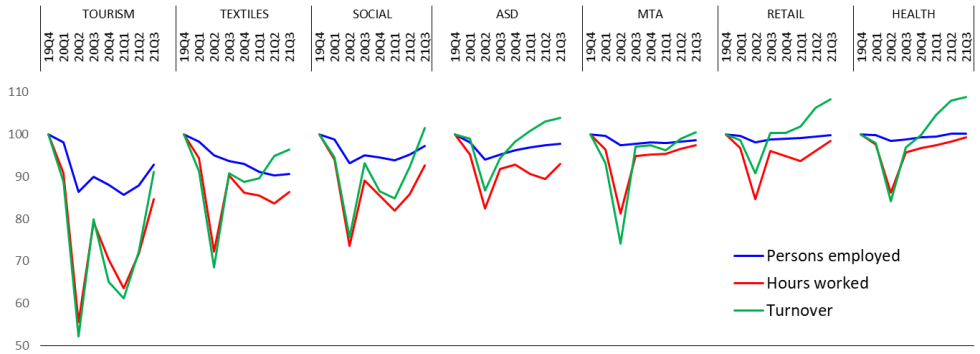
Source: European Commission services, based on Eurostat data. Note: the chart shows the coefficient of variation of the index of total turnover across NACE2 two-digit sectors and of the index of GDP across countries; both indexes are calculated with base 2019Q4.

1.2. The Recovery in the EU Industrial Ecosystems

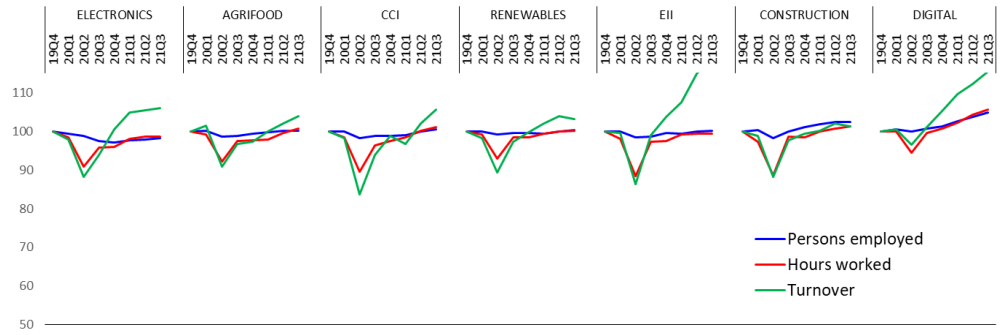
The Single Market shows signs of recovery, despite the depth of the pandemic shock. The EU as a whole has reached its pre-pandemic level of GDP in the third quarter of 2021 and all Member States are projected to have passed this milestone by the end of 2022.[1] The recovery is visible in the data on turnover in all EU industrial ecosystems (Figure 4): the index of total turnover in the second and third quarter of 2021 shows considerable improvement. In most cases, it also shows improvement with respect to the pre-pandemic level. However, the impact of the shock has been heterogeneous across industrial ecosystems; not all have managed to come back to 2019 levels and the speed of the recovery differs from one to another. Textiles, Tourism, and Proximity, Social Economy and Civil Security seem to have struggled the most.

Some productivity gains can be observed in several ecosystems. The gap between turnover and employment trends (in particular of hours worked) suggests productivity gains for some ecosystems: Digital, Health, Retail, Aerospace & Defence, and Electronics. These ecosystems are in fact more likely to digitalise some activities. Other ecosystems do not show similar productivity gains. The labour market is recovering in most ecosystems, in terms of both employment and hours worked, while still below pre-pandemic levels in Tourism and Textiles. The slightly stronger recovery in hours worked than in persons employed in Electronics, Agrifood, and Digital might indicate that in these ecosystems people are generally working longer hours than before.

Figure 4: Index of turnover and employment by ecosystem (2019Q4-2021Q3)



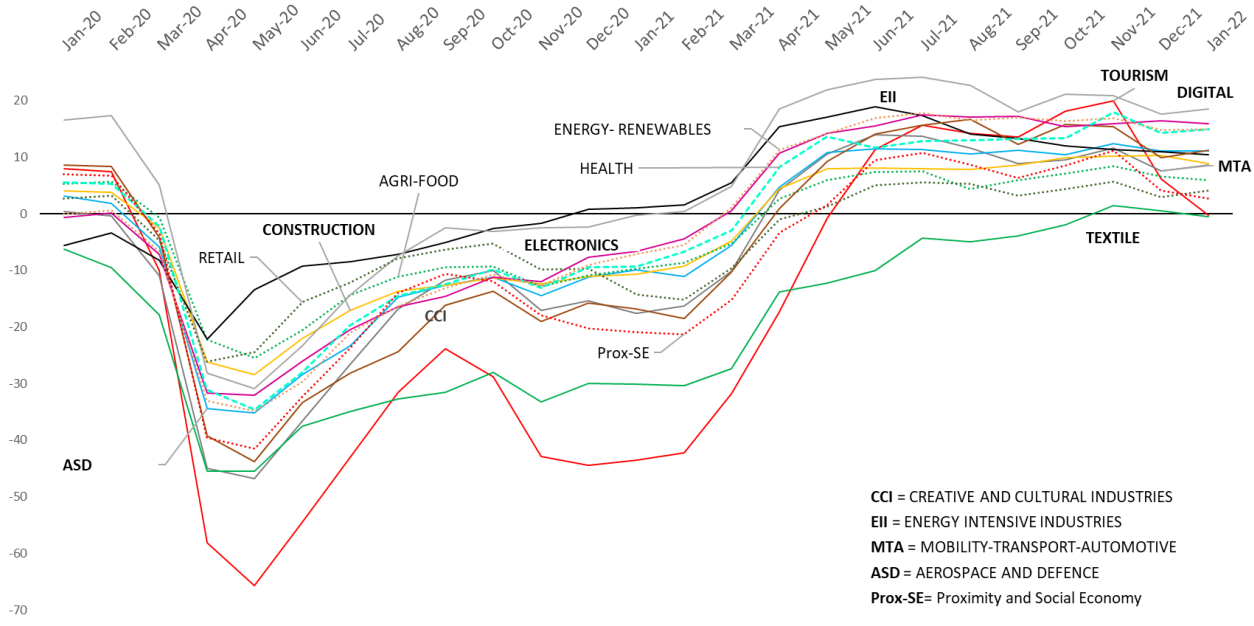
[1] European Commission, Winter Forecasts, 10 February 2022, available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_926.



Source: European Commission services, based on Eurostat data. Note: The charts show the evolution of the three indices for each ecosystem with base 2019Q4=100.

Positive survey data on the economic sentiment confirm the recovery path in 2021, although the most recent evolution call for caution. After the big drop in 2020, confidence has improved considerably throughout 2021. In November 2021, the economic confidence indicator finally turned positive in all ecosystems, while in December 2021 and in January 2022 it dropped, amid concerns about new variants and possible containment measures. The most considerable changes have occurred in Tourism, which had the second highest level of confidence, before the sharp deterioration suffered in December 2021 and January 2022. Tourism is the ecosystem which is the most sensitive to the evolution of the pandemic and related measures. More generally, the difference between the highest level of confidence (Digital) and the lowest one (Textiles) keeps declining, pointing to overall convergence. Steady deterioration of the confidence indicator in Energy Intensive Industries has been witnessed, since summer 2021 (Figure 5).

Figure 5: Evolution of the Confidence Indicator by Ecosystem – Monthly



Source: European Commission services, based on data by the Joint Harmonised EU Programme of Business and Consumer Surveys. Note: For "Retail", "Agrifood", "Proximity-Social Economy", "Renewable Energies", and "Health", the available data is limited, hence dotted lines are used and the related values should be interpreted with caution.

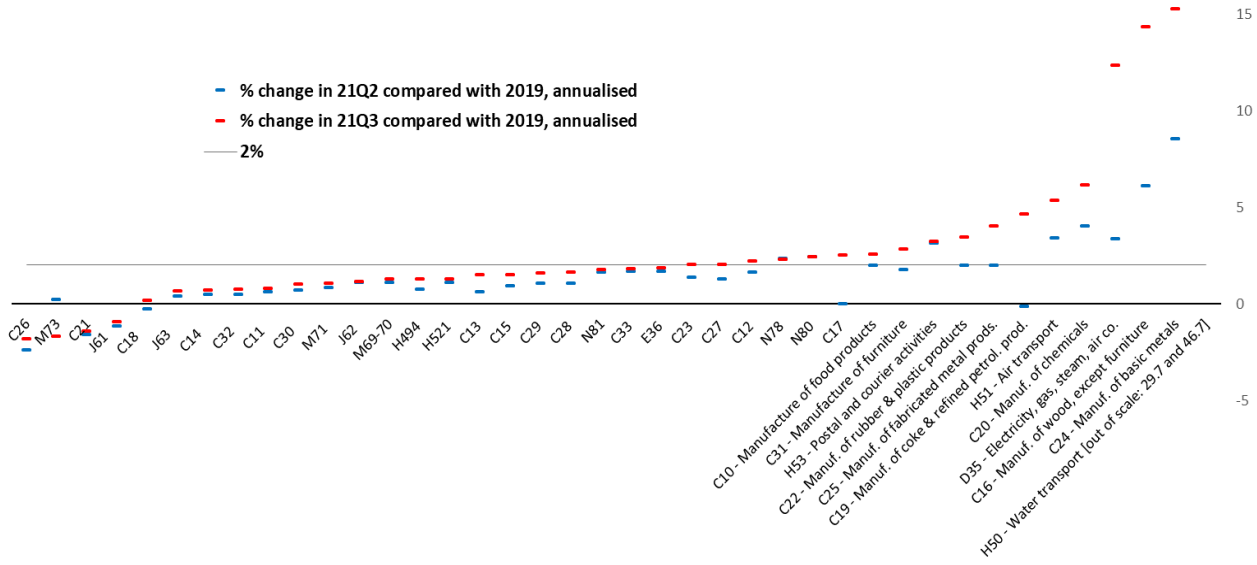
1.3. Producer Price Increases

After the extremely low levels of the past year, producer prices are on the rise, and this may have an uneven impact in industrial sectors and ecosystems. Furthermore, energy prices are increasing to unprecedented levels. Part of the standard inflation, which measures the variation of prices with respect to the previous year, is due to a base effect: given the stagnating or even decreasing level of prices in 2020, the 2021 data are in some cases inflated, and such effect will fade away only in 2022. In order to filter out this effect already in the 2021 data, we calculate the change on 2019 prices, and then annualise the values (Figure 8). In the third quarter of 2021 industry prices were 11.5% higher than in 2020, but 8.6% higher than in 2019, which means an average annualised inflation rate of 4.3% in 2019-2021. In the case of services, producer prices in the third quarter of 2021 were 4.0% higher than in the previous year, but only 4.8% (i.e. 2.4% annualised) higher than in 2019.

The sectors with the highest rise in producer prices are mainly industry sectors, but services sectors are also affected, notably those related to transport and postal and courier activities[2]. In manufacturing of basic metals and of wood, producer prices in the third quarter of 2021 were almost 15% higher with respect to 2019 on an annual basis; also in chemicals they are more than 6% higher. These developments pose some problems in the related ecosystems, mainly in Energy Intensive Industries, and to some extent in Automotive-Mobility-Transport.

[2] With the collapse of world trade in April 2020, cargo ships were not able to run at full capacity and containers were left to pile up in ports. When the second half of 2020 and first half of 2021 saw a surge in trade above pre-pandemic levels due to high demands for manufactured goods, this created a shortage of shipping containers. The normal functioning of the transport chains that were stretched already was further complicated by the rising surplus in Chinese trade that forced empty containers back to the Asian trade lane from Europe. The closure of Chinese harbours due to localized pandemic clusters and the Suez Canal blockage further strained supply chains. As a consequence, shipping transit times increased and transport costs surged during 2021.
(ref. https://www.ecb.europa.eu/pub/pdf/ecbu/eb202108.en.pdf)

Figure 8: Annualised change in producer prices on 2019, sectors



Source: European Commission services, based on data by Eurostat. Note: the indicator shows, for each sector, the annualised percentage change in producer prices in the second (blue) and third (red) quarter of 2021, with respect to the average of 2019. The values of sector H50 (Water transport) are out of scale, as the annualised increase in producer prices was 29.7% in the second quarter and 46.7% in the third one, i.e. by far the greatest increase across all sectors.

Sectoral prices increases are due to a combination of demand and supply imbalances. In an attempt to better understand which of the two forces is predominant at sectoral level[3], this section presents an indicator that could help assess the relative balance of supply constraints versus demand expansion in determining price pressures in each sector (see Box [1])[4]. The indicator shows to what extent the share of firms mentioning a demand expansion or a supply side constraint is different from the historical average in each sector. Such difference is expressed in standard deviations that measure the "impulse" coming from the two possible effects. The following figure shows that, based on this methodology, most of the price pressure observed would be due to supply constraints (in shades of blue, including labour supply) and much less to demand expansion (in red). In a second step, the analysis further looks into the relative importance of labour and equipment constraints within the overall supply-side effect. According to these indicators, in industry sectors, supply constraints seem to mainly originate from issues with equipment and materials (dark blue), while in services they seem mainly due to labour constraints (light blue).

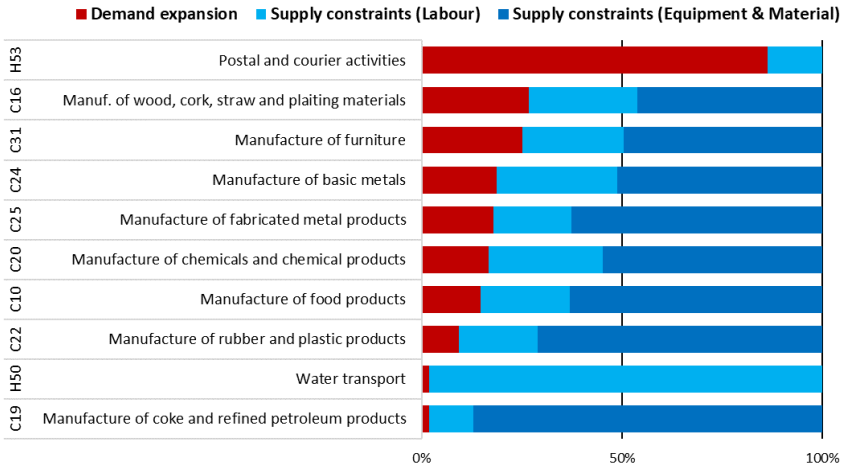
In the sectors most affected by price pressures, particularly in industry, supply constraints seem determinant to explaining price pressures. This analysis hints at supply challenges as the

[3] Other approaches try to disentangle the same balance on a macroeconomic level, i.e. Supply Bottlenecks: Where, Why, How Much, and What Next? (2022). IMF Working Paper (WP/22/31), while the scope of this analysis is to find indicators to perfom this assessment at specific sectoral level.

[4] Benoit F, Connell W, Herghelegiu C, and Pasimeni P. (2022) "Detecting and Analysing Supply Chain Disruptions", Grow Economic Paper Series, [01/22].[5] COM/2021/660: Tackling rising energy prices: a toolbox for action and support. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0660.

key contributors to price pressures in the sectors previously identified, with the exception of *Postal and Courier Activities*, where the very significant increase of demand seems to be the root cause of surging prices. For all these sectors, this assessment would suggest that between 75% and 98% of the increase in prices would be associated to supply constraints, of labour or equipment and material. The analysis suggests that within the supply factors, labour constraints may be the main determinant of price pressures in *Water Transport*, while constraints of material and equipment may explain price pressures in the other sectors (in particular, *Manufacture of Coke and Refined Petroleum Products*, *Manufacture of Rubber and Plastics*, and *Manufacture of Fabricated Metal Products*) (See Figure 9).

Figure 9: Relative importance of demand expansion vs supply constraints in determining price pressures



Source: European Commission services based on data by the Joint Harmonised EU Programme of Business and Consumer Surveys. Note: the indicator weights the number of standard deviations between the latest data point and the historical mean to capture the "impulse" coming from the different effects. Data refer to October 2021.

The rise in energy prices contributes considerably to overall inflation and producer price pressures. Energy prices staying at high level are increasingly affecting European households and businesses – in particular energy-intensive industries. It is also one important driver of the rising overall price levels. High electricity prices are driven by high and volatile gas prices strongly influenced by the geopolitical situation, in a way that could not have been foreseen and that creates more uncertainty. Households and companies face the prospect of higher energy bills at a time

when many have been fragilised by loss of income from the pandemic. This risks weighing on the recovery and its fairness and inclusiveness[5].

1.4. Supply Chain Challenges

As the recovery goes on, towed by the progressive release of pent-up demand, concerns over supply and demand imbalances are emerging. Supply constraints in specific value chains have been a major challenge since the start of the pandemic, with most of these challenges having in principle, a temporary nature. Some of these challenges included factory shutdowns, widespread lockdowns and mobility restrictions, which have led to logistic network disruptions, shipping cost increases and longer delivery times. However, an OECD study showed that many GVCs have continued to operate during the pick of the COVID crisis in 2020 (albeit with a lower output), including in activities which may not be regarded as essential. For instance, in the food industry (very much an essential activity), food supplies have proven relatively resilient. Trade openness is a clear supporting driver of the resilience of EU supply chains by expanding the range of alternative sources of supply. In spite of this, supply chain challenges have intensified in 2021.[6]

These challenges have negatively affected the European economy in 2021. This is a significant change for the EU, where demand and not supply has generally been limiting production. However, the bottlenecks in the transport and metals sectors are nevertheless expected to ease gradually, while the shortages of semiconductors are set to take longer to resolve.

According to the Commission's business surveys, supply-side bottlenecks in the European economy aggravated further in January 2022, which can be due among other factors to the surge in COVID-19 cases because of Omicron. Supply challenges for material and equipment were particularly severe in manufacturing while services were mainly affected by shortage of labour. The construction sector appears to suffer from supply challenges with regard to both labour and supply and equipment.

Despite some vulnerabilities, international supply chains continue to be an essential tool to sustain our industrial output. Integration into global networks have improved EU competitiveness due to various factors including a wider market access, as well as the possibility of accessing new suppliers.[7] While the increasingly complex supply chains have proven highly efficient, the pandemic has revealed some potential bottlenecks. Indeed, in times of crisis,

[5] COM/2021/660: Tackling rising energy prices: a toolbox for action and support. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0660.

[6] The Commission Business survey reports that for industry, supply-side concerns about materials and equipment are the single most critical factor for the first time recorded. In particular, in 2022-Q1, more than half (51%) of EU firms operating in industrial sectors reported supply challenges of materials and equipment.

[7] According to a recent McKinsey survey (i.e. McKinsey (2021), How COVID-19 is reshaping supply chains, November 2021), firms suffering disruptions adapted their supply chain strategies and configuration to adjust to the new situation. Early into the crisis they responded that they would improve supply-chain resilience, combining increases in the inventory of critical products, components, and materials with efforts to diversify supply bases, and localize or regionalize supply and production networks. A follow-up survey, performed Q2/2021, indicated that, on average, firms have increased inventories rather than nearshoring suppliers with the objective of improving resilience.

unexpected pressure on critical business nodes, as a result of events such as the closure of an important firm or distress in a logistic harbour, can paralyze the entire chain. The concentration of suppliers in some sectors can be another major source of vulnerability for very complex and integrated value chains. The just-in-time or lean inventory replenishment approach (i.e. producing goods when needed and thereby cutting stocks and inventory) can be a source of vulnerability in the event of major disruptions.

Skills shortages create a further drag on economic recovery and expansion. Disruptions due to containment measures had a negative effect on also the skills of the workforce. Job losses trigger loss of skills, and new skills gaps and mismatches arise due to the different recovery paths and labour reallocation across sectors. The green and digital transitions will imply a further reallocation of labour, with the risk of increasing skills mismatches. If they remain unaddressed, such skills shortages could hamper growth.

Supply and demand imbalances or tensions have emerged in many sectors: semiconductors, agri-food products, such as soya beans and palm oil, wheat, critical raw materials, and possibly subcategories of chemicals, such as fertilisers, plastic components or dyestuff used in the textiles ecosystem. Preliminary data analysis based on price increase and business surveys on businesses' expectations confirm these trends overall. For instance, the share of firms reporting constraints in equipment in the third quarter was: 57.8% in the motor industry, 52.2% for electrical equipment, 45% for rubber and plastics.

Such imbalances are negatively affecting EU industrial ecosystems. For instance, significant supply challenges for semiconductors has been reported in many industries, with severe effects on sectors such as the automotive industry but also other sectors such as home appliances, gaming, smartphones, telecom or medical devices. Industrial automation manufacturers report tight supplies of semiconductors and concerns about rising prices and delays. The situation has led to substantial cuts in the production of motor vehicles manufacturers. Estimates suggest an 8% cumulative volume loss in the first three quarters of 2021 compared to the 2019 yearly production[8].

Magnesium and construction products provide further examples of recent supply challenges affecting the EU economy. The recent supply challenge of magnesium (linked to curtailment of electricity use in China) represents a threat for the manufacturing of aluminium and steel and requires coordination of Member States' efforts. The EU faces a strong level of strategic dependency and high supply risks for magnesium, with China strongly dominating global production. In the construction ecosystem, many construction products (e.g. steel, copper, aluminium, wood and wood products, sand) experienced supply and demand imbalances and significant price increases in 2021 as well.

Supply chain challenges can have a negative impact on the EU economy's recovery.[9] The index of industrial production in the EU has shown signs of deceleration in autumn, after months of positive developments that led to pre-crisis levels. The latest data point to a significant

[8] Weekly data gathering by IHS Markit. The estimate does not include possible losses incurred in the last quarter of 2021.

[9] The impact of shortages on manufacturing in the EU, (https://www.voxeu.org/article/impact-shortages-manufacturing-eu).

improvement in November 2021; however in some countries, such as Germany, France, and Portugal, industrial production is still considerably below pre-pandemic levels. On the other hand, in Poland, Lithuania, Ireland, Belgium and Greece, instead, it is considerably higher. This is consistent with the national industrial structure that reflects to a greater or less extent the disruptions reported in specific sectors - such as the automotive industry - and in international supply chains.

1.5. Economic Situation of SMEs

SMEs have particularly suffered from the crisis. Lockdowns forced many small businesses to close temporarily and, as a consequence, SME value added declined sharply, by 7.6% in 2020. Public support measures helped mitigate some of the damage – employment in SMEs declined, but only by 1.7%. Many industries, especially in the SME-intensive services ecosystems, experienced large declines in sales as a result of the lockdowns and other measures introduced by Member States to fight the spread of COVID-19[10].

SMEs implemented a wide range of mitigation measures. While some temporarily ceased to trade, many others made use of the different support programmes implemented by national governments, especially to pay their wages, overcome cash flow issues, and reduce working hours and/or staffing. Many SMEs also made greater use of digital tools to continue to operate and either moved to or increased their web-based selling.

Digitalisation was of key importance for SMEs to weather the crisis. SMEs in the narrow digital sector only saw their value added fall by 0.5%, whereas non-digital SMEs' value added fell by 8% in 2020. The sectors in which SMEs were worst affected by the pandemic in terms of value added were 'accommodation and food service activities' (-37.8%), 'transportation and storage' (-16.1%), 'administrative and support service activities' (-13.3%), 'manufacturing' (-9.8%) and 'wholesale and retail trade' (-4.4%).

The number of new business registrations and start-ups in the EU-27 fell in 2020 and remained subdued in 2021, and so did the funding for start-ups and scale-ups. The EU, the UK, the US and the rest of the world all experienced declines in the creation of start-ups in recent years even before the pandemic[11]. However, the COVID-19 crisis accelerated these declines. The number of new start-ups fell by 54% in the EU, 60% in the UK, 61% in the US and 46% in the rest of the world in the 12-months period ending in August 2021 compared to the previous 12-months period.

The number of bankruptcies of SMEs in 2020 fell in many Member States, and although they have started to rise in 2021, bankruptcies remain at a lower level than before the crisis. This reflects the impact of the various economic support programmes implemented by Member States, forbearance by lenders and regulators, and reduced operations by legal and administrative authorities deciding on and recording bankruptcies. However, the overall figures mask significant

[10] See the Commission's SME Performance Review https://ec.europa.eu/growth/smes/sme-strategy/sme-performance-review_en.
[11] Source: Crunchbase.

differences by sector; as outlined in Figure 2, the situation for the accommodation and food services sector is significantly worse than before the pandemic. Therefore it is essential, when phasing out support measures, to avoid a cliff-edge for many SMEs. In this context, the Commission has decided to prolong the State Aid Temporary Framework[12] until 30 June 2022 and introduced new tools available to Member States until 31 December 2022 and 2023, to create direct incentives for forward-looking private investment and solvency support measures.

Both EU SME value added and employment had grown by the end of 2021 compared to 2020. Value added increased by 8.2% at EU level[13] (not adjusted for inflation). Recovery of SMEs is therefore expected to be much swifter than following the financial crisis.

Although a continuation of the recovery is expected in 2022, some ecosystems have already returned to pre-crisis levels but not all ecosystems nor SMEs will return to pre-crisis levels at the same pace. Even if across the EU-27, the numbers of SMEs and their value added are expected to surpass their pre-crisis levels, employment growth in SMEs is likely to remain subdued and, in certain Member States, might still remain below 2019 levels even throughout 2022. A recent survey by SMEunited has found that while SMEs' confidence in their own businesses in autumn 2021 had risen to pre-COVID-19 levels, their confidence in the overall state of the economy had slightly fallen compared to the first semester of 2021[14]. Similarly, the 2022 Eurochambres Economic Survey found that while SMEs expect to further recover in 2022, most SMEs expect affordable access to energy and raw materials to be the main challenge ahead[15].

[12] Sixth Amendment to the Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak and amendment to the Annex to the Communication from the Commission to the Member States on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to short-term export-credit insurance, 2021/C 473/01.

[13] Source: calculations by JRC based on Eurostat Structural Business Statistics, Short-Term Business Statistics and National Accounts Database.

[14] SMEunited, The SME Business Climate Index and EU Craft and SME Barometer, https://www.smeunited.eu/admin/storage/smeunited/barometer-21h2-final.pdf.

[15] Eurochambres, Eurochambres Economic Survey 2022, https://www.eurochambres.eu/publication/eurochambres-economic-survey-2022-ees2022-2/.

2. Strengthening the Single Market Resilience

Chapter 2 reports on the actions taken to ensure a more resilient and predictable Single Market environment, the work of the Single Market Enforcement Task Force (SMET) and remaining barriers. A well-functioning and resilient Single Market remains the key asset and the necessary condition for a swift and transformative recovery of the EU economy. Therefore, maintaining a strong focus on enforcement and deepening of the Single Market framework is of clear priority.

The chapter looks into the challenges posed by the supply chain disruptions caused by COVID-19 pandemic and it describes the policy response that was rolled out, first to secure protective personal equipment supply and then to ramp up the industrial production of vaccines. It finally presents EU instruments and actions that were taken to boost resilience of the Single Market and industrial ecosystems as a follow up to the May 2021 Updated Industrial Strategy.

2.1. Single Market Enforcement and Remaining Barriers

Commitment to the Single Market, compliance and the effective implementation of its rules allow citizens and businesses to fully benefit from their free movement rights, consumers to enjoy more choice and rights, and also facilitate green and digital transition.

Enforcing the rules: Strategic report on Single Market enforcement

The implementation and enforcement of the Single Market rules is key to strengthening the integrity and resilience of the Single Market. To address remaining barriers in the Single Market and to maximise the effectiveness and efficiency of compliance and enforcement across the EU, the specific actions and horizontal measures of the Long-term action plan for better implementation and enforcement of the Single Market[16] are being implemented (See Annex 2 Overview Table: State of play of the implementation of the Single Market Enforcement Action Plan) by the Commission together with the Member States.

Containment measures adopted in response to evolving epidemiological situation have hindered or even paralysed free movement of goods, services and persons a number of times. These restrictions were also subject to frequent changes, leading to a lack of predictability. Particularly in the early days of the pandemic, businesses and citizens suffered from restrictions, border closures and supply disruptions.

The COVID-19 crisis has underscored the need to address the existing barriers to cross-border trade to preserve and enhance the free movement of goods and services and to unlock the full potential of the Single Market. Effective competition in goods and services markets is needed to ensure the continuous increases in productivity and for consumers to benefit from lower

[16] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A94%3AFIN.

prices and wider choice**.** The Communication on Identifying and addressing barriers in the Single Market of 10 March 2020[17] highlighted 13 key barriers from a user perspective.

Many barriers to the Single Market derive from national legislation or administrative requirements. In this regard swift cooperation between Member States and with the Comission to address unilateral restrictions and prevent new ones is critical. COVID-19 has also generated a significant increase of the number of complaints by companies and citizens and has prompted the Commission to closely monitor and intervene where needed.

Striving to preserve a well-functioning Single Market, the Commission concentrated its efforts on cases that have a significant impact on the Single Market, special attention was paid to the area of goods, public procurement, late payments, and services[18].

The Commission paid special attention to export restrictions and to compliance in the automotive sector. In the area of goods, national bans or restrictions to the export of goods to other Member States (bans on medicinal products and prior declaration for export of construction products) threaten to undermine the essence of the Single Market and are being tackled forcefully through a combination of political outreach and formal enforcement action. In the automotive sector, EU-wide rules ensuring the proper functioning of the internal market introduced harmonised technical requirements and procedures permitting new types of motor vehicles and their trailers to conform to EU-approved requirements on safety and environmental protection[19] entered into force. The enforcement efforts have focused on ensuring full compliance with the rules governing the deployment of the Member States' supervisory action in this sector.

Public procurement legal framework is essential to ensure transparency, full competition, equal treatment and effective expenditure of public finance. The Commission enforcement actions focussed on the correct transposition of the 2014 public procurement directives in all the Member States. Previous restrictions hampering the participation of SMEs to public procurement, such as limits to subcontracting, or the obligation to dispose of a local representative in the trade of products like coffee, have been removed in 2021.The public procurement rules as framework rules also have an important role to play in the recovery and green and digital transitions, notably through the management of a significant portion of public funds, including RRF and other EU funds. Used strategically, they help addressing strategic dependencies and make the EU economy more resilient and sustainable, however their potential is not being fully explored by a number of public buyers.

[17] COM/2020/93 final. The Communication focuses on the top 13 barriers to cross-border activity, as most commonly reported by businesses (with regard to cross-border trade or establishment) and consumers (with regard to cross-border purchase of goods or services).

[18] The Commission adopted 120 decisions in formal infringement procedures, including 40 letters of formal notice, additional letters of formal notice, reasoned opinions and additional reasoned opinions and one letter of formal notice Article 260 (following a first judgement of the Court).

[19] The replacement of Directive 2007/46/EC governing type approval by the new Regulation (EU) 2018/858 is in force since September 2020.

Further actions, such as the EU Observatory on late payments[20], are being developed to ensure Member States address unfair payment practices and delays in payments. However, the improvement in reducing delays in some Member States[21] has been interrupted/reversed by the COVID-19 pandemic. The incidence of late payments temporarily increased during COVID-19 crisis and became one of the most important concerns for EU SMEs, affecting their resilience and the good functioning of supply chains. The average time for an SME to get paid increased from 35 days in 2019 to more than 52 days in 2020. The average payment delay slightly decreased in 2021, to 48 days, however, it remains substantially higher than before the crisis[22]. For each invoice that is not paid on time (or not paid at all), it is estimated that four additional invoices will not be paid, leading to a cumulative effect spreading through supply chains, undermining their viability and destroying their resilience. The enforcement actions of the Commission are contributing to make possible that the situation as regards backlog of late payments made to SMEs by public administrations in several member States, although still problematic, is constantly improving. Pilot work on the observatory is ongoing in the construction sector. Construction mostly relies on SMEs and is the sector most affected by late payments: in 2020, 42% of companies stated that late payment has a high impact on threat to survival of their business[23]. A report on late payments indicators for the construction sector was published in September 2021[24].

In the area of services, the Commission moved forward, launching infringements regarding essential Single Market legislation. Infringements were launched under the Professional Qualification Directive to address restrictive regulation of professions and issues related to recognition procedures, such as the European Professional Card, alert mechanism[25], partial access to or language requirements in professional services (e.g. accountants, tax advisers, architects, lawyers, doctors, veterinarians, and pharmacists). As a result of this, overall, 70% of grievances raised have been effectively solved before referral to the European Court of Justice, facilitating business opportunities for thousands of workers in professional services and increasing choices and quality of service for EU citizens.

Putting in place e-government solutions and facilitating access to and exercise of service activities is critical to enable free circulation of cross-borders services[26]. The infringement package launched under the Services Directive and continuous dialogue between the Commission and the Member States has led to significant advancements towards fully functioning Points of

[20] The EU Observatory on late payments will monitor payment performance and practices by public authorities to businesses and in B2B transactions, across supply chains.
[21] For example in Italy, Belgium, Spain, Greece.
[22] European Payment Report 2021 (Intrum), available at https://www.intrum.com/publications/european-payment-report/european-payment-report-2021/.
[23] Report on late payments indicators for the construction sector, available at : https://ec.europa.eu/docsroom/documents/46899.
[24] The full report is available at https://ec.europa.eu/docsroom/documents/46899.
[25] An early warning mechanism introduced by Directive 2013/55/EC obliges the Member States to alert each other via the IMI about professionals in the areas of healthcare and education of minors, who have been banned, even temporarily, from practising their profession or parts of it.
[26] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Identifying and addressing barriers to the Single Market - COM(2020) 93 final.

Single Contact (PSCs), a critical tool to support cross-border services provision, since they make it easier for businesses to navigate administrative procedures and access information. Numerous Member States thoroughly reviewed their PSCs with a view to, e.g., improve user interfaces, add foreign language translations, expand the possibilities to complete procedures online, integrate them more with other e-government tools and upgrade them to the standards required by the Single Digital Gateway Regulation. Both citizens and providers can benefit from the smooth functioning of cross-border services, however, further efforts are needed in a number of Member States

Furthermore, a strong emphasis was put on ensuring a robust transposition and application of the Proportionality Test Directive via infringement action, a major preventive tool to ensure that Member State do not unnecessarily restrict the functioning of the Single Market for professional services when adopting new, or modifying the existing, regulations of professions.

Close cooperation with Member States' authorities is essential to deploy preventive and remedial actions. The Single Market Enforcement Task Force (SMET) became a key vehicle for coordinated work with Member States and a joint response. Initially, SMET played an active role in addressing and countering the introduction of COVID-19-related obstacles hindering smooth functioning of the Single Market. SMET is also addressing concrete systemic barriers that hamper the full functioning of the Single Market[27], such as cross-border restrictions for professionals (prior checks of qualifications for temporary and occasional service provision and excessive document requirements); measures with potential protectionist effects in the agri-food sector; national certification schemes in construction services sector and restrictions related to non-harmonised construction products; excessive administrative burdens associated with the posting of workers, and availability of insurance for temporary and occasional services providers. In the future, SMET will pay particular attention to obstacles hindering a smooth recovery, and to barriers that hamper the green and digital transitions and delay the implementation of the national recovery and resilience plans.

Effective enforcement actions have strengthened the fight against counterfeit and illegal products in the context of the COVID-19 pandemic. The trade of counterfeit and sub-standard COVID-19 related products pose a threat to the safety of EU citizens, the EU's financial interest and legitimate EU businesses. In close cooperation with Member States' authorities, the Commission, via the European Anti-Fraud Office (OLAF), has investigated the circulation of such products on the market. Since March 2020, over 100 million counterfeit or sub-standard products have been seized or detained as a result.

In preventing the creation of new barriers to the Single Market, the notification tools of the Single Market Transparency and Service Directives have played an important role. The need for timely information on new barriers to the Single Market became particularly evident during the first months of the COVID-19 pandemic. The crisis led to an exponential increase of

[27] The First report on the work of the Single Market Enforcement Taskforce provides details on the achievements and substantial progress that has been achieved in these areas. https://ec.europa.eu/docsroom/documents/47154/attachments/1/translations/en/renditions/native.

notifications, which continues to this day 969 notifications of draft national regulation on goods and services were examined during 2021.

At the same time, the Commission stepped up efforts to enhance dialogue with Member States and boost efficient cooperation and swift exchange of information among public authorities. Dedicated meetings[28] focused on finding solutions and accelerating resolution of infringement cases as well as other enforcement related issues linked to Single Market Transparency Directive notifications, Information and Communication System for the pan-European Market Surveillance (ICSMS) notifications and SOLVIT structural issues. In 2020, SOLVIT dealt with more than 2450 cases addressing concrete problems that citizens and businesses face due to a misapplication of the Single Market rules, out of which 87% were solved. Examples of issues addressed included labelling requirements, application for VAT refunds, and recognition of professional qualifications, among others. In 2021, the extension of the Internal Market Information System (IMI) was prepared to provide support for mobility of workers in the transport sector and refusals of granting of licences for the firearms. Cooperation and information exchange between OLAF, other Union agencies and bodies and Member States' anti-fraud coordination services (AFCOS), law enforcement and customs authorities also ensures protection of the Single Market through effective enforcement.

The Single Market Scoreboard[29] continues to be a source of information for monitoring Member States' performances on the implementation of Single Market rules. The 2021 edition of the Scoreboard has been upgraded[30] and in 2022 the Single Market Scoreboard will be further developed in order to better feed into the European Semester process.

Remaining barriers: Single Market for services

The services sector and persisting obstacles deserve particular attention in the efforts to strengthen the EU's recovery and resilience. This is because of its share in EU GDP and employment and its importance for driving the competitiveness of all industrial ecosystems and manufacturing supply chains. Well-functioning services sector will equally play an important role in supporting green and digital transitions of industrial ecosystems. Further efforts by all players with a view to investment and innovation as well as reducing regulatory restrictiveness in services would boost productivity and competitiveness of the EU services sector and manufacturing industries which source many services and increasingly offer their products in combination with services. The Commission is also pursuing dialogue with the Member States in the framework of the European Semester aiming to reduce unjustified or disproportionate obstacles hindering the performance of the Single Market for services.

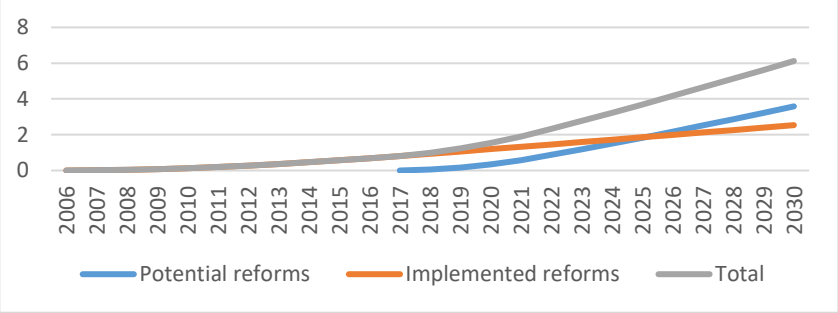
[28] Implementation of ACTION 22: Systematic periodic package meetings, from the Long-term action plan for better implementation and enforcement of Single Market rules - COM(2020) 93 final: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A94%3AFIN.

[29] https://ec.europa.eu/internal_market/scoreboard/.

[30] Three new policy areas were added: Market Surveillance, SMEs Business Environment and Circular Economy/ Greening of the industry and in addition the digital tool used for the Scoreboard was modernised.

The economic performance of the Single Market for services can be improved by reducing regulatory barriers and ensuring that regulatory restrictions are adequate and proportionate. According to a recent study[31], since the adoption of the Services Directive in 2006, there was only a small decrease in absolute level of barriers and more reform efforts are needed to remove regulatory and administrative barriers faced by service providers when operating in the Single Market[32]. Nevertheless, the reforms implemented so far would result in discounted cumulative gains of 2.1% of GDP by the year 2027. Furthermore, if Member States were more ambitious in implementing reforms (to reach the average of the 5 least restrictive Member States), the additional growth potential is estimated to be 2.5% of GDP[33] (see Figure 6).

Figure 6: Impact of removal of barriers in the services sector on EU GDP



Source: The chart shows the cumulative net present value of GDP impact of already implemented reforms as well as of more ambitious reforms (to reach the average of the 5 least restrictive Member States) as percentage of base year GDP.

Removing obstacles to cross-border provision of services and reducing administrative burden for posting of workers will boost the resilience of the EU economy. In parallel to the full enforcement of the Services Directive and the Professional Qualifications Directive (reported in the previous section), the Commission is addressing those issues also through two targeted initiatives: i) a common electronic form for the declaration of the posting of workers: following a mapping of current national declaration procedures for posting of workers, the Commission launched a consultation process in several steps to devise the voluntary common form in close cooperation with Member States and stakeholders; and ii) use of European services standards as a tool to address cross-border barriers and increase consumers' confidence in cross-border provision of services.

The July 2021 updated Commission recommendations[34] and the restrictiveness indicator for seven professional services reflect the very limited progress made by Member States in

[31] European Commission, DG GROW, Mapping and assessment of legal and administrative barriers in the services sector: summary report, 2021, https://data.europa.eu/doi/10.2873/419434.

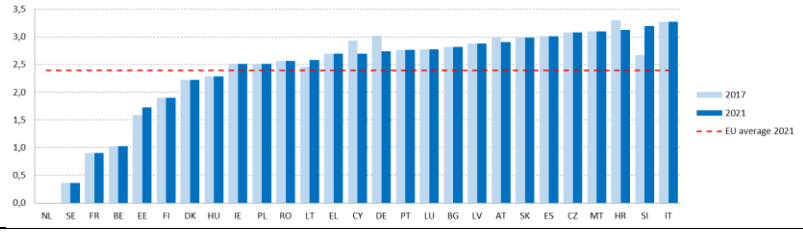
[32] European Commission, DG GROW, Mapping and assessment of legal and administrative barriers in the services sector: summary report, 2021, https://data.europa.eu/doi/10.2873/419434.

[33] Barbero et al. (2022). A RHOMOLO assessment of the impact of regulation in the EU services sector. JRC – DG GROW Territorial Development Insights Series, JRC127035, European Commission, https://publications.jrc.ec.europa.eu/repository/handle/JRC127035.

[34] The update of the reform recommendations is based on a thorough assessment of the national regulatory frameworks applicable to the seven professions. The overall restrictiveness of national regulation is estimated using a composite restrictiveness indicator which provides a quantitative basis for benchmarking the Member States' regulatory frameworks for the seven professions by measuring their restrictiveness per Member State and per profession on a

reforming professional regulations since the initial recommendations in 2017. The updated recommendations on regulation of seven professional services - architects, engineers, lawyers, accountants, patent agents, real estate agents and tourist guides - aim to incentivise and assist Member States in creating a regulatory environment that is conducive to growth, innovation and job creation and above all to do away with persisting obstacles in the single market for services. These sectors provide intermediate inputs across all industrial ecosystems and play an essential role in the European economy and for the green and digital transitions. Only a few Member States have taken action to remove unjustified or disproportionate regulation. Overall, the reforms only partially addressed the Commission's 2017 recommendations, leaving significant room for further regulatory improvements in most Member States.

Figure 7: Restrictiveness indicator: Civil engineers



The Figure 11 shows the relative position of Member States in terms of the level of restrictiveness to access and exercise the profession of civil engineer, according to the new restrictiveness indicator. Since 2017, the indicator was slightly revised to better capture additional certification/attestation schemes, which make access to specific activities subject to additional authorisation requirements.

2.2 Addressing recent Supply Chain Challenges

Supply chain disruptions can be triggered by several factors such as the scarcity of a given raw material, the sudden increases in temporary high energy prices or other bottlenecks along supply chains. A supply challenge can also be originated by a temporary or structural increase in demand that cannot be easily met by a corresponding increase in supply. Understanding the nature of the supply challenge is the necessary analytical step to be able to assess whether and if yes what policy response would be appropriate. Any such policy response would have to come with a cost-benefit analysis.

The COVID-19 pandemic highlighted challenges for the organisation of the Single Market in case of unforeseen crises and/or demand or supply shocks. While the overall Single Market legal framework is considered sound, there are challenges in the field of information availability and communication channels, in particular with regard to a possible emergency response in

scale from zero (least restrictive) to six (most restrictive). The types of regulatory requirements covered by the indicator included: (1) regulatory approach: activities reserved to holders of specific qualifications, protection of title; (2) qualification requirements: years of education and training, mandatory state exam, continuous professional development obligations, etc.; (3) other entry requirements: compulsory membership or registration in professional body, limit to the number of licences granted, other authorisation requirements, etc.; (4) exercise requirements: restrictions on forms of company, shareholding and voting requirements, restrictions on joint exercise of professions, incompatible activities, etc.

specific sectors. These aspects may be further assessed in the impact assessment of the Commission's forthcoming proposal on the Single Market Emergency Instrument.

The approach taken to tackle the 2020's shortage of personal protective gloves and to ramp-up COVID-19 vaccines production provides an example of action for future health crises. Faced with last year's pressure on personal protective equipment supply (e.g. gloves and masks needed in the context of the pandemic) and vaccines, the Commission took a number of initiatives (see Box 1) to address this specific supply challenge. The experience in scaling up the manufacturing of COVID-19 vaccines (see Box 2), as well as the experience with monitoring supplies of critical raw materials offer additional examples of such actions for future emergencies.

Box 1: The example of handling the 2020 supply crisis of personal protective equipment (PPE)

In the first months of the COVID-19 crisis, the world faced massive disruptions. Combined with spiked, immediate demand, it resulted in a situation where protective personal equipment, of good quality in particular, was unavailable. Because of the exploding global demand, the world faced an accute situation of undercapacity which impacted all countries. The global shortage was felt by all countries, including China that hold more than 50% of the world production. It was therefore crucial to ramp up production globally. Concrete measures to address the above problems, taken by the Commission, included:

- intense cooperation with Third Countries to ensure the free flow of goods and avoid any disruption of supply chain in a situation of scarce goods,
- intense diplomatic dialogue with Third Countries to avoid that emergency sanitary measures impede the ramping up of production of essential goods for fighting the pandemic,
- establishment of a structured dialogue with associations representing relevant industry and with individual companies (e.g. IKEA[35], H&M);
- monitoring of supply through questionnaires about production capacity and existing stocks;
- matchmaking activities bringing together textile and PPE manufacturers, PPE and automotive manufacturers, to quickly reconvert/adapt/add production lines;
- streamlining the conformity assessment procedures for PPE[36] to be able to quickly provide equipment to healthcare systems, and call on Notified Bodies to prioritise essential medical equipment in the fight against COVID-19.
- creation of the Clearing House for medical equipment offered a platform for dialogue and sharing of information with Member States' representatives on the demand and supply of medical equipment at EU level and on means to overcome shortages and build capacity; and
- purchase of PPE through the Civil Protection Framework – RescEU and the use of the Joint Procurement Agreement[37]; export authorisation scheme to ensure adequacy of PPE supply obliged Member States to consult the Commission when assessing whether to issue an export authorisation.

[35] For example, IKEA used its network with public authorities to help the matchmaking of its suppliers (mostly SMEs) who have converted their production to manufacture PPE. H&M used its supply chain to help addressing the high demand of PPE at the peak of the crisis (via donations to Italy and Spain), especially for frontline workers.

[36] Commission Recommendation (EU) 2020/403 of 13 March.

[37] https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/public-health/ensuring-availability-supplies-and-equipment_en#identifying-demands-and-matching-supplies-of-medical-equipment

Box 2: **The example of scaling up COVID-19 vaccine production**

Scaling up COVID-19 vaccine production

The pandemic created the need for substantive amount of COVID-19 vaccines to be provided within a very short timeframe. To meet this challenge the Commission established the Task Force for Industrial Scale-up. With the support of the Task Force, by the end of 2021, the EU had reached an installed annual production capacity of 5 billion doses of COVID-19 vaccine. By the beginning of February 2022, the EU had produced 3 billion doses and delivered 1.3 billion vaccines to Member States, enough to meet the EU targets both for vaccinations and donations to developing countries.

The Task Force was successful in contributing to the rapid increase of Europe's industrial capacity to produce vaccines through its five main tasks:

(i) **identifying and removing vaccine production bottlenecks in the EU**: Working closely with industry to identify vaccine production capacities and main bottlenecks in terms of capacity, the task force helps industrial partners find suitable solutions to resolve shortfalls of key supplies, thereby avoiding significant delays or disruptions in vaccine production.The task force has also engaged with manufacturers to support the launch of new production capacities and facilitated industrial reviews between Advance Purchase Agreements (APA) manufacturers and the EU countries where their facilities are located.

(ii) **mapping EU vaccine production capacities throughout the supply chain**: the task force surveyed vaccine production capacity in the EU. The results of the survey, as well as more detailed knowledge gained through regular contacts with APA manufacturers, other industry partners and EU countries, contributed to a detailed mapping of EU vaccine production capacities that is regularly updated.

(iii) **facilitating partnerships through matchmaking events for vaccine and therapeutics production**: two matchmaking events took place to date: the first EU matchmaking event on 29 and 31 March focussed on expanding vaccine production capacity and tackling supply chain bottlenecks; it gathered around 300 companies from 25 EU countries. A second matchmaking event, organised on 12 and 13 July, centred on the development and production of COVID-19 therapeutics and enhancing participation of EU companies in the therapeutics value chains and speed up connections between organisations.

(iv) **ensuring sufficient long-term manufacturing capacity for vaccines and therapeutics in Europe**: the task force contributes to broader efforts to ensure the EU's preparedness for the possible emergence of new variants or other health-related emergencies in the future by preparing the 'EU-FAB' project[38].

(v) **securing cross border supply chains, supporting global vaccine access and vaccine sharing efforts**: Working closely with Third Countries to avoid significant delays or disruptions in vaccine production, the Commission engaged with Third Countries to facilitate the free flow of vaccines and its inputs and develop vaccine production capacities around the world. It does so by working in partnership with EU countries and relevant stakeholders, and in direct contact with the COVAX Manufacturing Task

[38] EU FAB is part of the industrial dimension of the European Health Emergency Preparedness and Response Authority (HERA), as announced in the Communication Introducing HERA, the next step towards completing the European Health Union on 16 September. A prior information notice was published in Tender Electronic Daily, Supplement to the Official Journal (https://ted.europa.eu/udl?uri=TED:NOTICE:467537-2021:TEXT:EN:HTML) to inform economic operators of an upcoming public procurement procedure.

Force and similar entities globally. For example, a regional hub for manufacturing COVID-19 and other endemic disease vaccines, hosted by the Institut Pasteur de Dakar in Senegal, will significantly increase Africa's medical and vaccine production capacity. Moreover, an EU-US Vaccines Task Force was established to jointly work on the bottlenecks in the supply chains, identify and solve problems related to the production of vaccines or therapeutics and other issues.

As it has been the case for vaccines and PPE, coordination of efforts within and outside the EU helped provide an immediate response to address supply challenges. Short-term actions to mitigate the effects of supply disruptions have included prioritisation of inputs for ecosystems/supply chains suffering from challenges, matchmaking of economic players, trade instruments including export transparency mechanisms, joint procurement and advance purchase agreements. In the case of personal protective equipment and vaccines, these actions have already been put in place on an ad-hoc basis up to the establishment of HERA. The Communication on the Contingency plan for ensuring food supply and food security in times of crisis (COM(2021) 689 final) of 12 November 2021 led to the establishment of the European Food Security Crisis preparedness and response Mechanism (EFSCM). Moreover, the European Chips Act[39] proposes a new governance framework to respond to the semiconductor shortage and to prevent future crises.

Trade diversification and cooperation with extra-EU countries is also necessary to address supply challenges as well as strategic dependencies. This is about working with key partners and diversifying sources. It encompasses talks with trading partners to secure and diversify supplies, trade agreements and other trade policy and diplomacy tools, and any other EEAS action. For instance, the Global Summit on Supply Chain Resilience of 31 October 2021 in Italy has allowed for the identification of shared principles to improve international coordination on all aspects of supply chains. The EU and the US are already engaged in a bilateral cooperation through the Trade and Technology Council. This work aims to build more resilient supply chains and includes a dedicated track on semiconductors (see the next section 2.3).

In addition **competition policy and enforcement** set predictable market conditions for companies to thrive in, with special attention to SMEs and start-ups, thereby enabling strong and diversified supply chains and ensuring companies have alternatives sources for their inputs.

Member States have a key role to play in addressing shortages of products. Their action is particularly relevant when it comes to national actions such as facilitating the granting of permits to production/extraction facilities, the removal of obstacles to production and logistics, notifications of intra EU export bans. They are also the key actors for the implementation of coordinated solutions such as joint procurement, stockpiling of critical inputs or export transparency mechanisms and the participation in multi-country projects. Their support is essential to reskilling and upskilling actions such as the Pact for Skills, or the EU Strategy for Universities, in particular to strengthen education and training relevance for future-proof skills.

[39] COM(2022) 46 final of 8.2.2022; 2022/0032 (COD).

2.3. EU actions to Boost Resilience Today

The Updated Industrial Strategy of May 2021 underscored the need to boost the resilience of the Single Market and industrial ecosystems, including by addressing strategic dependencies that lead to vulnerabilities of the EU economy. The analysis of EU's strategic dependencies, carried out in May 2021, as well as the second round of in-depth reviews[40] pointed to a number of strengths and weaknesses and the Updated EU Industrial Strategy underscored the need for active, targeted use of relevant instruments to boost resilience of EU strategic supply chains. These instruments relate to putting in place the enabling regulatory environment, diversifying trade and building new trade partnerships to decrease dependences, by promoting diversification of sourcing, mobilising EU funding and private investments, spurring research and innovation, investing in EU's own capacity, including through the work of industrial alliances and the support of Member States to Important Projects of Common European Interest (IPCEIs) where appropriate.

Actions are also being undertaken in some areas to boost resilience, build competitive supply chains and avoid strategic vulnerabilities. The in-depth reviews[41] carried out as part of the Industrial Strategy of May 2021 and the second round of in-depth reviews[42] unveiled a number of strategic dependencies and vulnerabilities across several products and technologies, for which actions are being deployed.

Legislation is being developed or updated to put in place a regulatory framework including to incentivising sustainable investment. Appropriate rules provide the legal certainty and help to mobilise further investments, build project pipelines, close technological gaps and build resilient and more sustainable supply chains in a number of strategic areas. The proposal for regulation of batteries[43], the revision of the Renewable Energy Directive[44] and the Hydrogen and Decarbonised Gas package[45] will promote the sustainability of these sectors in the EU. The European Chips Act has endowed Europe with a coherent vision and strategy for semi-conductors. Further examples are the recently agreed revision of the Regulation on the Trans-European Networks for Energy (TEN-E) that aligns EU energy infrastructure on the Green Deal objectives[46] and the Regulation on the EU Taxonomy for sustainable activities[47].

Existing and proposed legislation can further ensure a level playing field. Current procurement rules allow to exclude economic operators from third countries that do not have any agreement

[40] SWD(2021)352 and SWD(2022)41 on EU strategic dependencies and capacities: second stage of in-depth reviews.
[41] SWD(2021)352.
[42] SWD(2022) 41.
[43] COM Proposal of 10 December 2020, COM(2020)798 final.
[44] COM proposal of 14 July 2021, COM(2021)557 final.
[45] COM proposal of 15 December 2021, COM(2021)803 final and COM (2021)804 final.
[46] Thanks to its new and updated infrastructure categories and a strengthened regulatory, planning and permitting toolbox for smart and sustainable infrastructure, the new rules TEN-E will help trigger and mobilise the needed investments (e.g. in hydrogen, grids or offshore renewable technologies). It also contributes to make the energy market more secure, better integrated and more competitive, by interconnecting the EU energy infrastructure and accommodating new energy trends, such as increased electrification, energy system integration or digitalisation.
[47] COM(2020) 852 final.

providing for the opening of the EU procurement market[48]. The proposed International Procurement Instrument[49] is intended to provide the EU with leverage to negotiate the opening of third country procurement markets on the basis of reciprocity. The proposals for new Regulation to address distortions caused by foreign subsidies in the Single Market[50] will provide further safeguards to preserve the level playing field.

To mitigate the sustainability risks, the EU has kept its active role in different policy areas to promote decent work in supply chains (e.g. trade, development, human rights), including through new legislative initiatives such as the one on platform workers and the sustainable corporate governance.

International partnerships and trade diversification have helped boosting resilience in many strategic areas where vulnerabilities were identified. With its unwavering support to the multilateral trading framework and the ongoing efforts to reform it, as well as its extensive network of Free Trade and Investment agreements, the EU is facilitating European businesses integration in global value-chains and creating opportunities for diversification. In certain strategic areas, in raw materials in particular, the EU has signed strategic partnerships to deepen the existing cooperation and exchanges (e.g. Canada and Ukraine), and the EU is working on developing similar partnerships with other key partners. In the digital area, under the Global Gateway strategy[51], the EU will work with partner countries to deploy digital networks and infrastructures such as submarine and terrestrial fibre-optic cables, space-based secure communication systems as well as cloud and data infrastructures, which together provide a basis for exchanges of data, cooperation in high performance computing, Artificial Intelligence (AI), and earth observation. The EU is promoting its regulatory frameworks based on its human-centric values through the establishment of digital partnerships with Japan, the Republic of Korea and Singapore. The EU has also been engaging with some partners to reinforce a sectoral cooperation. This is for example the case with the U.S. within the Trade and Technology Council (TTC) which e.g. aims to jointly strengthen supply chains resilience in sectors of common strategic importance. The EU has also been working with Japan and Korea to address the question of semiconductors shortages.

At multilateral level, the EU is supporting efforts to reinforce global value chains, for instance by taking part in the Rome Supply Chains Summit on 31 October 2021, aimed at improving the transparency of supply chains, promoting openness, predictability, security and sustainability of international supply chains. The EU has also been involved in discussions amongst G7 countries to improve the coordination efforts to build resilient supply chains. The new Global Gateway Strategy[83] offers new opportunities to further develop and extend partnerships with third country partners by supporting the investment in infrastructure needed for boosting the resilience and sustainability of value-chains.

[48] As explained in Communication C/2019/5494.
[49] COM(2016)34 final.
[50] COM (2021)223.
[51] JOIN(2021) 30.

Existing industrial alliances have proved instrumental to strengthening European open strategic autonomy. Figure 1 provides an overview of the industrial alliances launched as well as those under consideration. The expertise developed by the alliances is valuable for identifying gaps and regulatory barriers or bottlenecks that need to be addressed along the relevant supply chains, to assess investment needs, build project pipelines and mobilise investments in strategic areas and technologies. For example, in the area of batteries supply chain, the identified priority to be tackled is the sourcing and processing of raw materials. In this regard, work and projects identified by the European Battery Alliance (EBA) and the European Raw Materials Alliance (ERMA) on battery raw materials are closely linked. ERMA highlighted also the need for regulatory measures that could incentivise the exploration, mining and circularity across the value chain[52]. ERMA also calls for access to finance tools to support projects' development and for the deployment of Horizon Europe programme to develop solutions for raw materials' substitution, recycling, sustainable extraction, etc. The European Clean Hydrogen Alliance helped identifying several regulatory gaps in the area of hydrogen supply chain[53]. The proposal to amend the Renewable Energy Directive (RED II)[54], Hydrogen and gas Package[55], and the Alternative Fuels Infrastructure Directive, proposed as part of the July Fitfor55 package[56], provide solutions[57] to address many of these gaps.

[52] This includes revising legislation relative both to the collection, extraction, and processing of magnets in Europe, and to the retention of End of Life products containing rare earth permanent magnets.

[53] This concern for instance: the missing legal definition of hydrogen, certification schemes for renewable and clean hydrogen, regulation of hydrogen infrastructures, framework for hydrogen infrastructure planning, conditions under which electrolysers producing hydrogen will obtain access to renewable electricity. Please also refer to the Reports of the alliance round tables on barriers and mitigation measures by EHPA of Sept. 2021.

[54] Proposal for a definition of renewable fuels of non-biological origin (RFNBOs) is included in the proposal to amend the Renewable Energy Directive (RED II).

[55] The Commission has proposed certification schemes in the proposals for RED III and in the Hydrogen and Gas Market Package of December 2021. Moreover, missing framework for hydrogen infrastructure planning is proposed to be established in the Hydrogen & Gas Market Package.

[56] The Regulation proposed in the Hydrogen and Gas Market Package and the Alternative Fuels Infrastructure Directive, proposed as part of the July Fitfor55 package, aim to address the issue of missing regulation of hydrogen infrastructure.

[57] For example, to tackle missing hydrogen standards, a Standardisation Working Group was established within the European Hydrogen Alliance to feed into hydrogen standard-making processes at the CEN/CENELEC, and the Strategic Standardisation Communication further examines hydrogen standards among its main priority. Hydrogen Alliance Working Group is being set up to examine the issue of hydrogen permitting procedures and develop policy recommendations and good practices, including for dialogue with Member States.

Figure 11: Overview of industrial alliances

Source: European Commission services.

Further alliances under preparation or consideration could enhance the EU resilience in other areas. For example, in order to improve resilient EU access to space, the Commission is considering an Alliance on Space Launchers to bring together all industry players, existing and emerging, from demand and supply side, including from the public sector to work towards a globally competitive, cost-effective and autonomous EU access to space. The Alliance will benefit the whole space ecosystem, foster innovation and help to address needs from all actors, from start-ups and SMEs, to large enterprises. Moreover, following stakeholder consultations and expression of interest, the Commission is getting ready to launch an open call for membership applications for the Renewable and Low-Carbon Fuels Value Chain Industrial Alliance that was announced in the Sustainable and Smart Mobility Strategy. This is designed as a complementary measure to the legislative proposals ReFuelEU Aviation[58] and FuelEU Maritime[59] with an aim to rapidly boost production, storage and distribution capacity of renewable and low-carbon fuels in these areas.

Defence and space are equally critical sectors for the EU' open strategic autonomy. Supply challenges in this area in crisis time can have a critical impact on the security of EU citizens, impacting the freedom of action of the EU Armed forces. The Observatory of Critical Technologies (OCT) launched by the Action Plan on Synergies will identify, monitor and assess critical technologies, their potential application and related value and supply chains[60]. The Commission has just published two Communications[61] presenting several measures to boost EU innovation and reduce strategic dependencies on technologies being critical for the defence, security and space sector. Based on the findings of the OCT, the Commission invites Member States to develop an EU-wide strategic coordinated approach for critical technologies, commits to review existing EU instruments to encourage dual-use RTD&I at EU level and launches an EU

[58] COM(2021) 561 final.
[59] COM(2021) 562 final.
[60] The OCT will also analyse existing and foreseeable gaps, risks of strategic dependencies and vulnerabilities, and mitigating measures.
[61] A roadmap on critical technologies for security and defence (COM 2022 61) and a Commission contribution to European defence (COM 2022 60).

Defence Innovation scheme[62]. To reduce strategic dependencies the Commission will also systematically assess security and defence considerations when implementing or (re)designing EU industrial and trade instruments, incentivize joint procurement and ownership of defence capabilities, in particular when developed in a collaborative way within the EU. A further key objective is to reinforce the EU's overall resilience in different domains such as adapting to climate change, protecting against hybrid threats and defending the EU's and its Member States' interests in increasingly contested areas, such as cyber and space.

[62] It will include several concrete initiatives, namely a programme similar to CASSINI for defence, a dedicated Investment facility under InvestEU, as well as an Innovation incubator.

3. Investment for the Green and Digital Transitions and Resilience of the Single Market

The path towards a successful and fair green and digital transition of the Single Market and for boosting its resilience will need substantial investment to be undertaken. **The overall additional investment needs to meet the objectives of the twin transitions have been estimated at around EUR 650**[63] **billion annually up to 2030**, compared to the period 2011-2020, reflecting the required deep transformational change of the EU economy. The green transition accounts for EUR 520 billion or 80% of these needs, with 60% (or around EUR 390 billion) representing the energy policy and climate mitigation. The digital transformation in the EU was estimated to be at about EUR 125 billion per year.[64]

Private investment should account for the lion share of such endeavour, and public support tools should be used strategically to crowd in private investment and address market failures. This is even more important in a context where the EU has been experiencing investment gaps.

In this context, this chapter starts by outlining the instruments that have been used to mobilise the investment needed to achieve the green and digital transition and greater resilience of the Single market, such as industrial alliances, IPCEIs, or other appropriate State aid instruments, transition pathways, the Industrial Forum, the Horizon Europe Partnerships, the Invest EU, the Innovation Fund and the Recovery and Resilience Facility (RRF). It points to the value of the bottom-up process of transition pathways and of the engagement with stakeholders within the Industrial Forum.

It then provides an analysis of today's EU investment stance, drawing attention to the accumulated investment gap, and provides estimates of investment gaps by Member State.

Finally, taking a bottom-up approach, Annex 5 takes stock of investment volume which can be observed in a selection of nine critical industrial areas, in support of a green, digital and resilient EU: raw materials, batteries, solar PV, hydrogen, steel, cement, chemicals, clouds services, and cybersecurity. Annex 5 is not exhaustive in terms of the investments taking place in the selected areas, neither does it have the ambition to cover all critical areas within EU industrial ecosystems, but it provides an illustration on how real action is taking place on the ground.

[63] See COM (2021) 662: EUR 392 billion for climate and energy investments (SWD(2021)621 final), EUR 130 billion for environmental investments (SWD(2020)98 final table 1) Thus overall green investment needs thus sum up to EUR 520 billion. EUR 125 billion for digital investments (SWD(2020)98 final table 2).

[64] EUR 42 billion in communication networks, EUR 17 billion in semiconductors, EUR 11 billion in cloud. To note that this figure includes investments in digital infrastructure, digital skills and advanced technologies, but leaves out other dimensions such as digital public services. The Digital Compass Communication and the related policy programme "Path to the Digital Decade", proposes a new policy framework and new targets for the digital transformation of the EU to be achieved by 2030. COM(2021) 118 final; (COM(2021) 574 final). An update of the investment needs in view of the new ambitions for the Digital Decade is on-going.

3.1. What the EU is doing in terms of investment today

Europe's transition to climate neutrality and digitalisation will require profound changes of economic and business models, backed by substantial investments. A fundamental shift to sustainability is required across ecosystems and businesses, including accelerated and deep decarbonisation and circular transition. Bold action and swift mobilisation of private and public funds will be needed to build the necessary underpinning strategic value chains and enabling project pipelines from research to deployment. A large amount of EU public resources has been already deployed through the RRF, the NextGenerationEU and other EU financing instruments.

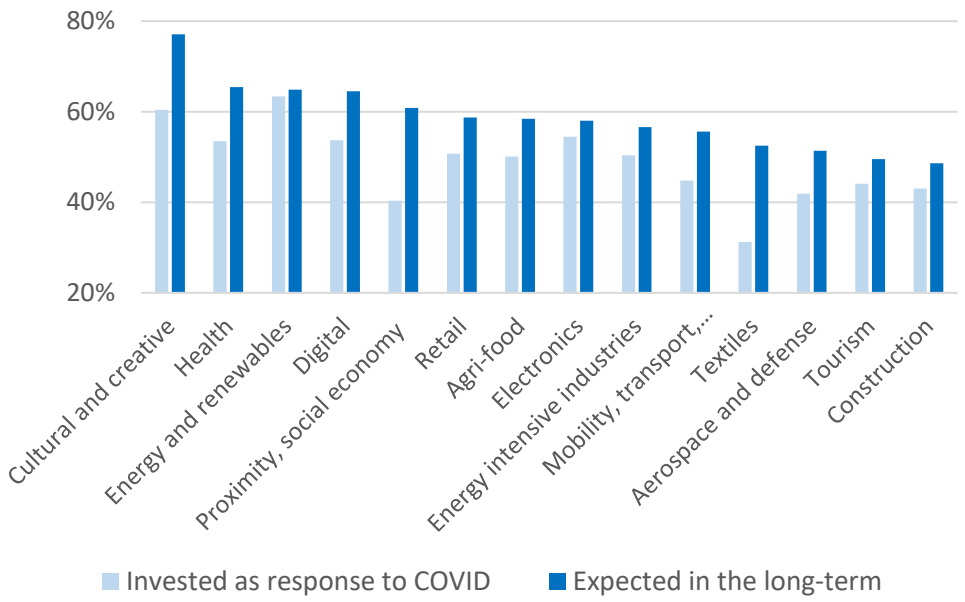
The green and digital transitions offer important opportunities to first movers, in terms of business and job prospects. For instance**,** as frontrunners in applying innovative, low carbon production pathways, while observing high environmental and social standards, European companies can set themselves apart from competitors and set global benchmark standards. For this scenario to materialise, workers need to be equipped with the skills required on a greener and more digital labour market.

As a response to the COVID-19 crisis, EU firms in most industrial ecosystems have invested in digitalisation and are planning investments also in the long term for that purpose. However, significant differences exist across industrial ecosystems (Figure 12). This is based on the EIB Investment Survey[65] which monitors investment and investment finance activities and captures potential investment barriers for the fourteen industrial ecosystems. In contrast to the more general digital transformation, the adoption of new advanced digital technologies (such as 3-D printing, advanced robotics, the internet of things, big data analytics and artificial intelligence, drones, augmented or virtual reality, or platforms)[66] is stalling in many ecosystems.

[65] The EIB Investment Survey 2022 covers about 12,000 EU firms every year. On average, each ecosystem represented in the figure is based on ca. 2,500 EIBIS observations, ranging from 1,700 observations in health or electronics, to more than 3,500 in mobility, retail or construction.

[66] For a more detailed discussion on how the pandemic has prompted many EU firms to accelerate their digital and green transformation, see EIB Investment Report 2021/2022: Recovery as a springboard for change.

Figure 12: Digital investment and long-term investment expectation (share of firms in %), by industrial ecosystems



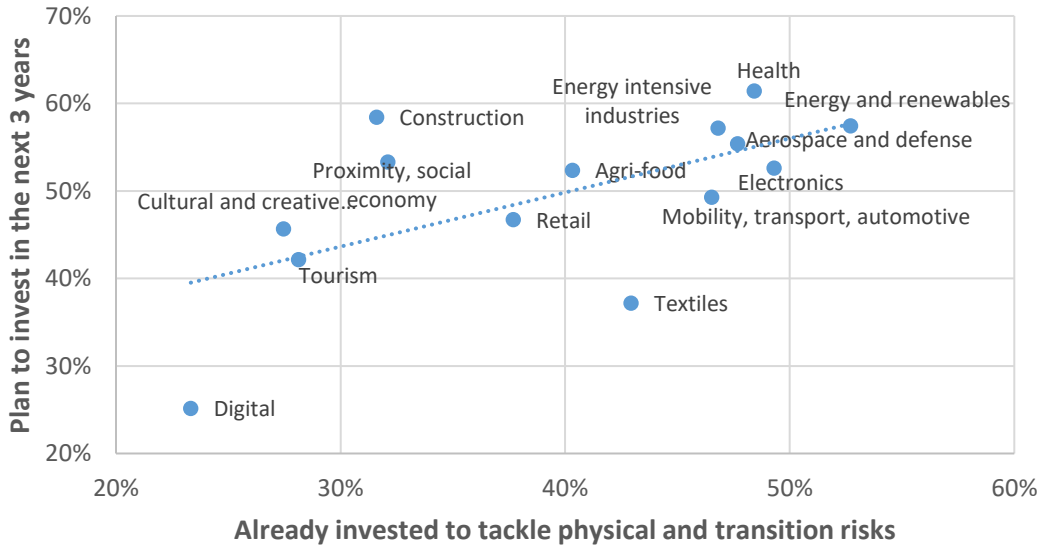
Source: EIB Investment Survey (wave 2021).
Question: As a response to the COVID-19 pandemic, have you taken any actions or made investments to become more digital? Do you expect the COVID-19 outbreak to have a long term impact on digitalisation?

A significant increase of investments can allow EU to develop critical and disruptive technologies to foster its productivity grow which can enable to finance the green transformation. The cumulative capital spending on physical assets for the net-zero transition between 2021 and 2050 would amount to USD 275 trillion globally[67].

On the green front, in 2021, 43% of EU firms have already invested to mitigate the impact of extreme weather events and to reduce carbon emissions. Moreover, 47% of firms have plans to make such investments in the next three years. On balance, most industrial ecosystems report to be well positioned to gain from the climate transition (Energy and renewables, Electronics, Health, Cultural and creative industries), whereas others state that the transition represents a risk (e.g. energy intensive industries, Mobility, transport and automotive). Furthermore, following the Fit for 55 adoption, many firms have also announced their pledge to become carbon-neutral in the next decades.

[67] Mckinsey, January 2022, the net-zero transition-report-jan-2022.

Figure 13 Investment plans to tackle climate change impact, by industrial ecosystem



Source: EIB Investment Survey (wave 2021).
Question: Now thinking about investments to tackle the impacts of weather events and to deal with the process of reduction in carbon emissions, which of the following applies?

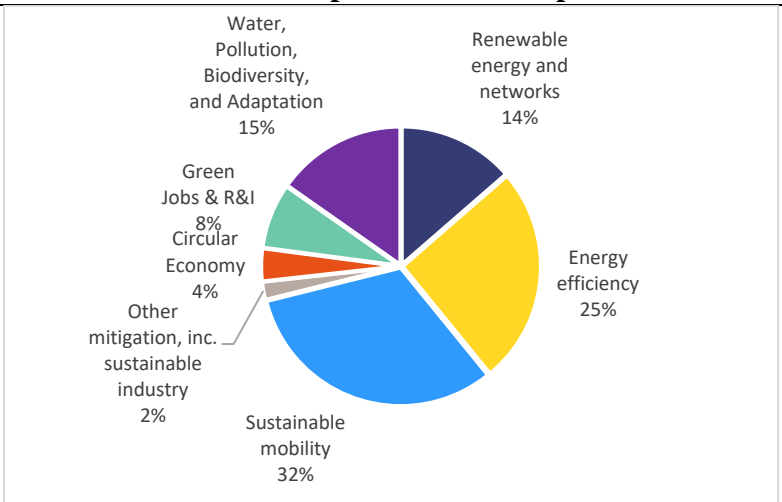
Actions are also being undertaken in some areas to boost resilience, build competitive supply chains and avoid strategic vulnerabilities, including by mobilising strong investments. The in-depth reviews[68] carried out as part of the Industrial Strategy of May 2021 and the second round of in-depth reviews[69] unveiled a number of strategic dependencies and vulnerabilities across several products and technologies, for which actions are being deployed.

Industrial ecosystems will benefit from a significant funding under the RRF to support the green and digital transitions, with the mobility, construction and energy intensive industries ecosystems estimated to receive substantial investments. While not sufficient to fill the entire investment gaps for the green and digital transitions, the RRF will be instrumental in getting the recovery on the right track, avoid business as usual, and implement reforms that will further enable the investments needed in the future.

Around 40%, EUR 177 billion, of the total allocation in Member States' Recovery and Resilience Plans is related to measures supporting climate objectives. In addition, the plans include over EUR 16 billion of additional environmental expenditure. The measures included in the RRPs address a wide of range of areas, including renewable energy and networks, energy efficiency, sustainable mobility, circular economy, green skills and jobs, sustainable industry, and other climate change mitigation and adaptation.

[68] SWD (2021)352 on Strategic dependencies and capacities.
[69] SWD(2022)41.

Figure 14: Climate and environmental expenditure in adopted RRPs



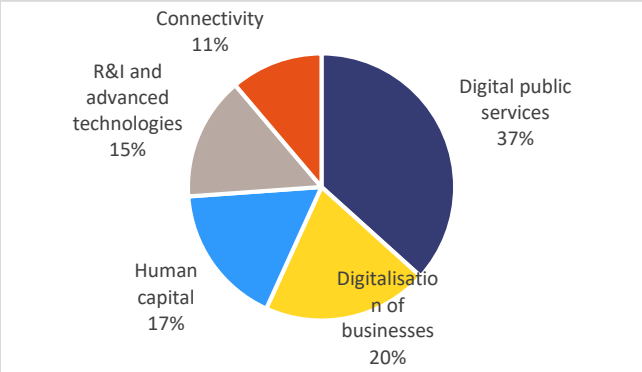
Source: European Commission services, based on the climate and environmental tracking in 22 adopted RRPs. Intervention fields are grouped according to list of policy areas that have been established by the Commission.

The RRF will accelerate the green transition of European industry. Around EUR 3.5 billion of the expenditure is directly targeting sustainable industry (including support schemes for industry in key green areas, industrial applications of hydrogen and remanufacturing measures)[70] however, support to industry goes beyond that. Investments in circular economy, and renewable energy and networks will contribute to a more resource and energy efficient industrial production. Hydrogen-related measures, which may provide a useful industrial feedstock and are particularly relevant for energy intensive industries, fall under the categories of renewable energy, R&I and energy efficiency in Figure 15, depending on the type of measure. Box 3 provides an overview on how these investments will support the green transition of the EU's industrial ecosystems.

Total digital expenditure in the adopted plans amounts to EUR 117 billion, about 26% of the total plan allocation. Investments in digital under the RRF target different areas across the digital policy spectra: digital connectivity and 5G deployment, digital skills development for the population and the workforce, digitalisation of public services, support to the digitalisation of businesses as well as R&D and deployment of advanced technologies.

[70] The figure refers to measures tagged under the intervention field 027 in Annex VI of the RRF Regulation.

Figure 15: Digital transformation expenditure in adopted RRPs



Source: European Commission services, based on the digital tagging in 22 adopted RRPs. Policy areas are established in the RRF Regulation.

Box 3. The Recovery and Resilience Facility's contribution to the green transformation of the industrial ecosystems[71]

For example, out of the 22 adopted RRPs so far, 12 RRPs include an investment dedicated to the Energy Intensive Industries' ecosystem. Several Member States plan to support a breakthrough innovation as well as the deployment of advanced technologies to decarbonise the EII via research and innovation instruments to improve the energy efficiency of processes and decarbonising industry's energy mix up to deploying carbon-free processes and carbon capture, storage and use.

The vast majority of RRPs investments in the construction ecosystem will support energy-efficient construction and renovation, notably as part of the Renovation wave[72].

Investment in sustainable mobility has been one of the key priorities of the Recovery and Resilience Facility, including the Flagship initiative "Recharge and Refuel". Overall, 22 Member States have included in their RRPs measures to support the Mobility-Transport Automotive ecosystem. The majority of the planned investments focus on green transition of the ecosystem. Among those, the deployment of recharging infrastructure features the most prominently, followed by the investments in railway and/or urban mobility infrastructure as well as grant and subsidy schemes to stimulate the renewal of the existing fleet into clean vehicles.

More information on RRF investments per industrial ecosystems is available on the website of the Internal Market, Industry, Entrepreneurship and SMEs[73].

Recovery and Resilience Facility will provide strong support for SMEs; investments and reforms for SMEs represent approximately 10% of the total estimated RRF expenditure, worth EUR 44 billion. Moreover, SMEs will benefit, partially or indirectly, from other RRF investments. Direct and indirect investments into SMEs together represent about EUR 109 billion[74].

[71] See the footnote 62.
[72] e.g. "Ecobonus and Sismabonus" in the Italian RRP, the "Thermal renovation of public buildings" in the French RRP or the "Federal funding for energy-efficient buildings renovation" in the German RRP.
[73] https://ec.europa.eu/growth/industry/strategy/ecosystems_en.
[74] The figure of EUR 109 billion includes both measures tagged as "Support to SMEs" (primary or secondary policy areas in the Recovery and Resilience Scoreboard) and additional wider measures which are likely to benefit SMEs.

Besides supporting the green and digital transitions of the SMEs, RRF investments support SME's resilience and growth, in particular access to finance, entrepreneurship, research and innovation, internationalisation and skills. The proposed investments will be underpinned by a set of reforms in the area of access to finance (for example direct financing for SMEs through start-up grants or green finance instruments, equity financial instruments and portfolio guarantees), business environment (such as reducing administrative burden and addressing regulatory obstacles) and skills. Finally, major investments in the industrial ecosystems, such as tourism and construction, will also substantially benefit SMEs as the latter are often key players in these ecosystems.

Box 4: Implementation of the SME Strategy

The SME Strategy[75] not only helps providing an immediate crisis support to SMEs, but is also key in supporting SMEs' recovery and fostering their resilience against future shocks, as well as their green and digital transitions.

Improving access to finance is one of the critical factors to enhance the resilience of SMEs. Despite large amounts of public support measures, it remains important to ensure that SMEs can get the financing they need. The new flagship programme InvestEU is expected to considerably increase investments in SMEs, both in capital support and equity financing. In addition, the European Commission has decided to prolong until 30 June 2022 the State Aid Temporary Framework[76].

Digitalisation proved to be one of the key factors explaining how well individual SMEs have been able to weather the COVID-19 crisis (see chapter 1). The SME Strategy will support SMEs with important tools facilitating their digital transition. For example, the Digital Innovation Hubs provide them with an access to technical expertise and experimentation as well as the possibility to 'test before invest'.

The SME strategy also includes a number of important support measures to help the SMEs succeeding in their green transition, including fully operational Enterprise Europe Network's (EEN) Sustainability Advisors helping SMEs transitioning to more sustainable business models, as well as the European Resource Efficiency Knowledge Centre (EREK) of the European Cluster Collaboration Platform showing/showcasing SMEs' new opportunities to embrace resource efficiency and benefit from circular economy business models.

Innovation in SMEs has to be underpinned by an environment conducive to entrepreneurship and protection of their intellectual property. The EU Start-up Nations Standard of Excellence, signed in March 2021, will ensure that start-ups and scale-ups in Europe benefit from best practices underpinning the world's most successful start-up ecosystems. In addition, more than 12 000 SMEs from all Member States have already benefited from the first EUIPO (EU Intellectual Property Office) SME Fund's intellectual property vouchers.

For a full overview of the implementation of the SME Strategy, see the Annex 1 to this Report.

[75]An SME Strategy for a sustainable and digital Europe (COM/2020/103), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0103, see table on Stocktaking of the implementation of the 2020 SME Strategy for a full overview of the implementation of the SME Strategy actions.

[76] Sixth Amendment to the Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak and amendment to the Annex to the Communication from the Commission to the Member States on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to short-term export-credit insurance, 2021/C 473/01.

Multi-country projects and technology driven Important Projects of Common European Interest (IPCEIs) can further steer investment and boost project pipelines in strategic value chains, complementing the existing IPCEIs on batteries and microelectronics. A number of Member States have seized the opportunity offered by the RRF to include multi-country projects in their Recovery and Resilience Plans and indicated interest in participating in possible future IPCEIs in areas such as hydrogen, microelectronics, semiconductors, and cloud.

The InvestEU Programme, focusing on the European Union's medium- and long-term policy priorities, will significantly support the European Green Deal and the Strategy on shaping Europe's digital future. The InvestEU Regulation provides that the InvestEU programme will target at least 30% of investments (i.e. around EUR 120 billion) contributing to climate objectives. Under the sustainable infrastructure policy window, at least 60% of the investment (corresponding to around EUR 85 billion) shall contribute to meeting the European Union objectives on climate and environment. The InvestEU will also significantly strengthen investments in digital infrastructures, technologies, and skills, in particular through its window on Research, Innovation and Digitisation (which has a budgetary guarantee of EUR 6.6 billion, corresponding to around EUR 94 billion of investments).

The European Partnerships in Horizon Europe are helping industry develop technologies to achieve their digital and green ambitions, such as in the framework of the Batteries Partnership, the Clean Hydrogen Partnership or cluster 4 of the Horizon Europe supporting the sustainable transition of process industries (Processes4Planet), sustainable advanced manufacturing (Made in Europe) and research on raw materials. In particular, the co-programmed European Partnership on 'Towards a competitive European industrial battery value chain for stationary applications and e-mobility' has a budget of EUR 925 million for the period 2021-2027, while the partnership on Clean Hydrogen has a budget of EUR 2 billion for the same period. In addition, Horizon Europe will invest around EUR 300 million (2021/2022) on raw materials (through cluster 4 and 5 of Pillar II).

Transition pathways aim at achieving that the different actors in an ecosystem follow a common and coordinated approach for the roll-out of actions supporting green and digital transitions of industrial ecosystems. For this, the relevant actors in the ecosystems need to have a common understanding of challenges and opportunities, the direction to take, and set out the steps that individual companies and industrial ecosystems need to take and commit to implement those. By supporting a coordinated approach, transition pathways help reducing the transition risk and create better conditions for investment. This is of clear relevance, as the existing supply chains are changing and new ones are being built. Work on transition pathways is being made possible and largely facilitated through a continuous stakeholders engagement (in the Industrial Forum and through targeted stakeholder platforms, e.g. the High Level Construction Forum).

The Commission has taken a prioritised approach to the work on transition pathways, starting with those where the transition is the most urgent. An initial priority was Tourism and Energy intensive industries ecosystems where broad stakeholder consultations have taken place on the basis of initial analysis and scenario papers prepared by Commission services. In a number

of industrial ecosystems such as Proximity and Social economy[77], Construction[78], Transport-Mobility-Automotive[79], stakeholder consultations have recently been launched**.** The transition pathway for the Tourism ecosystem[80], published in February 2022, proposes 27 action topics and 60 concrete actions to support the transition of this ecosystem, ranging from digital support to destination management to technology uptake for the reduction of CO2 emissions in touristic transport, etc. The co-implementation of these actions will be soon kicked-off thanks to a collaborative platform where all ecosystem stakeholders will be called to contribute.

The Industrial Forum[81] aims at promoting wider partnership with the industry and all relevant stakeholders. A dedicated task force is working towards a common understanding of challenges and opportunities of transitions, by developing common elements or horizontal building blocks[82] (the 'blueprint')**,** ranging from technological trends, capacity building and skills, investment needs, infrastructures, R&I and prototyping, competitiveness, governance to social actions.

With the "Path to the Digital decade" initiative, the Commission is responding the need to coordinate EU's efforts and investments to shape its collective digital transformation. Anchored in a vision for Europe's digital transformation by 2030, the Digital decade initiative revolves around four cardinal points: skills, government, infrastructure and business. With quantitative targets and key milestones, a joint governance structure including a traffic light monitoring system to identify successes and gaps, as well as multi-state projects combining investments from the EU, Member States and the private sector, the EU will be able to get together and foster investments in digital technologies and infrastructures to the benefit of citizens and businesses including SMEs.

The European Research Area's policy agenda[83] is helping to accelerate the green/digital transition of Europe's key industrial ecosystems with Member States. Its action 12 focuses (a) on the development of industrial technology roadmaps on low carbon technologies for energy-intensive industries and on circular industrial technologies, which feed into transition pathways for industrial ecosystems[84], (b) on the creation of a coordination mechanism to provide industry with the technology infrastructures needed to test, validate and upscale innovations, and (c) on better supporting the transfer of fundamental research results to industrial research and innovation.

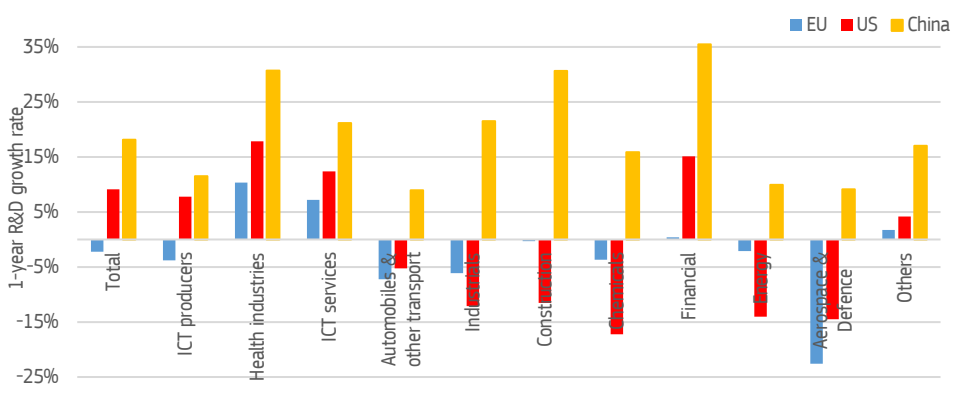
[77] SWD(2021)982 final.
[78] https://ec.europa.eu/docsroom/documents/47996.
[79] https://ec.europa.eu/docsroom/documents/48535.
[80] https://ec.europa.eu/docsroom/documents/48697.
[81] The Industrial Forum as Commission expert group gathers wide range of stakeholders, including Member State authorities, industry representatives, Civil Society Organisations, and research and technology organisations.
[82] These building blocks can inform the work in many other ecosystems with ecosystem-specific approaches, recognising for instance the very different challenges of sustainability in the tourism ecosystem to that of the energy intensive industries.
[83] st14308.en21.
[84] Updated Industrial Strategy, COM(2021)400.

The EIB Group has intensified investments in the green and digital transitions[85]; the Group will seek to support the sustainable transition by gradually increasing its share of finance dedicated to green investment to over 50% by 2025 and beyond. In 2021 the share of EIB investments that went to climate action and environmental sustainability projects rose to 43% (from 40% in 2020), for a total of EUR 27.6 billion investments supporting the green transformation of EU economies. In addition, a record EUR 20.7 billion went to support innovation, digital economy and human development. In its recent roadmap[86], the EIB identified 12 focus areas for green investments, this structure will help shaping EIB Group business development, including the provision of a financial and advisory support.

Box 5: Growth and intensity of R&D investment - Industrial R&I Investment Scoreboard.

In the COVID-19 crisis context, the latest R&D figures from the Industrial R&D Investment Scoreboard [87]show the resilience of industrial R&D investments as key for recovery and their potential for industrial transformation towards green and digital. However, the crisis further shaped the global tech-race in favour of EU competitors US and China. This is due to an increased demand for ICT and Health solutions, where these competitors have gained strength in the past decade. Global R&D growth was driven by the ICT services sector (15.5%), followed by the Health and ICT producers sectors (12.8% and 5.7% respectively). Most other sectors showed a decrease in R&D investment, particularly those hit hard by the crisis, i.e. Aerospace & defence (-17.0%) and Automotive (-4.3%). The Chemicals sector reduced R&D by 3.4%, continuing the negative trend observed in the past few years (see Figure 16).

Figure 16: R&D investment growth 2019-2020 by sector and selected region/country



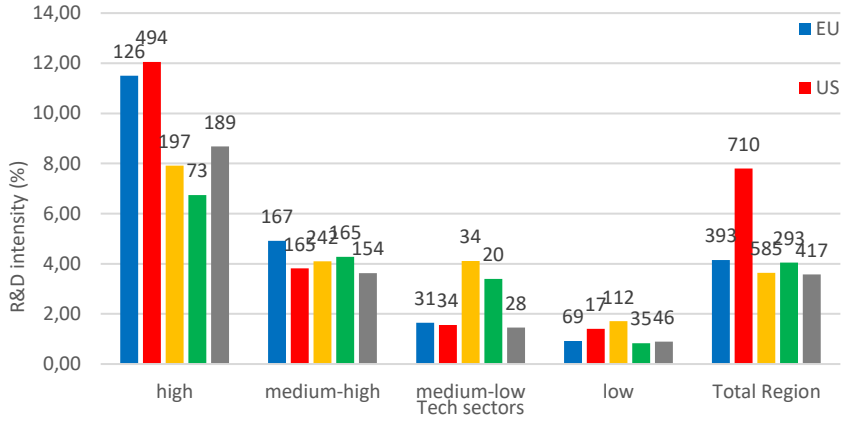
Note: R&D 2020 growth rates have been computed for 399 EU, 776 US and 597 Chinese companies for which data are available for both years 2019 and 2020. Sectors ordered from left to right in terms of overall R&D investment in 2020.
Source: The 2021 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG RTD.

Comparing the 2016 and the 2021 Scoreboards, the most important development in the global R&D ranking is the increased presence of high-tech companies, mainly from China, which comes at the expense of more

[85] Climate Bank Roadmap 2021-2025, November 2020.
[86] https://www.eib.org/attachments/thematic/eib_group_climate_bank_roadmap_en.pdf.
[87] The Industrial R&D Investment Scoreboard monitors private R&I competitiveness based on timely statistics from companies' latest published accounts. It comprises key indicators on the 2500 parent companies and more than 800 thousand subsidiaries. These companies, based in 39 countries, each invested at least €36.5 million in R&D for a total of €908.9 billion. The 2021 Scoreboard total R&D is equivalent to approximately 90% of the world's business-funded R&D.

"traditional" sectors, mainly from the EU and Japan. China's presence increased very significantly through the addition of 269 companies to the 327 included in the 2016 Scoreboard. Overall decreases in the case of the EU, the US and Japan are of similar magnitude, but their mix is least concerning for the US, which managed to increase its presence in two of the key global sectors, i.e. health industries and ICT services, thanks to its sustained investment in software, internet and computer services technologies as well as in pharmaceuticals and biotechnology. The EU lost both R&D and number of companies in all four key sectors, slightly in ICT and health, more in automotive. However, it increased in industrial machinery and general industrials, which are two sub-sectors that encompass a number of medium-low and medium-high tech industries and some more or less knowledge intensive services. Figure 18 shows the importance of the number of Scoreboard firms in high R&D intensity sectors.

Figure 17: R&D intensities by sector group and selected region/country



Note: R&D intensities have been computed for 2398 with Net Sales figures for 2020, representing 99.2% of the total R&D 2020. Number of companies per sector/region reported on top of each bar.
Source: The 2021 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG RTD.

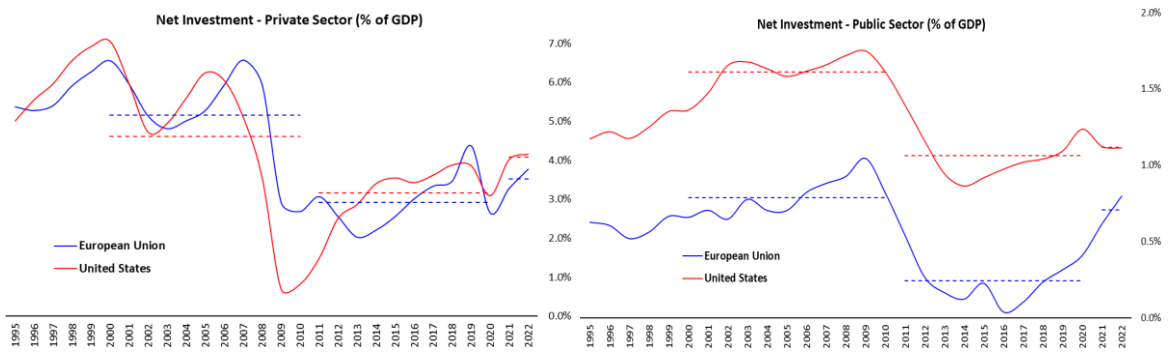
The Scoreboard also shows that the EU companies are among the global leaders on high-value green patents and green patents in energy intensive industries; specific efforts will be needed to pursue the requirements of the European Green Deal as well as to sustain leadership and remain competitive on global markets.

3.2. Investment catching-up in the EU

Private investment in the EU fell abruptly after 2009, a trend common to other economies. From an average level of net investment[88] of 5.2% of GDP during the first decade of the millennium, it fell to an average of 2.9% in the following decade. The gap accumulated in that second decade with respect to the first one was of the order of EUR 2.8 trillion. Therefore, the EU faced the COVID-19 shock having already accumulated a chronic lack of investment.

[88] Net investment refers to the net fixed capital formation, which takes into account the depreciation of the existing capital stock. In other words, it provides a measure of the actual investment done in the economy, which goes beyond the simple maintenance of the existing stock of capital.

Figure 18: Net Investment as a share of GDP in the EU and in the US, private and public sector, 1995-2022



Source: Commission services based on data by AMECO, accessed on 7 January 2022. Note: the indicator shows the level of net fixed capital formation, operated by the private and by the public sector, as a share of GDP. Data for 2022 are based on the latest forecasts.

A similar trend in contraction of private investment occurred in the US, although private investment in the US recovered slightly faster than in the EU. Closing such gap with the US, in terms of share of GDP, would have meant for the EU private sector investing EUR 300 billion more already in the ten years preceding the pandemic. However, the big decline in investment in the EU is more visible when we look at net public investment. The financial crisis and the following years in particular, marked a clear break, as the level of net public investment decreased from an average of 0.8% of GDP in the first decade of the millennium, to an average of 0.2% in the following one, right before the COVID-19 shock.

Investment in the EU has been hit by the pandemic shock, but is on a recovery path, also thanks to the bold action taken by Member States and the EU Institutions. Both public and private investment levels are recovering now, and are back to the pre-crisis levels, with the help of EU instruments, such as NGEU, and specific efforts at national level. In the future, the green and digital transition will call for new, very significant efforts.

A closer look at country-specific trends provides more insights about the origins of these gaps (See Figure 19 and Figure 20).

During the second decade of the millennium, right before the pandemic shock, most of the investment gap accumulated by the private sector in the EU clearly came from Italy. While in France and Germany the private sector maintained similar levels of investment in the two decades, a big drop occurred in Italy and in particular in Spain.

Figure 19: Net Investment by the Private Sector, Country detail

PRIVATE SECTOR

Private Sector Net Fixed Capital Formation

	1970-1979	1980-1989	1990-1999	2000-2010	2011-2020	2021-2022
	Average Level % GDP	Average Level % GDP	Average Level % GDP	Average Level % GDP	Average Level % GDP	Average Level % GDP
EU				5.2%	2.9%	3.5%
BE	6.8%	3.8%	6.4%	4.3%	3.8%	4.8%
BG			6.9%	8.9%	4.8%	2.7%
CZ			6.0%	8.3%	5.3%	6.0%
DK	8.1%	5.6%	3.6%	4.1%	2.6%	5.7%
DE	8.3%	5.6%	7.0%	2.9%	2.4%	2.7%
EE				12.1%	7.9%	10.6%
IE	8.0%	9.1%	7.4%	10.0%	8.0%	-2.2%
EL	0.0%	1.0%	7.5%	6.1%	-4.6%	-1.5%
ES	12.6%	7.2%	8.1%	11.1%	3.2%	4.0%
FR	10.3%	6.2%	4.5%	4.8%	3.9%	4.8%
HR			0.2%	4.4%	3.0%	2.8%
IT	11.5%	7.0%	4.7%	4.5%	0.1%	1.5%
CY			3.4%	8.5%	4.0%	7.3%
LV			-4.4%	4.3%	-1.2%	0.2%
LT			3.6%	7.8%	5.8%	8.6%
LU	0.0%	0.0%	7.7%	5.9%	4.6%	3.9%
HU			3.1%	6.4%	4.1%	7.5%
MT			3.3%	5.9%	6.5%	5.6%
NL	8.6%	5.6%	5.3%	4.3%	2.8%	3.9%
AT	10.1%	7.6%	8.7%	6.2%	4.9%	6.5%
PL			3.4%	6.0%	5.3%	3.8%
PT	2.3%	12.2%	9.0%	5.9%	-0.4%	0.9%
RO			-2.9%	4.5%	4.7%	7.3%
SI			2.6%	5.2%	-2.2%	-1.4%
SK			0.3%	3.3%	3.2%	2.4%
FI	12.3%	9.0%	2.6%	4.6%	3.3%	3.8%
SE	8.9%	9.1%	5.9%	5.6%	5.7%	6.5%
UK	3.0%	3.8%	4.2%	2.9%	1.4%	2.3%
USA	7.0%	6.1%	5.0%	4.6%	3.2%	4.1%

Source: Commission services, based on data from AMECO, of 7 January 2022

In the same decade 2011-2020, a comparatively bigger fall in investment came from the public sector in the EU (see Figure 21). Germany and Italy alone account for most of the one-trillion gap vis-à-vis the US. The telling data are the virtually null net public investment in Germany during the first two decades of the millennium and the negative rate of net investment in Italy during the second one[89]. Low public investment, however, was also visible in France and Spain.

[89] A negative net investment rate means that the actual gross investment in the country was not even sufficient to compensate for the depreciation of the existing stock of capital.

Figure 20: Net Investment by the Public Sector, Country detail

PUBLIC SECTOR

General Government Net Fixed Capital Formation

	1970-1979	1980-1989	1990-1999	2000-2010	2011-2020	2021-2022
	Average Level	Average Level	Average Level	Average Level	Average Level	Average Level
	% GDP	% GDP	% GDP	% GDP	% GDP	% GDP
EU				0.8%	0.2%	0.7%
BE	2.7%	1.2%	0.0%	0.0%	0.2%	0.7%
BG			-1.6%	1.1%	1.0%	1.6%
CZ			-0.4%	0.4%	-0.1%	1.0%
DK	1.6%	0.0%	-0.2%	0.0%	0.8%	0.6%
DE	2.4%	0.9%	0.4%	0.0%	0.0%	0.2%
EE				2.9%	2.3%	3.1%
IE	1.9%	1.8%	0.6%	2.2%	0.6%	1.2%
EL	0.0%	0.0%	1.3%	2.2%	-0.5%	0.2%
ES	1.4%	1.9%	2.5%	2.2%	-0.2%	0.0%
FR	2.1%	1.1%	1.0%	0.8%	0.2%	0.7%
HR			1.7%	3.0%	0.4%	2.5%
IT	0.4%	2.1%	0.9%	0.6%	-0.4%	0.3%
CY	0.0%	0.0%	1.3%	2.0%	0.5%	0.8%
LV			-1.9%	-0.6%	0.7%	2.9%
LT			-0.8%	1.0%	0.8%	1.2%
LU	0.0%	0.0%	2.2%	2.5%	1.7%	1.9%
HU	0.0%	0.0%	-1.1%	0.4%	1.4%	3.0%
MT	0.0%	0.0%	0.9%	1.2%	1.2%	2.7%
NL	2.6%	0.9%	0.6%	1.0%	0.4%	0.5%
AT	3.5%	1.5%	1.0%	0.4%	0.4%	0.6%
PL			0.4%	1.3%	2.1%	2.3%
PT	0.6%	1.8%	2.3%	1.8%	-0.7%	0.1%
RO			1.3%	2.8%	2.2%	4.0%
SI			0.8%	2.0%	1.3%	3.3%
SK			-1.3%	-0.5%	0.7%	0.9%
FI	2.4%	2.0%	1.1%	0.6%	0.7%	1.4%
SE	3.2%	1.4%	1.4%	0.9%	1.3%	1.8%
UK	3.4%	0.7%	0.5%	0.6%	0.7%	0.1%
USA	1.7%	1.8%	1.4%	1.6%	1.1%	1.1%

Source: Commission services, based on data from AMECO, of 7 January 2022

Even though both, private and public, investment levels in the EU are increasing in the current post-pandemic period, they remain considerably lower than in the US. In 2021 and 2022, in fact, reaching the same levels of investment on GDP as the US would require an important effort by the private sector in Germany and Italy, whose gaps alone are even larger than the total EU gap (because other countries are compensating by investing more). Germany also accounts for more than half of the total public investment gap of the EU vis-à-vis the US. The country detail suggests that Germany and Italy are the two countries that have accumulated the largest investment gaps. Their underinvestment has determined most of the EU's gap.

Annexes:

Annex 1:	***Implementation of SME Strategy, and Overview Table of the implementation of the SME Strategy***
Annex 2:	***Overview Table: State of play of the implementation of the Single Market Enforcement Action Plan***
Annex 3:	***Overview Table of the implementation of the Industrial Strategy and its Update***
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PART 2/2

COMMISSION STAFF WORKING DOCUMENT

Annual Single Market Report 2022

Annexes

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Annex 1: Implementation of the SME Strategy

The EU's SME Strategy[1] includes a wide array of actions aimed to improve SMEs' performance. These actions principally concern capacity-building, access to finance and market access. They have not only helped provide immediate crisis support to SMEs, but are also key to supporting SMEs' recovery and fostering their resilience against future shocks, as well as their green and digital transition.

Fostering the resilience of the EU's SMEs

Recent history has been marked by sudden and severe shocks. These shocks affected all businesses regardless of their size. However, evidence clearly shows that the smaller the enterprise the more vulnerable they are to those shocks. The SME Strategy therefore features measures geared towards preparing SMEs to better withstand future shocks.

Improving access to finance for SMEs is a critical factor in their resilience. Although large amounts of public support measures have ensured continued access to finance during the crisis, it remains important to ensure SMEs can get the financing they need. In the EU's 2021-2027 multiannual financial framework, the Union introduced debt and equity support under its flagship programme InvestEU and chiefly its SME window. InvestEU is expected to considerably increase investments in SMEs, both in capital support and equity financing.

In addition, the European Commission has decided to prolong until 30 June 2022 the State Aid Temporary Framework[2] with two objectives: set out the path towards a progressive phase-out of crisis measures in view of the observed economic recovery, and subject to the evolution of the pandemic, and kick-start and crowd-in private investment for a faster, greener and more digital recovery including through solvency support. The new solvency support tool enables Member States to leverage private funds and make them available for investments in SMEs. This tool is particularly relevant in light of the increasing indebtedness levels since the beginning of the crisis, in particular of smaller companies. It provides access to equity financing that is often difficult for these companies to pool alone. For example, Member States can give guarantees to dedicated investment funds that will reduce risks for private investors and make it more attractive to invest in SMEs, start-ups and small midcaps.

Access to finance is also hindered by late payments, which increased markedly during the pandemic. The average time for an SME to get paid increased from 35 days in 2019 to more than 52 days in 2020, and the average delay in payments from public authorities increased from 9 to 15 days[3]. Even though these numbers slightly decreased in 2021 (to 48 days and 11 days, respectively), they remain substantially higher than before the crisis. The latest survey on the access

[1] An SME Strategy for a sustainable and digital Europe (COM/2020/103), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0103, see table on Stocktaking of the implementation of the 2020 SME Strategy for a full overview of the implementation of the SME Strategy actions.

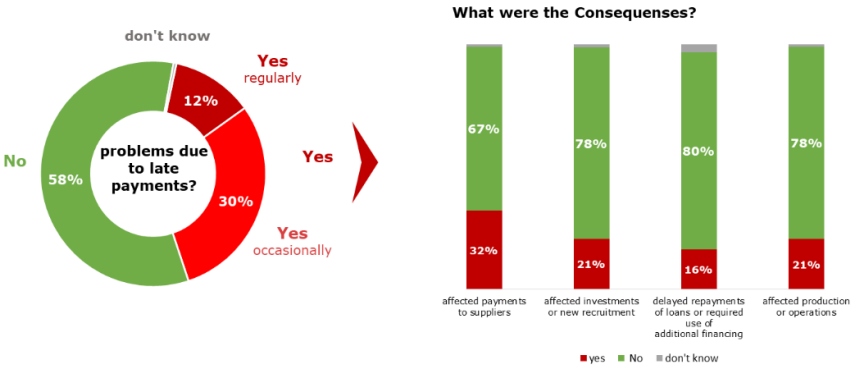
[2] Sixth Amendment to the Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak and amendment to the Annex to the Communication from the Commission to the Member States on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to short-term export-credit insurance, 2021/C 473/01.

[3] SME Performance Review 2021, based on the European Payment Report, Intrum.

to finance of enterprises (SAFE)[4] shows that for those SMEs who experienced late payments, the most common consequence was that it affected their payments to suppliers in turn. Late payments therefore have a cumulative effect that spreads through supply chains, undermining their viability and resilience.

Figure 1a: 42% of SMEs experienced problems due to late payments

figure 135 Proportion of SMEs in the EU27 that experienced problems due to late payments from any private or public entities in the past six months and the resulting consequences.

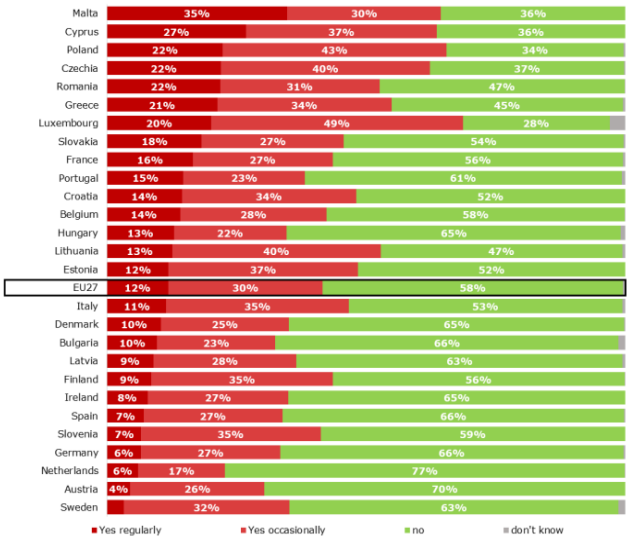


Source: SAFE Survey November 2021

The Commission is working on improving the effectiveness of the Late Payment Directive. A late payment observatory will identify unfair payment performance and practices by public authorities to businesses and in B2B transactions. Pilot work on the observatory is ongoing in the construction sector, consisting mainly of SMEs. Further work in other industrial ecosystems will follow.

Figure 1b

figure 136 Proportion of SMEs in the EU27 that experienced problems due to late payments from any private or public entities in the past six months and the resulting consequences, by country.



Source: SAFE Survey November 2021

[4] The SAFE provides information on the latest developments in the financial situation of enterprises, and documents trends in the need for and availability of external financing. The survey is available at https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html.

In addition to financial support, SMEs need the right partners and a level playing field to grow and innovate. Europe's Single Market is the most powerful instrument acting in favour of Europe's innovators. A European Innovation Council (EIC) was established under the EU Horizon Europe programme to identify and scale-up breakthrough innovations that have the potential to create entirely new markets and value networks. The EIC, the European Innovation Ecosystems (EIE), the European Institute of Innovation and Technology (EIT) and the Startup Europe programme help develop new business by creating local connections, and linking them up to learn from each other, catering for their specific needs. Improving the impact of EU funding for "market-creating" innovations is key to making the EU an industrial frontrunner.

Addressing SMEs' challenges of digitalisation, sustainability and capacity-building

Digitalisation has proven to be one of the key factors explaining how well individual SMEs have been able to weather the crisis. The Annual Report on European SMEs[5] unveiled large disparities regarding the digitalisation of SMEs, particularly small SMEs. A much larger proportion of micro SMEs reported focusing only on basic digital technologies and not on advanced digital technologies (36.5% of micro SMEs versus 29.2% of small SMEs and 26.9% of medium-sized SMEs). Although the crisis delivered clear evidence about the importance of digitalisation for the resilience of enterprises, many SMEs still do not consider digitalisation as essential for their business: 59% of SMEs not using ICT believe it is not suitable for their enterprise. EU and national support measures are therefore needed to allow all SMEs to make the transition towards digitalisation.

The SME Strategy has provided important tools to SMEs to master the digital transition. For example, the Digital Innovation Hubs provide access to technical expertise and experimentation as well as the possibility to 'test before invest'**.** They help SMEs improve their business processes, products, or services using digital technologies. They also provide innovation services, such as financing advice, training, and skills development that are needed for a successful digital transformation. Member States have already designated their candidate hubs to the European Commission.

The green transition confronts SMEs with similar challenges than the digital one. Only 24% of all EU SMEs have a concrete plan in place to reduce the carbon-footprint of their business and, eventually, achieve climate neutrality. Close to half (46%) of EU SMEs have invested less than 1% of their annual turnover in 2021 in measures to become more resource-efficient and less than a third (32%) have green products in their product range, i.e. goods or services that have the predominant function of reducing environmental risk and minimise pollution and use of resources[6].

The SME strategy includes a number of important support measures to help SMEs succeed the green transition. The SME pillar of the Single Market Programme (2021-2027)[7] and the former COSME programme (2014-2020) include actions to provide support for the transition to

[5] Full report available at https://ec.europa.eu/docsroom/documents/46062.
[6] 'Flash Eurobarometer 498: SMEs, resource efficiency and green markets', European Commission, 2022, forthcoming.
[7] Single Market Programme - Regulation (EU) 2021/690. More information available at https://ec.europa.eu/info/funding-tenders/find-funding/eu-funding-programmes/single-market-programme/overview_en.

sustainability and / or the green transition. As of 2022, Sustainability Advisors will become fully operational within the Enterprise Europe Network (EEN). These advisors will help all types of SMEs in their transition to more sustainable business models by identifying sustainability challenges and opportunities and advising on new sustainable business models, circular economy and resource efficiency. In addition, the European Resource Efficiency Knowledge Centre (EREK), which is an integral part of the European Cluster Collaboration Platform, helps companies by providing tools and services that show new ways to boost resource efficiency and to benefit from circular economy business models. There are other schemes to help address sustainability challenges in specific sectors such as social economy, and tourism which also include some possibilities for third party financing to SMEs. In addition, there is extensive support for patents and Intellectual Property, which helps SMEs invest in new green and sustainable technologies. There are also support schemes for encouraging good practice in sustainability at regional and local level. For example, the Intelligent Cities Challenge mobilises cities for setting up local green deals and support to local businesses is an important component of these.

SMEs also need financial support for green and sustainable investments. Amongst other things, SMEs can access debt and equity financing by contacting the local commercial or public banks that offer financial products for SMEs backed by InvestEU guarantees. This finance is available to SMEs in all sectors, and some of the financial products on offer also have specific environment/climate goals. Pending the full roll- out of InvestEU, similar financial instruments funded under the previous MFF continue to operate. In 2021, the European Innovation Council channelled over EUR 1 billion to start-ups and innovative SMEs.

The Enterprise Europe Network (EEN) and Clusters bring together various actors and offer support to SMEs, including advisory services on access to finance, access to markets, intellectual property rights, technology transfers, innovation and partnering opportunities. Namely, the EEN services are also being upgraded to help SMEs benefit from the sustainable and digital transitions and improve their resilience to market shocks, for example by introducing Sustainability Advisors.

Innovative SMEs need to keep protecting and managing their intangible assets, thus strengthening their competitive position and the resilience of national economies. To support this, an Intellectual Property Action Plan was prepared and an Intellectual Property voucher was deployed for post-COVID recovery and green and digital transitions.

On 1 January 2021, the Commission and the European Union Intellectual Property Office (EUIPO) launched the EU SME Fund, which has offered financial support through intellectual property (IP) vouchers for SMEs impacted by the COVID-19 crisis, with the objective to help them manage their IP portfolios. With a budget of EUR 20 million for one year, the Fund offered services to reimburse part of the costs of IP Scan and national trade mark and design registration. More than 12 000 SMEs from all Member States have benefited from the first SME Fund, which provided in total more than 28 000 services. On 10 January 2022, the Commission and the EUIPO launched a second EU SME Fund, with a budget of EUR 47 million, aiming at supporting SMEs in the COVID-19 recovery and green and digital transitions for the next three years (2022-2024). The new Fund counts includes higher reimbursement rates and an extended scope, also covering patents

The Intellectual Property Action for SMEs (IPA4SME), a project funded by COSME, has provided financial and expert support for intellectual property (IP) valorisation and protection services to eligible SMEs, worth up to EUR 15 000. With an overall budget of over EUR 4 million it has benefited more than 750 SMEs so far. It provided a number of support actions

for SMEs, such as a) reimbursement of intellectual property pre-diagnostic services and advice on the intellectual property potential of their business, b) financial aid for fees charged by the European Patent Office (EPO) and c) financial aid for costs of external legal advice by intellectual property attorneys.

Innovative SMEs require access to skilled labour as well as an environment conducive to entrepreneurship. The Pact for Skills was launched in November 2020 with a dedicated component for SMEs and a series of stakeholder roundtables. In 2021, 26 Member States and Iceland signed the EU Start-up Nations Standard of Excellence, to ensure that start-ups and scale-ups in Europe benefit from best practices underpinning the world's most successful start-up ecosystems. The Member States commit to take actions including an entrepreneurship-friendly environment and sharing of best practices, and have launched a Start-up Nations Hub to promote exchange among signatory countries.

Important regulatory initiatives benefiting SMEs in particular are under preparation or negotiation. The initiative on short-term accommodation will encourage the responsible development of short-term accommodation rentals and benefit the big number of micro and small companies in the tourism ecosystem. The Digital Services Act and the Digital Markets Act, so as the upcoming Data Act will help SMEs grasp the opportunities of the data /digital economy and also enhance fairness in business-to-business relations.

Stocktaking of the implementation of the 2020 SME Strategy

Colour-coding

Implemented / launched before February 2022

Under preparation

Action	State of implementation
Capacity building and support for the twin transition	
The Commission will enhance and upgrade the **Enterprise Europe Network** including with dedicated **Sustainability Advisors** and other sustainability services to provide SMEs with the necessary support in the twin transition.	Ongoing. The new Enterprise Europe Network has started in January 2022, incorporating the Sustainability Advisors.
The Commission will launch a "**digital volunteers"** programme to allow young skilled people and experienced seniors to share their digital competence with traditional businesses.	Ongoing. A Pilot phase started in May 2021, where digitally skilled staff of large companies support SMEs in their digital transformation. Roll out of the full programme in 2022.
The Commission will develop **Digital Crash Courses** for SME employees to become proficient in areas like AI, cybersecurity or blockchain.	Ongoing. Three online courses are available on the digital skills and jobs platform: https://digital-skills-jobs.europa.eu/en/about/digital-skillup. General action funded under the Digital Europe Programme will start in 2022.
The Commission will update the **Skills Agenda for Europe**, including a Pact for Skills with a dedicated component for SMEs, and will propose a Council	The Commission launched a Pact for Skills in 2020. Dedicated services have been deployed through the Pact, such as a networking and knowledge hub and

Recommendation aimed at modernising vocational education and training.	training centers of excellence providing vocational education and training (VET) to offer support for SMEs. The Council adopted in November 2020 the Commission's Proposal for a Council Recommendation on VET for sustainable competitiveness, social fairness and resilience. Action 6 of the Skills Agenda is supporting skills to accompany the green and digital transitions.
The Commission will expand **Digital Innovation Hubs** in connection with Startup Europe and the EEN to provide a seamless service within local and regional ecosystems.	Ongoing. First grants to be signed in 2022. Many European Digital Innovation Hubs (EDIH) will be based on existing clusters or include organisations that are part of an EEN consortia. Stronger cooperation between EEN, clusters and DIHs will be ensured.
The Commission will allocate at least 300 million Euros to encourage breakthrough innovations delivering Green Deal objectives under the **EIC**.	Ongoing.
For the SMEs which focus their activities on short-term accommodation rental services, the Commission will continue to explore a possible **collaborative economy initiative**.	Inception impact assessment published, public consultation closed. A Commission adoption of this initiative is planned for 2022.
Reducing regulatory burden and improving market access	
The EU SME Envoy and the network of national SME Envoys will contribute to the work of the Commission's Single Market Enforcement Task Force, to be set up as a result of the Enforcement Action Plan, to address among others **gold-plating** in the transposition process with a	The Single Market Enforcement Task Force (SMET) has started its work and the SME Envoy network is involved.

view to keep the regulatory burden on SMEs to a minimum.	
The Commission will encourage Member States to implement the Single Digital Gateway in a business friendly way. Member States link their services in a **one-stop-shop**.	Ongoing.
The EU SME Envoy will **filter** EU initiatives to signal to the Commission those that merit close attention from an SME perspective and have a specific role in the new Fit for Future Platform.	Ongoing.
The Commission will mobilise Member States behind an **EU Start-up Nations Standard** to share and adopt best practices to accelerate growth of high tech SMEs and start-ups.	The European Start-up Nations Standard was launched through a joint declaration in March 2021.
The Commission calls on Member States and their contracting authorities to use the flexibility offered by the **new EU's procurement framework** to enhance opportunities for SMEs including through the use of digital tools and platforms to step up cross border procurement. The Commission will **issue guidance and support to contracting authorities.**	Ongoing.
The Commission will encourage Member States to develop proposals for **regulatory sandboxes** by launching a pilot.	Pilot to be set up in 2022.
The Commission will launch a call for **pioneer partnerships among border regions** to enhance regional	Ongoing.

cooperation in enforcing the Single Market and removal of administrative barriers.	
The Commission will support the Member States in enforcing the **Late Payment Directive** by setting up monitoring and better enforcement tools and exploring the feasibility of alternative resolution/mediation mechanisms for SMEs. Furthermore, ongoing reflection to identify a roadmap of additional actions, not originally included in the Strategy) to ensure a more targeted response in view of the crisis(e.g. a possible Communication).	Ongoing. The EU Observatory on late payments will monitor payment performance and unfair payment practices by public authorities to businesses and in B2B transactions, across supply chains. Pilot work on the Observatory is ongoing in the construction sector. A Report on late payments indicators for the construction sector was published in September 2021 (https://ec.europa.eu/docsroom/documents/46899). The Alternative Dispute Settlement Resolution Mechanism will make it easier for SMEs to settle unresolved payment claims while preserving the commercial relationship with their clients.
The Commission will facilitate cross border cooperation with and among SMEs under the **European Defence Fund** and map strengths in its research and innovation eco-system.	European Defence Fund-related actions are being deployed over 2021-2027.
The Commission's will launch a **Space Entrepreneurship Initiative 'CASSINI'.**	The initiative was kicked off in 2021 with a series of hackathons in 20 locations across Europe. The preparation for the CASSINI Accelerator, Prizes and Seed & Growth Fund is ongoing.
The Commission will support Member States in transposing the recently adopted Directive on preventive restructuring frameworks and second chance, by **helping them set up early warning mechanisms** for companies in financial difficulties to avoid bankruptcy.	Ongoing. Early warning (EW) mechanisms under the Early Warning Europe network are being expanded. The EW design focuses on providing diagnosis and mentoring to companies in distress.

The Commission will explore with Member States possible measures to create a supportive environment for **transfer of SMEs**.	Commission project on improving the evidence base and data collection methods on business transfers across the EU completed in December 2020.
The Commission will continue to **enhance SME access to third country markets** including through dedicated SME chapters, use of dialogues to exchange good practices with trade partners and a new information portal. The Commission will facilitate SME access to trade defence instruments.	Free Trade Agreement (FTA) negotiations including SME chapters are ongoing with several third countries. New 'Access2Markets' (A2M) information portal launched in 2020: https://trade.ec.europa.eu/access-to-markets/en/content
EU Delegations will provide support by addressing queries of SMEs linked to the FTAs.	Ongoing.
The Commission will extend the **Erasmus for Young Entrepreneurs Global scheme.**	Ongoing.
Improving access to financing	
The Commission will **support Initial Public Offerings (IPOs) of SMEs** with investments channelled through a new private-public fund, to be developed under the InvestEU programme under the Capital Markets Union.	Preparatory work ongoing.
The Commission will introduce a first of a kind risk/reward mechanism to boost the size of venture capital funds and crowd in private investments for scaling up through the **ESCALAR initiative.**	Ongoing. Projects are in the process of being signed.

The Commission will launch **a gender-smart finance initiative** to stimulate funding for women-led companies and funds and to empower female entrepreneurship.	Implementation agreement is being finalised.
The Commission will launch a **green tech investment initiative** to pool funding from the EU, Member States and the private sector to increase the access to equity finance for innovative SMEs and start-ups that develop and adopt green tech solutions.	A market assessment is being prepared. Ongoing discussions on InvestEU financing for green technologies.
The Commission will launch **a blockchain-based initiative** enabling issuance and trading of SME bonds across Europe, using the European Blockchain Services Infrastructure.	Investigation of existing examples of issuance and trading of SME bonds and scope of the use case is ongoing.
The Commission will co-fund **tech due diligence services** under an EU pilot project to enable more precise valuations high tech start-ups and prepare their investment readiness.	Call for EU pilot project for tech due diligence and venture building linked to the Innovation Radar finalised in 2021 Project(s) to start in 2022.
The Commission will further **simplify the existing state aid rules** on combinations of national funds with InvestEU and Horizon funds. This will make it easier for SMEs to benefit from pooled resources to help them with the twin transitions. Furthermore, as part of its ongoing review of state aid rules, the Commission will **revise state aid rules for risk finance and the IPCEI** communication, to further support SME involvement, ensure crowding-in of private investment while avoiding distortions of the level playing field.	The simplification to achieve synergies with Horizon Europe was introduced in 2021 in the MFF General Block Exemption Regulation. The revised Communication on important projects of common European interest (IPCEI) was adopted in November 2021. The revised Guidelines on State aid to promote risk finance investments were adopted in December 2021. Both apply from 1 January 2022. The revised Guidelines on State aid for climate, environmental protection and energy were adopted and apply as from 27 January 2022. The review of state aid rules for research and development and innovation is expected to be finalised in Q1 2022.

Governance	
The Commission will appoint a high level EU SME Envoy.	The nomination process of the EU SME Envoy is ongoing.
The Commission will reinforce the **SME Envoys Network to strengthen** the link between the EU and national level on SME policy.	Ongoing.
The Commission will launch a group of Strategic Entrepreneurship Ambassadors.	Reflections within Commission ongoing.
The EU SME Envoy will raise awareness on SME-related aspects in a **regular dialogue with the Regulatory Scrutiny Board**.	Pending nomination of EU SME Envoy. In the meantime, EU SME Envoy network raises awareness on SME-related aspects.

Annex 2: Stocktaking of the implementation of the 2020 Single Market Enforcement Action Plan

Colour-coding

Implemented / launched before February 2022

Under preparation

Action	State of implementation
Establishment of the Single Market Programme.	• Adopted by co-legislators in 2020.
Single Market Barriers Report.	
Single Market Enforcement Action Plan.	
Action 1. Provide more specific guidance tools for national authorities.	The following guidance documents have been adopted so far: • Guidelines on the practical application of the essential functionality criterion of the definition of a 'video-sharing platform service' under the Audiovisual Media Services Directive 2020/C 223/02. • Guidelines pursuant to Article 13(7) of the Audiovisual Media Services Directive on the calculation of the share of European works in on-demand catalogues and on the definition of low audience and low turnover 2020/C 223/03. • Guidance document on Article 4 of the Market Surveillance Regulation. • Guidance on the Regulation on the principle of Mutual Recognition. • Guidance on the application of Articles 34-36 TFEU. • Guidance document on Article 9 of the Market Surveillance Regulation. • The new Guidance on Innovation Procurement was adopted on 18 June 2021 A series of webinars are being organised to illustrate the key parts of the document starting from 30 September 2021. Three webinars have been organised so far under the series on Innovation Procurement:

	– Preliminary Market Consultations – Ecosystems of Innovation – Intellectual Property Rights and Innovation Procurement • The Notice on tools to fight collusion in public procurement and on guidance on how to apply the related exclusion ground was published on 15 March 2021. • The new guide "Buying social – a guide to taking account of social considerations in public procurement" was adopted on 26 May 2021. A series of short lunchtime talks are being organised throughout 2021 and the first half of 2022 to further promote the guide and good practices in the field of socially responsible procurement. • Works on the Recommendation on Review systems ongoing: a questionnaire submitted to Member States representatives at the meeting of the Network of First Instance Review Bodies on 29 June 2021. • Guidance on Article 17 of the Directive on copyright and related rights in the Digital Single Market was issued in June 2021. • The Communication on taking stock of and updating the reform recommendations for regulation in professional services of 2017 adopted in July 2021.
	• Blue Guide on the implementation of EU for harmonised product rules • Practical application of the new media literacy obligations of the AVMSD: media literacy toolbox is planned for Q1 2022.
	• Practical application of the new media literacy obligations of the AVMSD: guidelines to Member States. • Support to the transposition of the European Accessibility Act (ongoing action). • Setting up platforms for exchange with Member States such as the one used for Public Procurement Directives. • Setting up a central information point on practical questions that civil servants in Member States have in their daily work applying single market law.

Action 2. Improving access to information on rules and requirements for users.	• **Your Europe Portal** became the interface of the Single Digital Gateway on 12 December 2020 and now provides not only information on EU rules and requirements, but also on national ones, both in English and the relevant national language. • Your Europe Portal continues to add links to national websites notified by Member States. An annually updated guidance document helps Member States meet their information obligations under the SDG Regulation. • New module of **Information and Communication System on Market Surveillance (ICSMS)** deployed since April 2020. • In the framework of the SMET project on restrictive measures concerning non-harmonised construction products, a number of questions have been clarified that Member States authorities had concerning the application of the mutual recognition principle and notifications in ICSMS. • Member States registered their authorities responsible for construction products in ICSMS and confirmed that they do have access to the mutual recognition module of ICSMS. Most of the authorities have already been trained for mutual recognition. Further training sessions on mutual recognition are planned. • The **EU Product Contact Points** are empowered by the 'Goods Package' to provide better and faster information to businesses about the rules that apply to their products.
Action 3. Online platforms facilitating compliance of products.	• Horizontal asymmetric due diligence obligations have been included in the Commission's proposal for the Digital Services Act. This includes know-your-business-customer obligation for online platform that allow consumers to conclude distance contracts with traders, which will help in idenitfying sellers of illegal products. • The Digital Services Act is under negotiations in the Council and the European Parliament.
	• The revision of the General Product Safety Directive aims to improve product safety, including in online sales. On 30 June 2021, the European Commission

	adopted a proposal for a new general product safety regulation. The legislative proposal is currently subject of the negotiations by the co-legislators.
	• New EU database on medical devices (EUDAMED) currently under development. Ongoing work: collection, processing and analysis of data related to medical devices in the EU, development of the IT platform with interconnected modules. EUDAMED will contain, inter alia, specific modules on devices and certificates registration, market surveillance, vigilance and clinical investigation. Three modules already released in 2020 and 2021: Actors registration, UDI/Devices registration, Notified Bodies and Certificates.
Action 4. Training and exchange of practices for national judges and practitioners.	• European judicial training strategy for 2021-2024 adopted and European Training Platform[8] launched in December 2020. • Training provided to Member State authorities on the application of the Mutual Recognition Principle for non-harmonised products. • Other actions ongoing.
	• Conference of stakeholders on European judicial training took place in May 2021.
Action 5. Capacity building for national public administrations.	• Ongoing numerous actions under implementation by various Commissions services.
	• The EU Product Compliance Network adopted its Work Programme for 2021-2022 decided on the prioritisation of joint actions and first sectors for the establishment of Union testing facilities, eligible for funding under Article 36 of the Market Surveillance Regulation 2019/1020.
	• Regular meetings of the Network of First Instance Review Bodies on Public Procurement - ongoing (the last meeting was organised in June 2021).

[8] https://e-justice.europa.eu/content_european_training_platform-37158-en.do

Action 6. Building capacity of public procurement professionals and strengthening the cooperation between national bodies.	• High-level training programme in 2021 to improve administrative capacity of Central Purchasing Bodies (a new package of training sessions ongoing: September 2021 – beginning 2022).
Action 7. Structured dialogue for better transposition of Single Market Directives.	• Ongoing monitoring of transposition of the European Electronic Communication Code (EECC) through the Communications Committee and through regular meetings with competent authorities in the Member States. • Regular meetings of the Contact Committee on the Audio-Visual Media Services Directive. • Ongoing cooperation of media regulators within the European Regulators Group for Audiovisual Media Services (ERGA) with voluntary cooperation mechanism put in place at the end of 2020. • Regular meetings of the Copyright Contact Committee. • In 2020, the Commission revamped its IT monitoring system on transposition. • Regular workshops with national authorities in the Company Law Expert Group (CLEG) to support the transposition of the Directive on digital tools in company law (2019/1151) and of the Directive on cross-border conversions, mergers and divisions (2019/2121), Capital Requirements Directive (CRD V) (2019/878/EU), Bank Recovery and Resolution Directive (BRRD II) (2019/879/EU), Investment Firms Directive (2019/2034/EU) and Covered Bonds Directive (2019/2162/EU).
Action 8. Implementation partnership for Single Market Regulations.	• Ongoing, numerous actions under implementation by various Commissions services.
Action 9. Improving ex-ante assessment of restrictive regulation under the Proportionality Test Directive.	• Guidance document on the Proportionality Test Directive is being finalised on the basis of the insights gained from the compliance checks of national implementation measures.
Action 10. Streamlining the operation of the Single Market Transparency Directive (SMTD).	• Development of the strategic implementation of the SMTD, including reinforced participation of and cooperation with Member States as well as the development of a new TRIS IT system (ongoing).

Action 11. Preventing new barriers to providing services in the Single Market	• Ongoing actions including the upgrade of the IMI module used for services notifications, guidance and training provided to Member States, a detailed annual report on the implementation of the procedure and awareness raising. • Other ongoing actions: – Workshops organised on the notification procedure under the Services Directive to increase awareness of Member States. – Trainings provided to Member States authorities on the Services Directive notification procedure.
Action 12. Unlocking the full potential of the notification mechanism under the e-commerce Directive.	• Ongoing, numerous actions under implementation by various Commissions services.
Action 13. Rationalising Single Market IT systems and setting-up a platform for online enforcement (e-enforcement lab).	• The proof-of-concept e-enforcement lab for the consumer protection authorities (EU eLab) is being tested with the authorities from 15 Member States. Subject to approval of Commission's Information Technology and Cybersecurity Board, EU eLab would be available for all CPC network as of early 2022.
	• New interface in IMI for submission of posting declarations in Road Transport sector & information exchange to enforce posting rules in 2022.
	• Establish a single European information entry point for authorities for controls on non-food products, where the existing systems such as ICSMS and RAPEX will be reachable.
	• Integration of the Regulated Professions Database in IMI in 2022.
	• Implementation of the new platform 'Annual Report Official Controls' (AROC) in IMSOC to allow Member States to upload their annual reports using the new electronic version of the standard model form. In 2021, for the first time, all Member States used this platform to upload their annual reports for 2020.

	• Commission Notice on a guidance document on how to fill in the standard model form in the Annex to Commission Implementing Regulation (EU) 2019/723 published on 1 March 2021 (2021/C 71/01).
Action 14. Strengthening the fight against counterfeit and illegal products.	• Contribution to the EU Toolbox against counterfeiting. • Cases against imports of illicit or non-compliant medical devices and protective equipment. • Pilot cases against food fraud – Ongoing cooperation between SANTE, OLAF and national authorities. • Development of OLAF's operational activities targeting imports of substandard products, particularly those linked to the Covid-19 pandemic, and continuing active support for activities addressing fight against IPR infringement.
	• Project to verify the implementation of arrangements put in place by Member States to fight fraud in the agri-food chain in accordance with the provisions of Regulation (EU) 2017/625. Two pilot missions were carried out in 2020, followed by 6 fact finding studies in 2021-2022.
Action 15. Strengthening enforcement in the agri-food chain.	• Systematic follow-up of audit recommendations to ensure that Member States implement the actions necessary to correct identified shortcomings by the competent services (continuous) General Follow-up Audits (GFAs) on 8 Member States carried out in 2021 and further 11 GFAs are planned for 2021. • Continuation of 'Better Training for Safer Food' training programme. • Ongoing work on monitoring implementation of Multi-Annual National Control Plan (MANCP) and the review of obligations on Member States and new requirements for MS annual reports.
	• Commission Notice on a guidance document on the implementation of the requirements for the multi-annual national control plans as set out in Articles 109 to 111 of Regulation (EU) 2017/625 published on 8 March 2021 (2021/C 78/01). • Regular meetings of the National Audit Systems (NAS) network.

	• Commission Notice on a guidance document on the implementation of the provisions for the conduct of audits under Article 6 of Regulation (EU) 2017/625 of the European Parliament and of the Council published on 26 February 2021 (2021/C 66/02). • Inception Impact Assessment on the review of the Geographical Indications (GIs) published on 28 October 2020. GIview database launched on 25 November 2020 • Ensuring that national schemes in favour of local products in some Member States are compatible with the principle of non-discrimination. • Development of OLAF's operational activities targeting imports of substandard products and continuing active support for activities addressing fight against food fraud.
Action 16. Development of labelling and traceability systems.	• Evaluation of the need to update the digital labelling and traceability requirements started in 2020. • New customs equipment capable of reading and checking the encoded information will be developed as part of the Integrated Border Management Fund 2021-2027. • The Commission will seek the digital submission of compliance information for industrial and consumer products. • External study on cybersecurity of connected products in the Single Market launched in August 2020.
	• Dedicated module in the EU database on medical devices (EUDAMED) for the identification and traceability of medical devices via Unique Device Identification system (UDI) released for voluntary use in 2021.The use of the module will become compulsory according to the transitional provisions set out in Regulations (EU) 2017/745 and 2017/746.
Action 17. EU Product Compliance Network.	• The EU Product Compliance Network has adopted its Work Programme for 2021-2022.

Action 18. Making SOLVIT the default tool for Single Market dispute resolution.	• SOLVIT training to **European Labour Authority** (ELA) staff (including National Liaison Officers). • The Mutual Recognition problem solving procedure became operational on 19 April 2020. • First Commission Opinion adopted on the application of the Mutual Recognition Principle on 30 September 2021. • ELA Mediation Working Group (Member States, Social Partners and Commission (including EC SOLVIT) drew up **European Labour Authority - SOLVIT Cooperation Agreement** (covering cooperation generally and cooperation on mediation) in the course of 2021. . It was finalised and agreed on both sides in January 2022. The agreement will allow SOLVIT to refer unresolved cases concerning the EU labour mobility rules to ELA for mediation. The ELA mediation procedure is expected to be up and running as from mid-2022.
	• SOLVIT is considered as part of a problem solving initiative in the area of VAT double taxation.
Action 19. Better prioritisation of enforcement action.	• Action 19 is addressed by the Annual Single Market Report. • Continued quarterly reports about structural and recurrent issues detected through the SOLVIT application. • Ongoing work to improve the use of SOLVIT evidence by European Commisison services for policy and enforcement actions. • Ensuring consistent and comprehensive approach in different ecosystems/cross-cutting areas (e.g. public procurement, health products, late payments, construction, authorisation of economic activities, automotives etc).
	• Actions ongoing aiming towards a better articulation between SOLVIT and other types of follow-up of complaints.

Action 20. Clarity and consistency in case handling.	• The Commission's complaint handling system was adjusted to reflect the new requirements on preliminary assessment of complaints, and internal guidance was issued in January 2021.
Action 21. Better use of the EU Pilot system.	• In order to better target and structure the EU Pilot system as a rapid and effective tool, the Commission issued new EU Pilot guidelines on 30 July 2020 resulting in an increase of the use of EU Pilot .
Action 22. Systematic periodic package meetings.	• Package meetings have been organised with all Member States in the areas of responsibility of DG GROW/CNECT/DEFIS (2020-2021).
Setting up a Single Market Enforcement Task-Force (SMET), composed of Member States and the Commission(GROW/SMP).	• Ongoing: Inaugural meeting took place on 7 April 2020. • Based on a strong partnership with the Member States, SMET made real progress quickly and efficiently in addressing some of our major Single Market concerns. • The first SMET Report was published and presented to EU Ministers during the Competitiveness Council on 29 September 2021.
Cooperation network between national enforcement coordinators.	• First meeting took place on 24 November 2020. • Online trainings provided in the Single Market area for national judges and national administration in Denmark, Lithuania and Croatia.
Single Market Scoreboard.	• Being updated to better reflect the needs of end users in the Single Market and to support the European Semester. Single Market Scoreboard 2021 edition published on 20 December 2021.

Annex 3: Stocktaking of the implementation of the March 2020 Industrial Strategy and its May 2021 Update

Colour-coding

Implemented / launched before February 2022

Under preparation

A New Industrial Strategy for Europe (10 March 2020)

Key action	State of implementation
1. Creating certainty for industry: A deeper and more digital single market	
Single Market Enforcement Action Plan and Single Market Barriers Report.	• Adopted in March 2020.
Setting up a Single Market Enforcement Task-Force, composed of Member States and the Commission.	• First report on the work of the Single Market Enforcement Taskforce published in September 2021. • The Taskfoce has met so far in April, June and September 2020 and January, February, May, July, October and December 2021.
SME Strategy for a sustainable and digital Europe.	• Adopted in March 2020.
Ongoing review of competition rules, including the evaluation of merger control and the fitness check of State aid guidelines.	• State aid fitness check completed. • Evaluation of jurisdictional and procedural aspects of EU merger control published. • Review of competition rules ongoing. The Commission adopted in November 2021 the Communication “A competition policy fit for new challenges”. • The Regional aid Guidelines were adopted in April 2021.

	• The revised Communication on important projects of common European interest (IPCEI) was adopted in November 2021. • The revised Guidelines on State aid to promote risk finance investments were adopted in December 2021. • The revised Climate, Environmental protection and Energy Aid Guidelines (CEEAG) were adopted in January 2022. • The review of state aid rules for research and development and innovation is expected to be finalised in Q1 2022.
Intellectual Property Action Plan to assess the need to upgrade the legal framework, ensure a smart use of IP, better fight IP theft.	• Adopted in November 2020.
Follow-up to the European Data Strategy to develop an EU data economy, including the launch of common European data spaces in specific sectors and value chains.	• Proposal for a Regulation on European data governance (Data Governance Act) presented in November 2020. The Regulation will empower users to stay in control of their data, and encourage the creation of common European data spaces in crucial sectors. These sectors include health, the environment, energy, agriculture, mobility, finance, manufacturing, public administration, and skills.
	• Common European data spaces in specific sectors under preparation. Specific data spaces have different timelines. • Conceptual work is ongoing in several sectors such as health and finance. In addition the Commission launched in November 2021 a call for proposals under the Digital Europe programme for coordination and support actions aiming at defining the technical architecture and the governance model of several data spaces, among which the green deal, industrial manufacturing, agriculture, mobility, smart communities, tourism and skills data spaces. • The coordination and support actions are expected to start in 2022 and deliver their first results by 2023. At the same time, the Commission is investing in the

	development of the basic building blocks for the creation of sectoral data spaces through its actions supporting the creation of a European Cloud & Edge data infrastructure. Overall, the Commission is going to invest about 400 millions EUR for the creation of data spaces.
Digital Services Act to update and strengthen the legal framework for a single market in digital services.	• The European Commission proposed in December 2020 two legislative initiatives to upgrade rules governing digital services in the EU: the Digital Services Act (DSA) and the Digital Markets Act (DMA). They form a single set of new rules applicable across the whole EU to create a safer and more open, fair and contestable digital space.
Initiative on improving the working conditions for platform workers.	• The Commission adopted in December 2021 proposals to improve the working conditions of people working through digital labour platforms, including: a Communication on Better Working Conditions for a Stronger Social Europe, a proposal for a Directive on improving the working conditions in platform work. Draft guidelines on the application of EU competition law to collective agreements of solo self-employed people have also been published for stakeholders' feedback.
2. Upholding a global level playing field	
White paper on an instrument on foreign subsidies by mid-2020, also looking at foreign access to public procurement and EU funding.	• Following the adoption of the White Paper in June 2020 and an extensive consultation process with stakeholders, the Commission proposed in May 2021 a Regulation on foreign subsidies distorting the internal market. The legislative process is ongoing.
Action plan on the Customs Union in 2020 to reinforce customs controls, including a legislative proposal for an EU Single Window Environment for Customs to allow for fully digital clearance processes at the border.	• Customs Union Action Plan published in September 2020. • Proposal for a Regulation establishing the EU Single Window Environment for Customs Presented in October 2020. Pending adoption by EP and Council.

Swift adoption of the International Procurement Instrument.	• Proposal adopted and revised. Pending adoption by EP and Council.
Strengthening the global rules on industrial subsidies in the World Trade Organization.	• Annex to the Trade Policy Review Communication on reforming the WTO presented in February 2021. • The EU will continue discussions and outreach with other WTO Members on industrial subsidies/level playing field.
3. Supporting industry towards climate neutrality	
Strategy for smart sector integration.	• Adopted in July 2020.
A Common European Energy data space will exploit the potential of data to enhance the innovative capacity of the energy sector.	• Ongoing. • The Commission presented A European strategy for data in February 2020 and proposed a Regulation on European data governance as part of its data strategy in November 2020. The Regulation will encourage the creation of common European data spaces in crucial sectors to ensure that more data become available for use in the economy and society, while keeping the companies and individuals who generate the data in control. These sectors include health, the environment, energy, agriculture, mobility, finance, manufacturing, public administration, and skills.
Launch the Just Transition Platform to offer technical and advisory support for carbon-intensive regions and industries.	• Launched in June 2020.
Chemicals Strategy for Sustainability.	• Adopted in October 2020.
Review of the Trans-European Network Energy regulation.	• The Commission adopted a proposal to revise the EU rules on the TEN-E Regulation in December 2020.

EU Strategy on Offshore Renewable Energy.	• Adopted in November 2020.
EU Strategy on Clean Steel.	• Funding proposal for Clean Steel Partnership presented in the context of Horizon Europe in September 2020. • Commission Staff Working Document 'Towards competitive and clean European steel' published in May 2021 in the context of the Update of the industrial strategy. • End of June 2021 Commissioners Gabriel and Breton signed a Memorandum of understanding for 6 partnerships, including the Clean Steel Partnership.
Comprehensive Strategy for Sustainable and Smart Mobility.'	• Adopted in December 2020.
'Renovation Wave' Initiative and Strategy on the built environment.'	• 'Renovation Wave' adopted in October 2020. • Revision of the energy performance of buildings Directive presented in December 2021.
Carbon Border Adjustment Mechanism to reduce carbon leakage, in full compatibility with WTO rules.	• Commission proposal adopted in July 2021 as part of the 'Fit-for-55' package.
4. Building a more circular economy	
Circular Economy Action Plan adopted in parallel with this strategy, including a new sustainable product policy framework.	• Circular Economy Action Plan adopted in March 2020.
	• Sustainable product policy framework to be adopted in 2022 including: – Empowering consumers for the green transition – Substantiation of green claims – Sustainable Products Initiative – Circular electronics initiative (non-legislative) – New design requirements and consumer right.

	• The Commission will also propose an Initiative on the right to repair in 2022.
New Regulatory Framework for Sustainable Batteries.	• Proposal for a Regulation on batteries and waste batteries adopted in December 2020.
EU Strategy for Textiles	• The Commission will present a new EU strategy for sustainable textiles in 2022.
5. Embedding a spirit of industrial innovation	
Communication on the Future of Research and Innovation and the European Research Area to map out a new approach to innovation and ensure the EU budget is used with maximum impact.	• Adopted in September 2020.
Launch Public Private Partnerships in the Horizon Europe programme.	• Single Basic Act for proposed institutionalised partnerships (Joint undertakings) and art 185 (public-public partnerships) adopted by the Commission in February 2021.
	• The Commission adopted a Decision on the approval and signature of the Memoranda of Understanding for 11 co-programmed partnerships in June 2021.
6. Skilling and reskilling	
The Commission will update the Skills Agenda for Europe, including a Pact for Skills, and will propose a Council Recommendation aimed at modernising vocational education and training.	• Skills agenda adopted in July 2020. • The Council Recommendation on vocational education and training for sustainable competitiveness, social fairness and resilience was adopted in November 2020.
Launch of a European Pact for Skills.	• Launched in November 2020.

Communication on achieving a European Education Area by 2025.	• Adopted in September 2020.
New Digital Education Action Plan (2021-2027).	• Adopted in September 2020.
Implementation of the EU Gender Equality Strategy 2020-2025, adopted in March 2020.	• Ongoing.
7. Investing and financing the transition	
Work with Parliament and Council to ensure rapid adoption and implementation of the next long-term budget.	• Agreement in November 2020.
Consider scope for coordinated investment by Member States and industry in the form of new IPCEIs and on the possible follow-up to the first IPCEIs on batteries and microelectronics.	• Second IPCEI for batteries launched in January 2021. • Some Member States and companies have jointly expressed interest to engage in additional IPCEIs, such as next-generation Cloud and Edge Infrastructure and Services, hydrogen, health and a second IPCEI on microelectronics. The Commission monitors several of these projects plans and will assess if and when notified to the Commission under applicable state aid rules.
Review State aid rules for IPCEIs.	• The revised Communication on important projects of common European interest (IPCEI) was adopted in November 2021.
Action Plan on the Capital Markets Union in 2020, including measures in support of integrated capital markets and more funding opportunities for citizens and businesses.	• Action Plan on the Capital Markets Union adopted in September 2020. Implementation ongoing. • Capital Markets Union package adopted in November 2021, including: – A proposal for a European Single Access Point (ESAP) Regulation – Review of the European Long-Term Investment Funds (ELTIFs) Regulation

	– Review of the Alternative Investment Fund Managers Directive (AIFMD) – Review of the Markets in Financial Instruments Regulation (MiFIR). • Building on the actions announced in the 2020 Capital Markets Union (CMU) Action Plan, the Commission will follow up in 2022 with more CMU actions, including a proposal on listing, an open finance framework, an initiative on corporate insolvency and a financial literacy framework.
A renewed sustainable finance strategy.	• Adopted in July 2021.
A new Digital Finance Strategy.	• Adopted in September 2020.
8. Reinforcing Europe's industrial and strategic autonomy	
A new EU pharmaceutical strategy in 2020, including actions to secure supplies and ensure innovation for patients.	• Adopted in November 2020.
An Action Plan on Critical Raw Materials, including efforts to broaden international partnerships on access to raw materials.	• Adopted in September 2020.
Follow-up to the 5G Communication and the Recommendation on cybersecurity of 5G networks.	• Ongoing. • Cybersecurity Strategy for the Digital Decade published in December 2020, including an appendix with a list of actions and objectives for the next steps in the EU coordinated approach on 5G cybersecurity. • Cybersecurity Strategy implementation report published in June 2021 including an update on the coordinated work on 5G cybersecurity. • ENISA has started to work on a candidate EU cybersecurity certification scheme for 5G networks.

	• The NIS Cooperation Group has decided to launch an in-depth analysis of the security implications of Open RAN, following the approach and methodology of the EU Toolbox.
Action Plan on synergies between civil, defence and space industries, including at the level of programmes, technologies, innovation and start-ups.	• Adopted in February 2021.
9. A partnership approach to governance	
Building on the successful template of industrial alliances, a new European Clean Hydrogen Alliance will be launched.	• European Clean Hydrogen Alliance launched in July 2020.
Alliance on low-carbon industries.	• Under consideration.
Alliance on raw materials.	• European Raw Materials Alliance launched in September 2020.
Industrial European Alliance on Industrial Data, Edge and Cloud.	• European Alliance on Industrial Data, Edge and Cloud launched in July 2021.
The Commission will undertake a thorough screening and analysis of industrial needs and identify ecosystems needing a tailor-made approach.	• Ongoing.
An inclusive and open Industrial Forum will be setup by September 2020 to support this work.	• The Industrial Forum was established in December 2020. The Forum met in February, June and December 2021.
The Commission's annual Industry Days will continue to be an important event to bring all players together.	• The 5th edition of the EU Industry Days took place on 8-11 February 2021.

Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery (5 May 2021)

1. Strengthening Single Market resilience	
Single Market Emergency Instrument.	• Under preparation. To be presented in 2022.
Annual Single Market Report.	• First Annual Single Market Report published in May 2021. Second Report presented in February 2022.
Possible common form/template for the declaration of the posting of workers.	• Under preparation. • Consultations with Member States and social partners are ongoing. To be presented 2022.
Strengthen Single Market surveillance of EU and imported products.	• Ongoing.
Under InvestEU, work on capital support and equity financing to support SMEs.	• Ongoing. • New guarantee and equity products for SMEs to be launched in Q1 2022.
2. Dealing with dependencies: open strategic autonomy in practice	
Adopt proposal to address the potentially distortive effects of foreign subsidies in the Single Market.	• Adopted in May 2021.
Periodic review of strategic dependencies and monitoring of risks associated with strategic dependencies.	• Ongoing. • Report on EU strategic dependencies and capacities: second stage of in-depth reviews published in February 2022.

Explore international partnerships and cooperation to address strategic dependencies.	• Ongoing. • EU-US TTC Working Group on Secure Supply Chains launched in September 2021 with focus on critical raw materials, pharmaceuticals and solar energy value chains as well as a dedicated track on semiconductors. • EU-Ukraine Strategic Partnership on Raw Materials and EU-Canada Strategic Partnership on Raw Materials established in July 2021.
Launch of the Industrial Alliance for Processors and Semiconductor technologies.	• European Alliance on Processors and Semiconductor technologies launched in July 2021.
Launch of the European Alliance for Industrial Data, Edge and Cloud.	• European Alliance for Industrial Data, Edge and Cloud launched in July 2021.
Consideration of further European industrial Alliances.	• European Alliances are being considered in the following areas: Space Launchers, Zero Emission Aviation, Renewable and Low-Carbon Fuels.
Reinforced action on SME supply chain disruptions and vulnerabilities.	• Ongoing.
Adopt a standardisation strategy.	• New Standardisation Strategy adopted in February 2022. The Strategy is accompanied by a proposal for an amendment to the Regulation on standardisation, a report on its implementation, and the 2022 annual Union work programme for European standardisation.
3. Accelerating the twin transitions	
Co-creation of green and digital transition pathways for relevant ecosystems, starting with tourism, energy intensive industries, construction and mobility.	• Ongoing. • The Commission prepared in 2021-2022 staff working documents outlining possible scenarios for transition pathways for the tourism, energy intensive

	industries, construction, proximity and social economy and mobility ecosystems and invited stakeholders to reflect and contribute to the scenarios and list key enablers for the transition. • Transition pathway for tourism presented in February 2022. Transition pathways for other industrial ecosystems will follow.
Actions to promote renewable Power Purchase Agreements in the proposal for a revised Renewable Energy Directive.	• Proposal to revise the Renewable Energy Directive presented in July 2021 as part of the 'Fit-for-55' package. The proposal includes measures to facilitate Power Purchase Agreements (PPAs).
Consider European approach for carbon contracts for difference in the proposal for a revised ETS Directive.	• The 'Fit-for-55' package presented in July 2021 includes a legislative proposal to revise the EU ETS Directive and a new Carbon Border Adjustment Mechanism.
Energy and Industry Geography Lab (EIGL).	• Launched in December 2021.

Annex 4: Monitoring the implementation of Industrial Policy – Key Performance Indicators

The Council Conclusions "A recovery advancing the transition towards a more dynamic, resilient and competitive European industry", adopted on 16 November 2020, "CALLS on the Commission to define key performance indicators for monitoring the industrial strategy and competitiveness […], including taking into account investment trends, and comparing those to other world regions". The conclusions also calls "for the objectives of the EU's industrial policy to be reflected in sound indicators, in particular concerning industrial competitiveness, industry's contribution to the green and digital transition and the Union's resilience and strategic autonomy while preserving an open economy."[9] The set of KPIs presented below presents the analytical approach to address this request.

All the indicators are based on publicly available data. They complement other existing monitoring tools used by the Commission. Regular reporting on areas identified as priorities for European industrial policy, based on reliable data sources, can support the Commission and the Member States in providing timely policy response in case of identified challenges.

Compared to the 2021 edition of the Annual Single Market Report[10], this set of KPIs include a new thematic area (social dimension) and few additional indicators for SMEs and for the international dimension. As new data becomes available and policy priorities evolve, the KPIs will continue evolving.

Structure of the document

The KPIs are clustered along four broad topics:

1. **Headline indicators**, providing a synthetic overview of the main trends of the EU economy and benchmarking against other countries;
2. **Short-term indicators**, to describe the evolution of the COVID-19 crisis and provide a forward-looking analysis;
3. **Thematic indicators,** which proxy the following dimensions:
    a. Economic Resilience
    b. Social dimension
    c. Digital transition
    d. Climate neutrality and circular economy
    e. Single Market integration
    f. SMEs
    g. International dimension
4. **Indicators by ecosystem**, which describe the main features of the ecosystems and their performance.

[9] https://data.consilium.europa.eu/doc/document/ST-13004-2020-INIT/en/pdf
[10] SWD(2021) 351 final

The tables below summarises the selection of indicators by thematic area.

List of horizontal and thematic KPIs

Thematic area	Indicator	Measure	Source
Headline indicators	Gross value added	annual % change	World Bank, National Accounts, Eurostat
Headline indicators	GDP per person employed	constant prices, annual % change	AMECO
Headline indicators	Number of employees	annual % change	AMECO
Headline indicators	EU global market share	%	Eurostat
Short-term indicators	Turnover	% of the same month in previous year	Eurostat, STS
Short-term indicators	Industrial production	% of the same month in previous year	OECD, Eurostat
Short-term indicators	Declaration of bankruptcies	Index	Eurostat, STS
Short-term indicators	Registration of businesses	Index	Eurostat, STS
Short-term indicators	Permanent, temporary and self-employment	Change with respect to same period in previous year	Eurostat, Labour Force Survey
Short-term indicators	Gross Fixed capital formation	% of same period in previous year	Eurostat, National Accounts
Short-term indicators	Economic confidence Indicator	Level	ECFIN
Economic Resilience	Net public investments	% of GDP	AMECO
Economic Resilience	Net private investments	% of GDP	AMECO
Economic Resilience	R&D expenditures	% of GDP	World Bank, Eurostat
Economic Resilience	STEM graduates	per 100 population aged 20-29	Eurostat and OECD
Social dimension	Net earnings	Index and intra EU differences	Eurostat
Social dimension	Health and safety at work	Number of accidents at work	OSHA and Eurostat
Social dimension	Employment by gender	Shares	Eurostat
Digital transition	Integration of digital technologies	Index	DESI, Eurostat
Digital transition	Use of internet	Index	DESI, Eurostat
Digital transition	Connectivity	Index	DESI, Eurostat
Digital transition	Digital public services	Index	DESI, Eurostat
Digital transition	Human capital	Index	DESI, Eurostat
Digital transition	Population with basic or above basic digital skills	% of total population	Eurostat
Green transition	GHG emission intensity	tCO2e/GDP	UNFCCC and World Bank
Green transition	Electricity prices for non-household consumers	EUR/MWh	Eurostat, IEA and CEIC
Green transition	Wholesale electricity prices	EUR/MWh	Platts, ENTSOE-E and European power exchanges
Green transition	Recycling rate of Municipal waste	% of total	Eurostat
Green transition	Circular material use rate	% of total material use	Eurostat
Single Market integration	Intra-EU trade	Import + Exports, bn EUR	Eurostat
Single Market integration	Intra-EU trade	Nominal growth rate y/y	Eurostat
Single Market integration	Price convergence	Coefficient of variation of PPP for GDP	Eurostat
SMEs	Persons employed in SMEs	Index 2008=100	Eurostat and DIW Econ
SMEs	Value added in SMEs	Index 2008=100	Eurostat and DIW Econ
SMEs	Share of EU SMEs trading across EU borders through e-commerce	%	Eurostat
SMEs	Share of SMEs using Big Data analytics	Share	Eurostat
International dimension	Extra-EU export	Bn EUR and nominal growth rate	Eurostat
International dimension	Extra-EU import	Bn EUR and nominal growth rate	Eurostat

International dimension	Global market share in medium/high technology manufacturing (gross value added	%	UNIDO
International dimension	Global market share of high technology exports	%	World Bank and Eurostat

The majority of the indicators presented are calculated for the whole EU economy. In some cases, the most relevant macro components of the economy (e.g. industry, manufacturing and/or services) are also presented and, where possible and meaningful, international comparisons are included.

A selection of KPIs is also presented for the 14 industrial ecosystems, allowing for a more granular view of the main trends characterizing specific parts of the economy. The table below summarises these indicators.

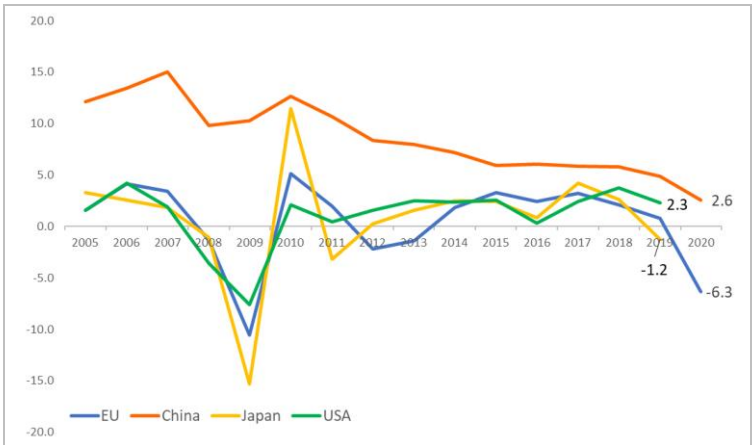
List of KPIs calculated by ecosystem			
Thematic area	**Indicator**	**Measure**	**Source**
Headline indicators	Gross value added	Million EUR and % change 2015-2018	Eurostat
Headline indicators	Employment	Million EUR and % change 2015-2018	Eurostat
Headline indicators	Number of firms	Number	Eurostat
Strenght of the ecosystems	Value added to production value	%	Eurostat
Strenght of the ecosystems	Gross Operating Rate	%	Eurostat
Green transition	Greenhouse gas intensity	Level and % Change 2015-2018	Eurostat
Short-term indicators	Confidence indicator	Level	ECFIN
International dimension	Export intensity	Extra EU Export/VA	Eurostat
Single Market integration	Intra-EU trade	% of total ecosystem trade	Eurostat
Economic Resilience	Churn rate of business	% change 2015-2018	Eurostat
Economic Resilience	Investments in tangibles	Level and % change 2015-2018	Eurostat

This set of KPIs takes into account, and in some cases partially overlaps, other thematic scoreboards that monitor specific policy areas. These initiatives complement the present, by analysing in greater detail and precision the impact and the performance of specific policie areas. Among them we can list the Single Market Scoreboard, the European Innovation Scoreboard, the EU Industrial R&D Investment Scoreboards[11], DESI, the Circular Economy Monitoring framework[12], the Eco-innovation Scoreboard[13], the Resilience Dashboards[14], the European Interoperability Framework[15].

[11] https://iri.jrc.ec.europa.eu/rd_monitoring
[12] https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework
[13] https://ec.europa.eu/environment/ecoap/indicators/index_en
[14] Proposed in the Commission's 2020 Strategic Foresight Report COM(2020) 493 final
[15] https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring

1. Headline indicators

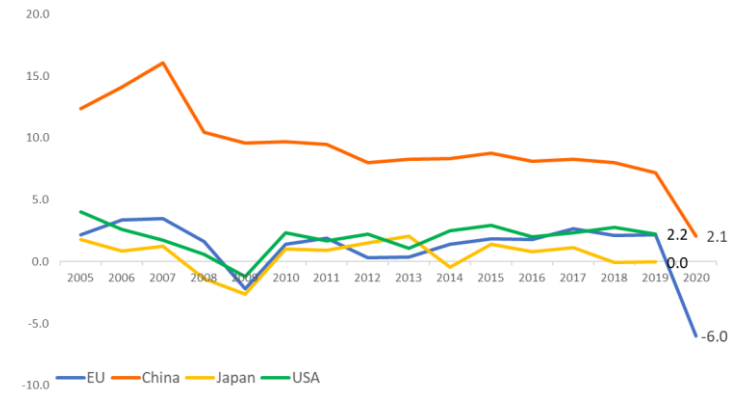
Value added in industry and services



Value added in Industry (including construction): annual % growth.
Source: World Bank national accounts data.

The overall composition of our economy has changed over time, with industry shrinking relative to services.[16] This is a global trend among developped economies and some developping economies, influenced by many factors, including servitisation and productivity gains of industry. Changes in relative prices of industrial goods compared to services, driven by the broad decrease of prices of many manufacturing products, also contribute to this trend.

In 2018, 2019 and 2020, EU growth in industry has been lower than international competitors (except for Japan in 2019).



Value added in Services: annual % growth.
Source: World Bank national accounts data.

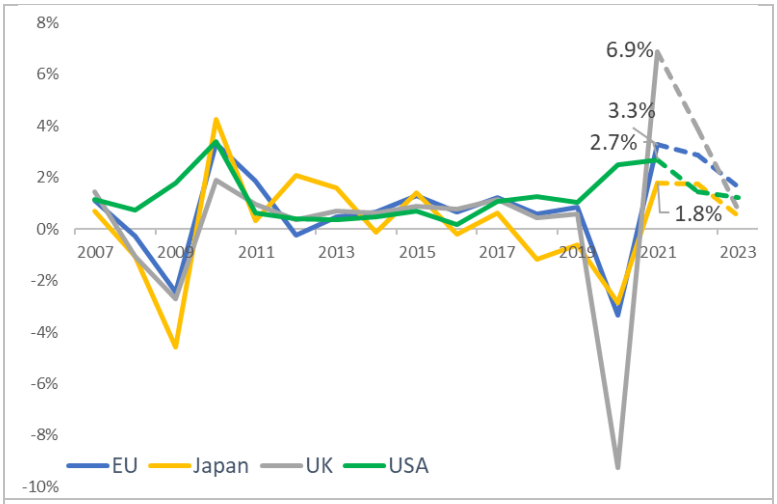
Services grew faster, but not as fast as China and the United States. In particular, the performance of China signals its increasing importance also in service provision.

The impact of the COVID-19 crisis was very strong for both industry and services, and lead to a significant decrease of value added. In comparison to China, for which more recent data is available, the drop of the EU27 growth rate compared to 2019 was more important. These indicators are only available until 2020 for international

[16] Industry corresponds to ISIC divisions 10-45 and includes in mining, manufacturing, construction, electricity, water, and gas. Services correspond to ISIC divisions 50-99 and include wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services.

comparisons, hence they cannot describy yet the recovery phase. The indicators in the next sections provides an overview of the most recent developments.

GDP per person employed

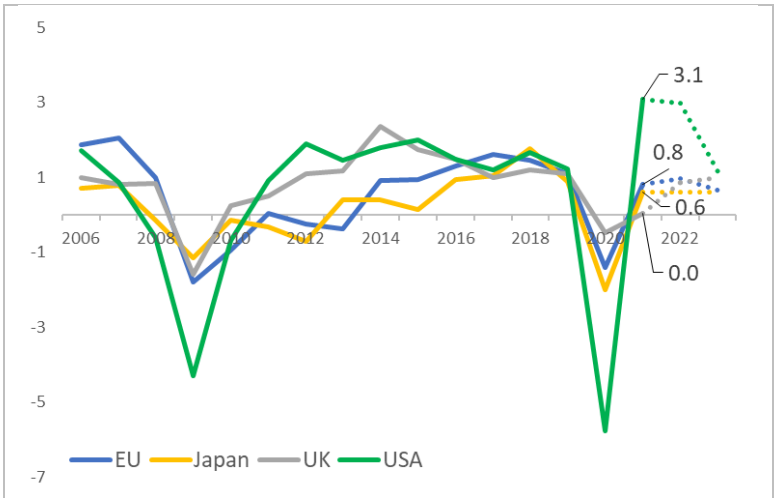


GDP per person employed: constant prices, total economy, % annual growth, data for 2021 and 2022 based on estimates.
Source: AMECO (RVGDE).

Another trend common to most advanced economies is the long-term slowdown in productivity growth, something the EU is not immune from.

In the last days, the EU has experienced a slowdown in labour productivity, matched by a similar trend in total factor productivity growth. Nonetheless, in 2021 productivity increased significantly.

Employment

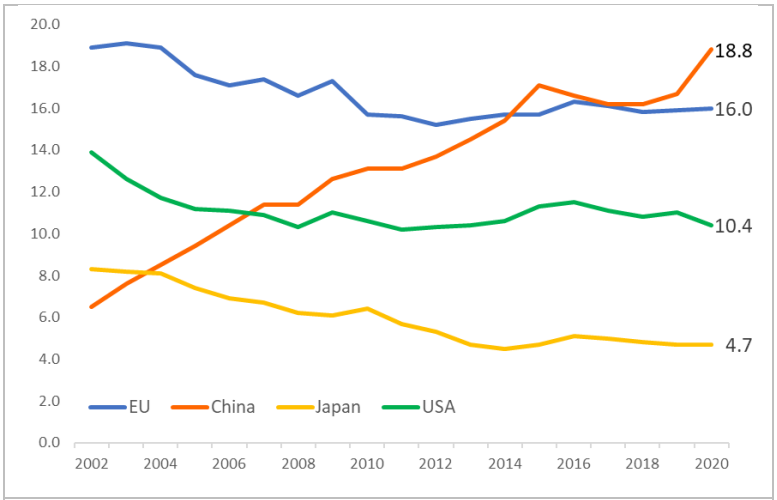


Number of Employees: Total employment, domestic, annual % growth. Data for 2021 and 2022 based on estimates.
Source: AMECO (NETD).

The pandemic triggered the deepest shock in the history of the EU,and caused large employment losses. However, the international comparison shows how social safety nets in the EU played a major role in mitigating them, limiting the drop in the EU as compared to USA and Japan in 2020.

The rebound in 2021 was important, but not enough to compensate previous losses.

Global market shares



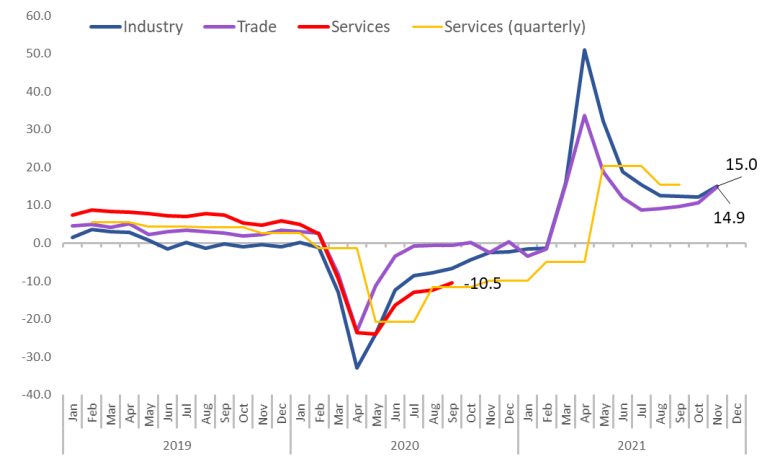
Share of world export: percentage.
Source: Eurostat [ext_lt_introeu27_2020].

The EU share of world exports remained stable at about 16% in the last ten years, amid a very challenging environment in which the rise of China has been remarkable. The COVID-19 crisis caused a drop of more than 9% of EU exports in 2020. Nonetheless, the EU maintained a stable market share of global trade.

As illustrated in Section 1.9, 2021 data on trade show a ssignificant recovery

2. Short-term indicators

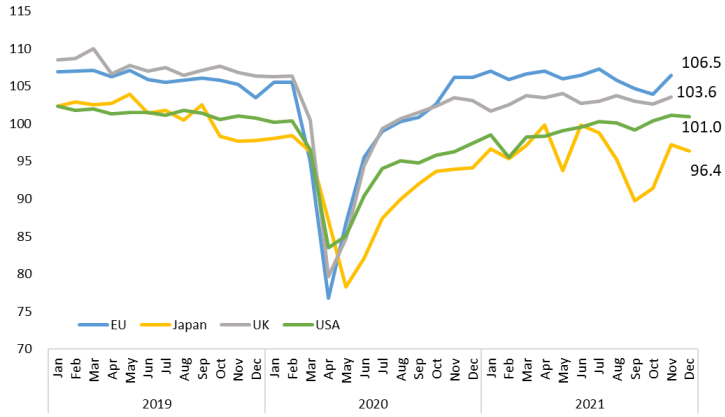
Turnover



Turnover: Percentage change with respect to the same month in the previous year.
Source: Eurostat Short-term Statistics.

The lockdown measures induced by the COVID-19 generated dramatic turnover losses in April and May 2020 (compared to the previous year, -33% for industry, -23% for wholesale and retail trade, -24% for services). The shock hit all sectors. As of January 2021, turnover in industry and trade had recovered to pre-COVID-19 levels and boomed in April, as firms and consumers compensated for the delayed consumption and investments. In December 2021, turnover for both industry and trade was still above the pre-COVID-19 levels. As recent monthly data is not available for services, the graph also reports quarterly data for services, which show a comparable pattern of recovery.

Industrial production

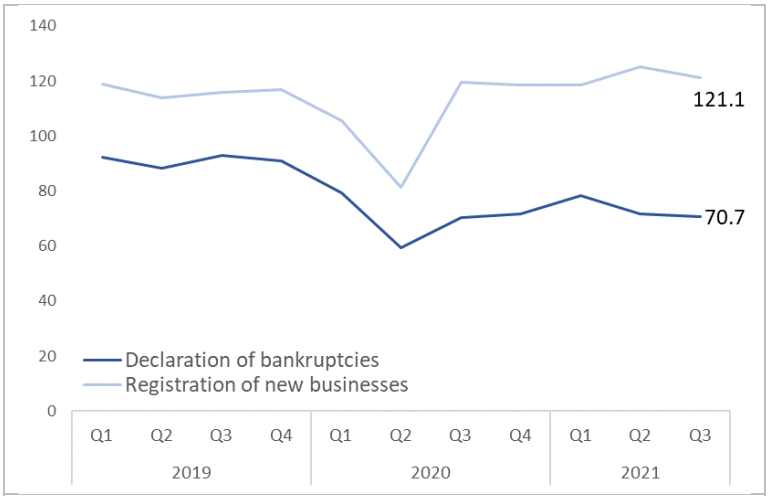


Industrial production: relative to January 2015.
Source: OECD.

The fall in industrial production in April and May 2020 was remarkable, and slightly deeper than other large economies. Nonetheless, its recovery was quick, also compared to international competitors.

Industrial production reached levels comparable to pre-lockdown levels since the end of 2020.

Declarations of bankruptcies and Registration of businesses

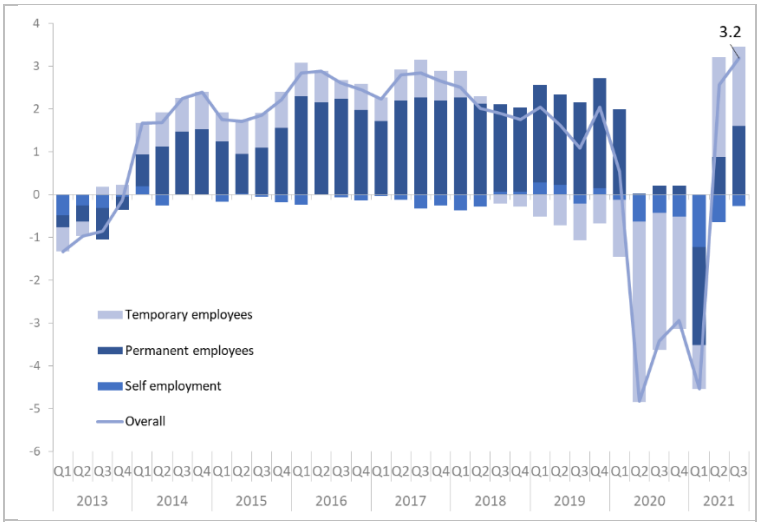


Declaration of bankruptcies and registrations of businesses: index 2015=100. Seasonally adjusted data. Incomplete coverage of EU.
Source: Eurostat [sts_rb_q].

The number of declarations of bankruptcies dropped with the inception of the COVID-19 crisis (2nd quarter 2020). This is due to the support policies put in place by Member States to shelter business in response to the lockdown measures. An increase is visible as of the third quarter of 2020. Since then, the level has been stable.

The number of new registrations of businesses followed a similar pattern, but the rebound has been more significant.

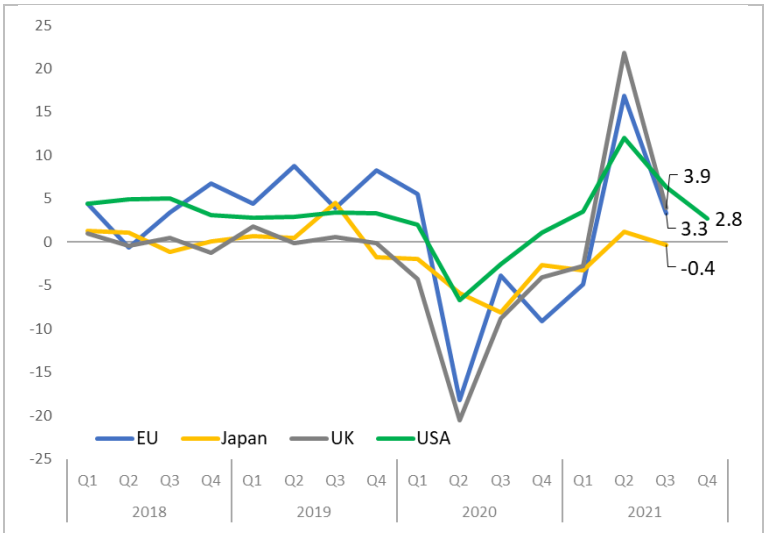
Permanent, temporary and self-employment



Permanent, temporary and self-employment: change with respect to same quarter in the previous year. Age 15-64. Data not seasonally adjusted.
Source: Eurostat - LFS [lfsq_egaps, lfsq_etgaed].

Data by employment type provides a clearer picture of the recovery in terms of social and economic aspects. During the last three quarters of 2020, the most significant drop in employment was visible amongst temporary employees, followed by self-employed, who were generally less protected by the public measures. In the first quarter of 2021, also permanent jobs were affected. More recent data suggest an inversion of the trend for all but self-employed.[17]

Gross fixed capital formation

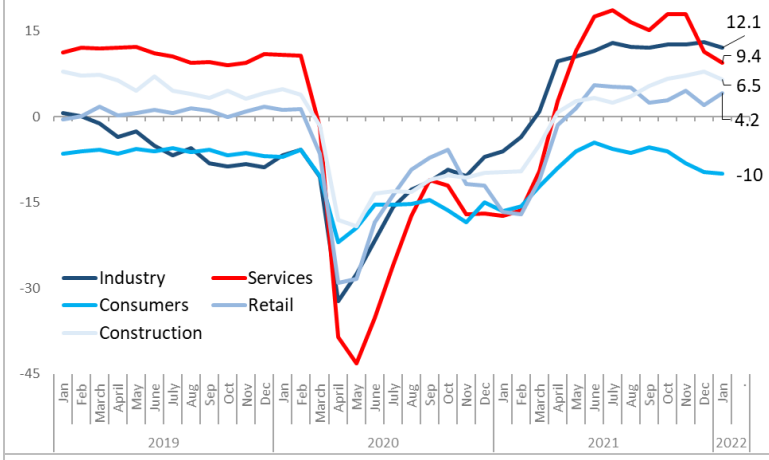


Quarterly Gross Fixed Capital Formation: Growth rates compared to the same quarter of previous year. Seasonally adjusted.
Source: OECD.

Gross fixed capital formation touched its lowest level in the second quarter of 2020, falling by 18.1% compared to the previous year. The start of 2021 was marked by a strong rebound and in Q3 2021, growth with respect to the same period in 2020 was 3.3%. Comparing internationally, the fall during the 2nd quarter of 2020 was much bigger in the EU than in the USA or Japan, but so was the rebound. The USA and Japan showed a much more stable trend.

[17] Note that in Q1-2021 there was a break in the series, so the result should be interpreted with caution.

Economic confidence indicator



Economic confidence indicators
Source: Joint Harmonised EU Programme of Business and Consumer Surveys, European Commission.

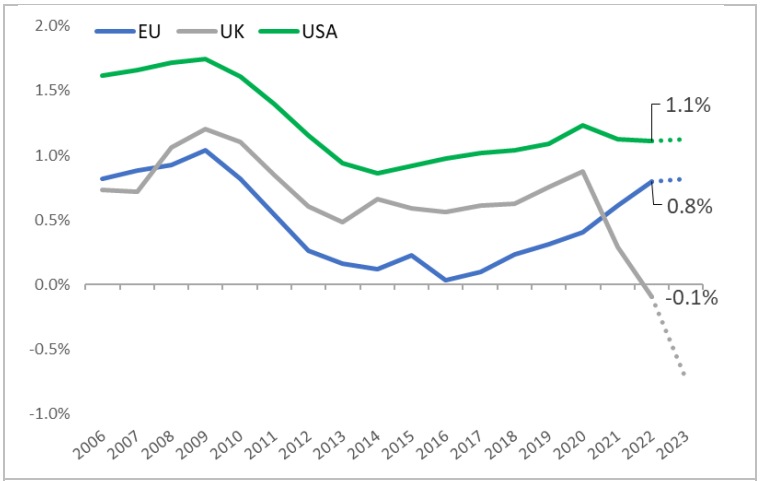
The economic sentiment dropped dramatically to historical lows during the lockdown in spring. Since then, it recovered ground and improved significantly starting from March 2021. However, the analysis of the series signals heterogeneous sectoral developments, with industry and services seeming more optimistic than retail and construction. The consumers' index is still negative, and decreased further in January 2022.

3. Thematic indicators

3.1. Economic Resilience

Resilience is a concept encompassing several dimensions. It is difficult to fully describe it with a limited set of economic indicators. Investments, R&D expenditure and skills are proxies to monitor how European industry renews and upgrades its products, its processes and its workforce.

Net public investments

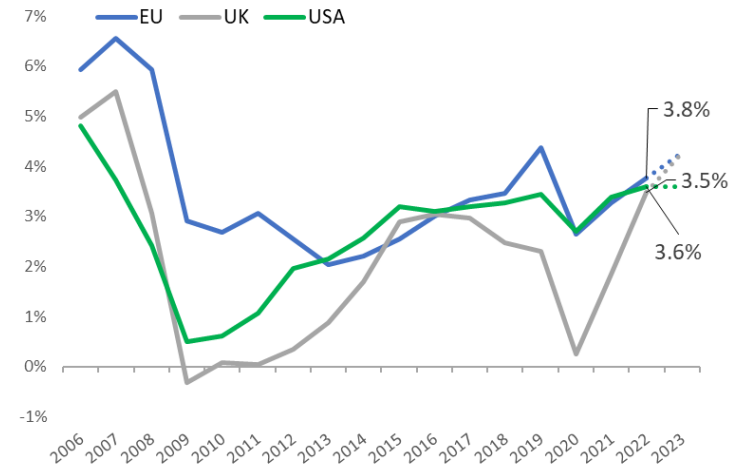


Public Investments: Net Fixed Capital Formation as a share of GDP. Data for 2022 and 2023 based on estimates.
Source: own calculations based on AMECO data.

Investments signals how industry prepares for the economic and societal challenges of the future.

Public investment between 2013 and 2018, has been lower in the EU than in the USA and the UK, and was not even sufficient to compensate for the depreciation of the existing capital stock. However, since 2019, the trend has been increasing and is likely to keep increasing in 2022, also thanks to the interventions at European and Member State level to support the economy during the recovery.

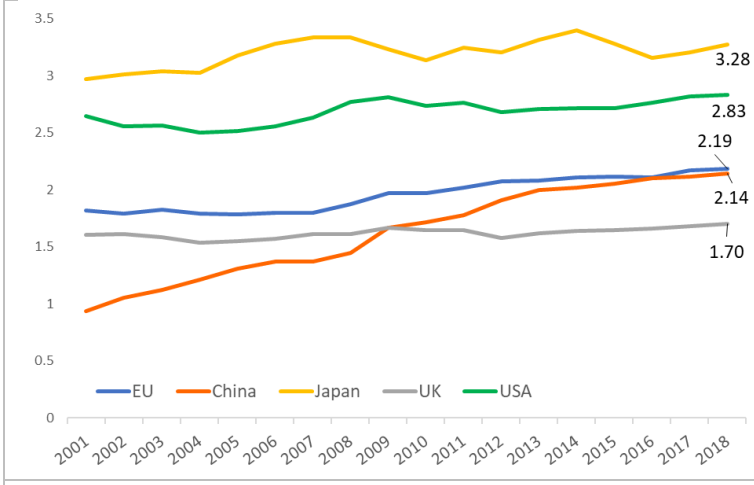
Net private investments



Private investments: Net Fixed Capital Formation as a share of GDP. Data for 2022 and 2023 based on estimates.
Source: own calculations based on AMECO data.

Private investment was on an increasing trend before the COVID-19 crisis, also in line with international levels. After the COVID-19 shock in 2020, which caused a dramatic drop of net private investment, 2021 marked a significant increase, in line with the USA and UK levels.

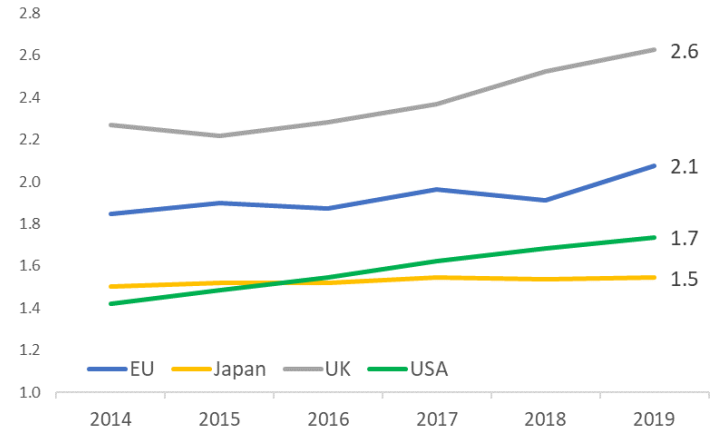
R&D expenditures



R&D expenditure: % of GDP.
Source: UNESCO institute for Statistics through World Bank API.

In terms of R&D expenditures, the EU is lagging behind other major economies, such as the US and Japan. China has also rapidly increased its level of investment in R&D, and has now levels comparable to the EU.

STEM graduates



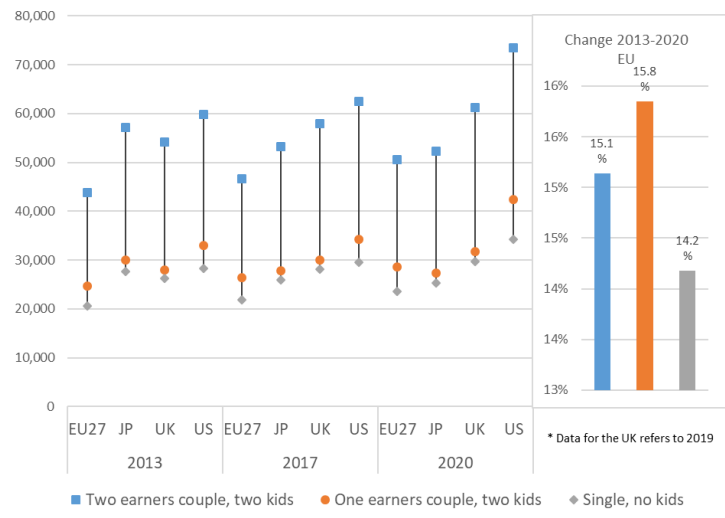
Graduates in STEM and related fields: per 100 population aged 20-29. Tertiary graduates (levels 5-8), in natural sciences, mathematics, statistics, ICT, engineering, manufacturing and construction. Eurostat and OECD data not fully comparable.
Source: Eurostat [EDUC_UOE_GRAD02] and OECD [Distribution of graduates and entrants by Field].

Skills in Science, Technology, Engineering and Mathematics (STEM) are essential to accompany the digital and green transition.

The share in the EU has increased very slightly in the last six years, while the USA and the UK both experienced a more pronounced increasing trend.

3.2. Social dimension

Net Earnings

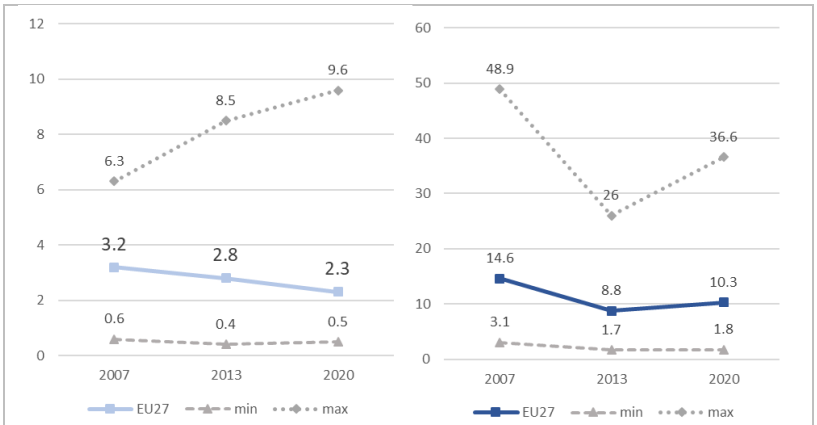


Net earnings: annual net earnings in PPS, for persons earning 100% of the average earning of the specific cathegory.
Source: Eurostat [earn_nt_net].

Net earnings in the EU are slightly smaller than in Japan, UK and USA for all categories considered, but have increased since 2013.

The gap between the lowest (single with no kids) and highest earnings (two earners couple with two kids is also the smallest in the EU, and grew at the same pace as the US.

Health and safety at work

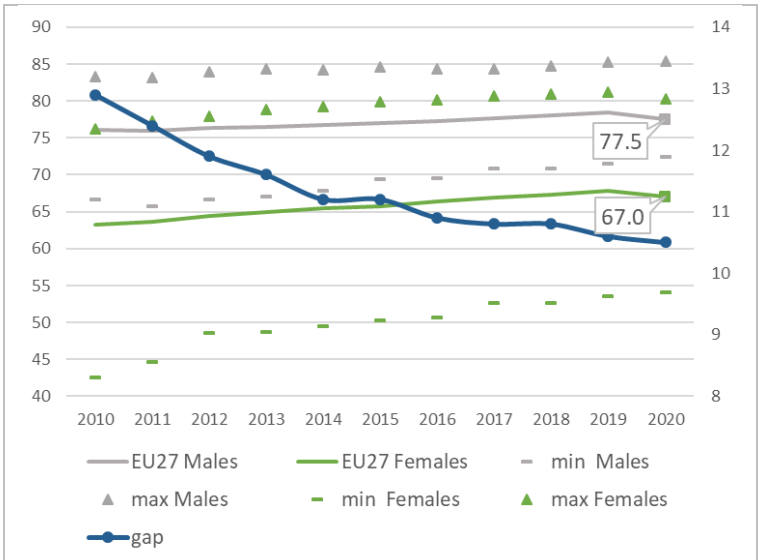


Accidents at work (left) **and work related health problems** (right) **:** percentage of persons employed and previously employed.
Source: Eurostat [hsw_ac1] and [hsw_pb1].

The number of reported accident at work has slightly decreased since 2007 on average, but the variation across Member States is large, and has increased.

The trend for work related health problems is less clear and the difference between the lowest and the highest reporting Member State is very large.

Employment by gender

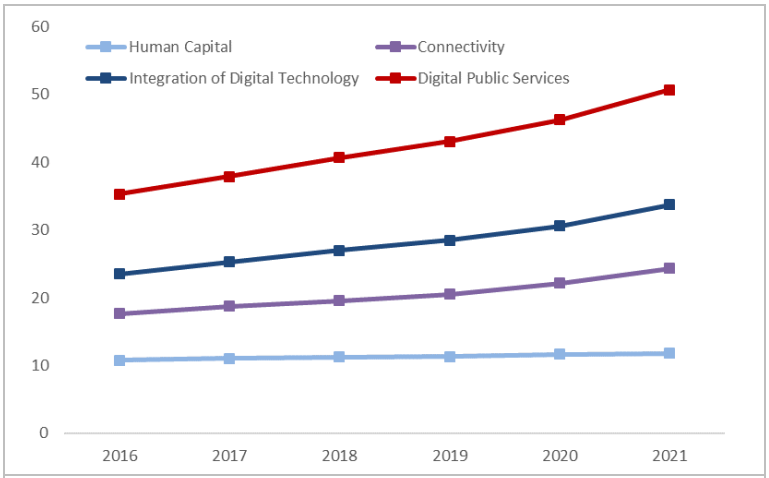


Employment by sex: percentage of total population and gap between male and female.
Source: Eurostat [lfsi_emp_a].

The difference between female and male employment is still significant in the EU. While 77.5% of men between 15 and 64 years old are part of the labour force, only 67% of women are, a gap of more than 10 percentage points, that is decreasing at a relatively slow pace.

3.3. Digital Transition

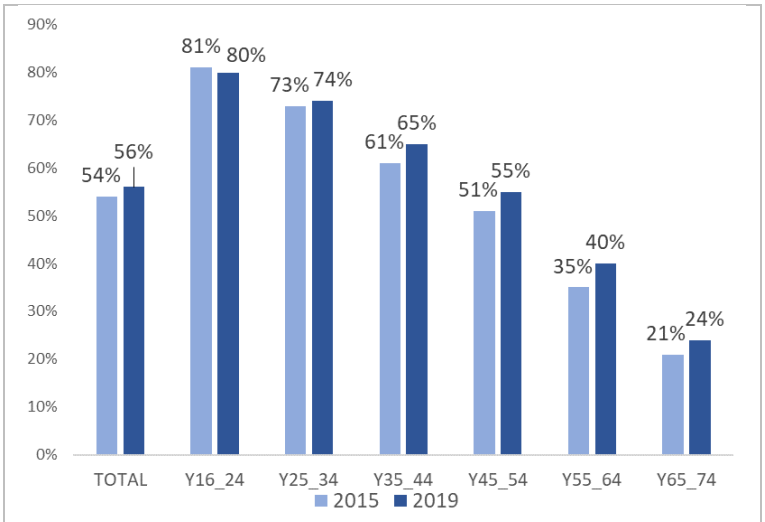
Digital Economic and Society Index bycomponents



DESI: index, weighted score (0 to 100).
Source: Digital Economy and Society Index, European Commission.

In the last six years, the Digital Economic and Society Index (DESI) has grown at a stable rate. All components kept improving, although with some disparity among them. Human capital shows the smallest growth. The digital public services and the integration of digital technology have grown much faster, with the latter starting from low levels, especially in some European Member States. The growth in connectivity has has also increased significantly, and with a strong increase in the last two years.

Digital skills

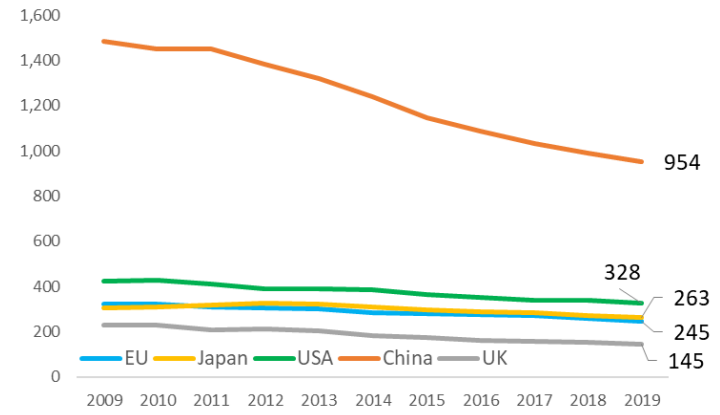


Share of population with basic or above basic digital skills: % of total population, by age group.
Source**:** Eurostat [isoc_sk_dskl_i].

Skills encompass many dimensions, but one area where they are particularly important today is the digital world. In 2019, the majority of the EU population had basic or above basic digital skills, but the dispersion across age groups is wide. The share of total population with basic or above basic digital skills had increased in the last five years, by 2 percentage points.

3.4. Climate neutrality and Circular Economy

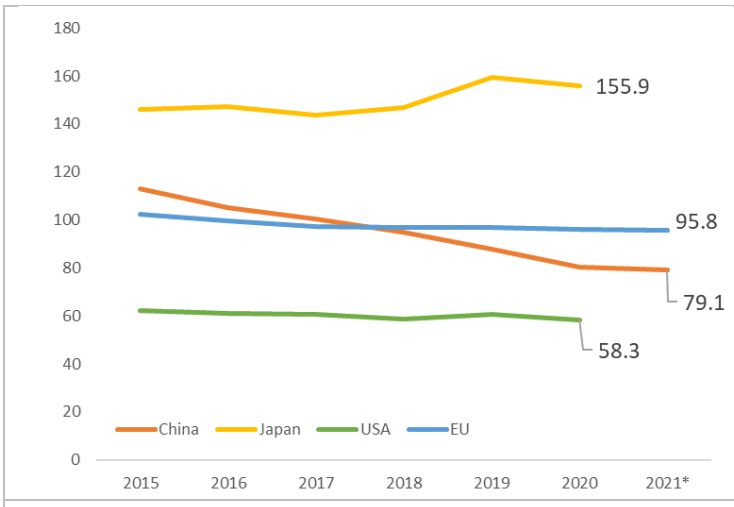
GHG emission intensity



GHG emission intensity: Total GHG/GDP (tCO2eq/GDP constant).
Source: UNFCCC, World Bank.

Greenhouse gas emission intensity is one of the most important factors in pursuing the European Green Deal and also one of the clearest indicators to measure its success. The GHG emission intensity of the EU is close to Japan, lower than the United States and significantly lower than in China. In the last decade, the GHG emission intensity of the EU economy decreased by 24.5%, compared to 22.8% for United States. China's emission intensity has decreased by 35.7%, but remains much higher.

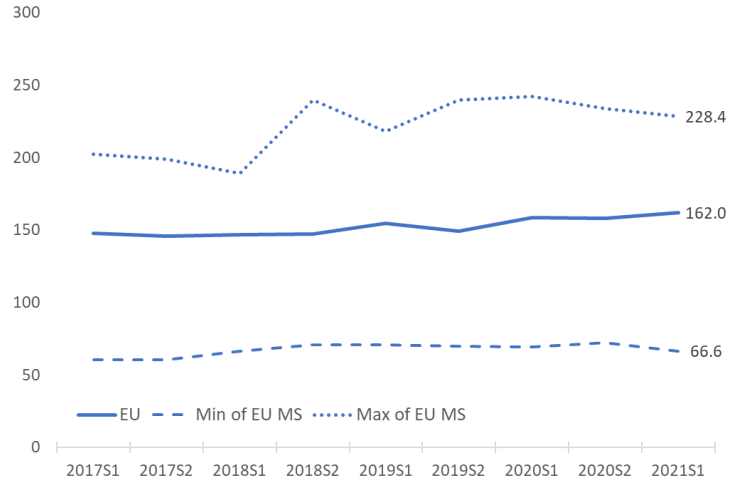
Electricity prices



Industry Electricity Prices: International Comparison, EUR/MWh. EU data based on medium size industrial consumers (annual consumption of 2000-20000 MWh). Prices exclude taxes and levies. The last data point for the EU refers to the first semester of 2021.
Source: CEIC, IEA and Eurostat [nrg_pc_205].

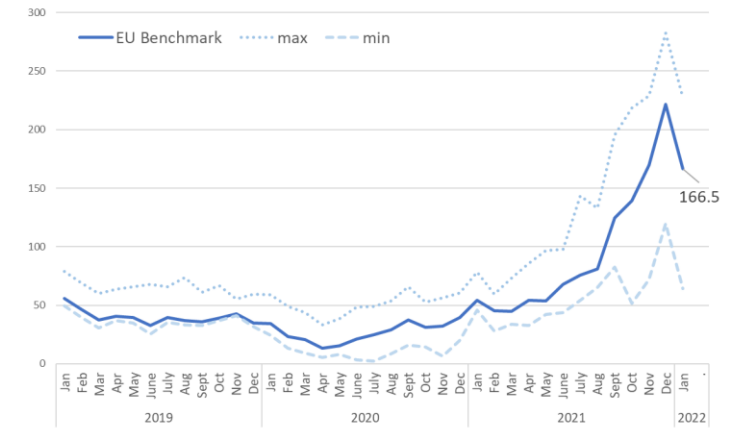
The green transition will require access to abundant, decarbonised and competitively priced electricity. While increases in electricity prices can trigger improvements in energy efficiency, electricity prices are also a key component for the competitiveness of some industries.

Despite the reduction in emissions, EU industry electricity prices have been relatively stable for the last decade, up until the first semester of 2021. They were significantly higher than the US prices. Despite comparable emission intensity, prices in the EU are below the prices in Japan. Industrial electricity prices in China declined and are now below EU prices. EU industrial (non-household) electricity prices fluctuated around 96 EUR/MWh in the last decade.



Electricity prices for non-household consumers: prices in PPS per Megawatt-hour, all taxes and levies included, for the consumption band between 500 MWh and 2 000 MWh.
Source: Eurostat [nrg_pc_205].

When taxes and levies are included, EU electricity prices double. Data also show a significant variation across Member States. In the first semester of 2021, the average EU price increased by 2.02% compared to 2020.

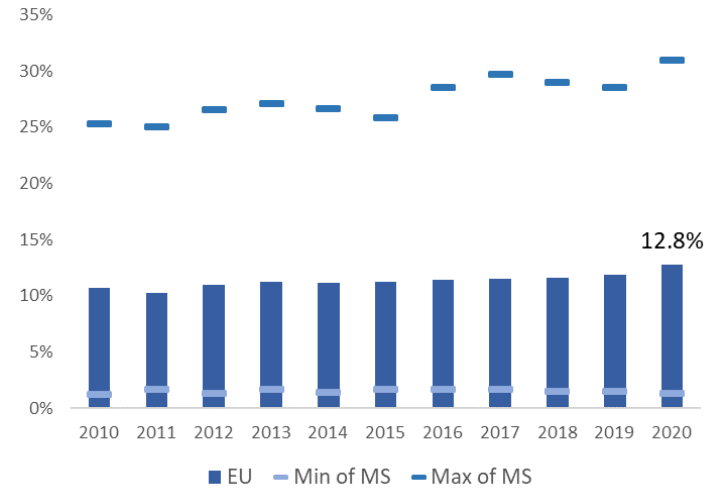


Wholesale electricity prices: EUR/MWh, European Power Benchmark based on weighted average consumption of the 5 most important markets in the EU (DE, FR, NL, ES and NordPool), and range of variation across Member States.
Source: Platts, ENTSOE-E and European power exchanges.

The data above do not capture the most recent developments in energy markets. In January 2022, electricity prices had increased by 208% compared to January 2021. This is likely to impact significantly energy-intensive sectors in manufacturing.

Due to the exclusion of VAT and other factors related to tariff calculation, industrial electricity prices are more influenced by the energy component compared to households and, hence, more driven by developments in wholesale markets. Thus, the current increase in wholesale electricity prices can be seen as a proxy of the increase on retail prices for non-household consumers.

Circular material use rate

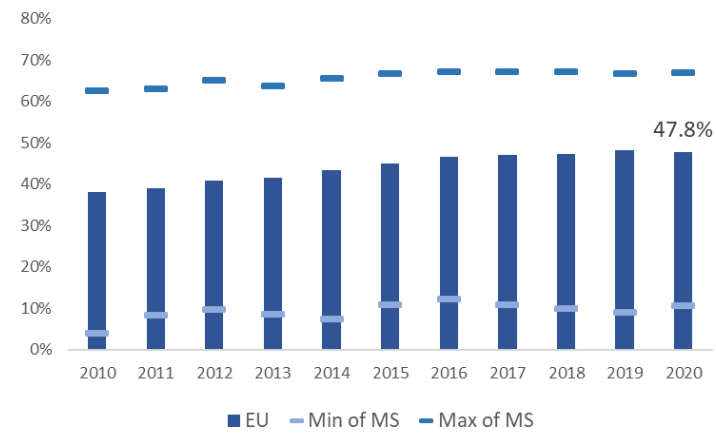


Circular material use rate: percentage share of overall material use.
Source**:** Eurostat [cei_srm030]

Scaling up the circular economy will play a key contribution to achieve climate neutrality by 2050. Increasing recycling rates offer a partial picture of the circular economy, as they do not capture the extend to which recycled materials find their way back into the economy. The circular economy aims at increasing the amount of material recovered and fed back into the economy.

The circular material use rate measures the contribution of recycled materials to overall materials demand. A high circularity rate value indicates that more secondary materials substitute for primary raw materials, thus reducing the environmental impacts of extracting primary material. In the last 10 years, the rate of re-use of materials in the EU has increased to 12.8% in 2020. There is significant variation across Member States.[18]

Recycling rate of municipal waste



Recycling rate of municipal waste: % and variation across Member States.
Source: Eurostat [CEI_WM011].

Increasing recycling is fundamental for the circular economy, as the demand and the supply of recycled material should naturally evolve

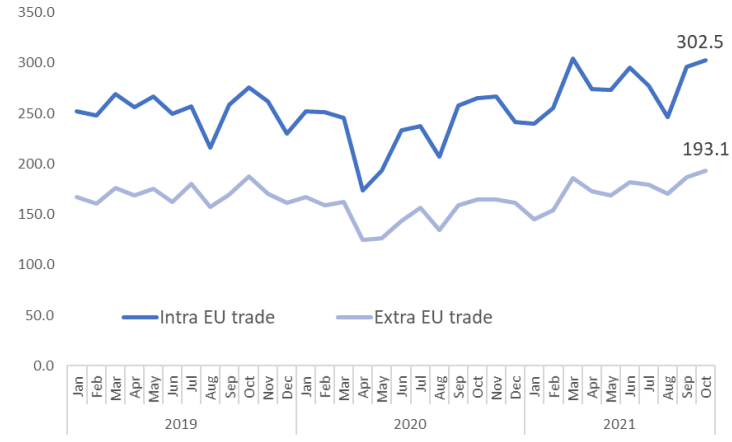
[18] The new Circular Economy Action Plan for a cleaner and more competitive Europe announced that the Commission will revise the Monitoring Framework. New indicators will take account of the focus areas and of the interlinkages between circularity, climate neutrality and the zero pollution ambition. Indicators on resource use will also be further developed.

together.[19] The Waste Framework Directive sets a target of 50% recycling of municipal waste in 2020.[20]

In the last decade, the recycling rates for municipal waste have increased by around 10 percentage points for the whole EU, getting very close to the target of 50%. However, heterogeneity across Member States remains high.

3.5. Single Market Integration

Intra-EU trade

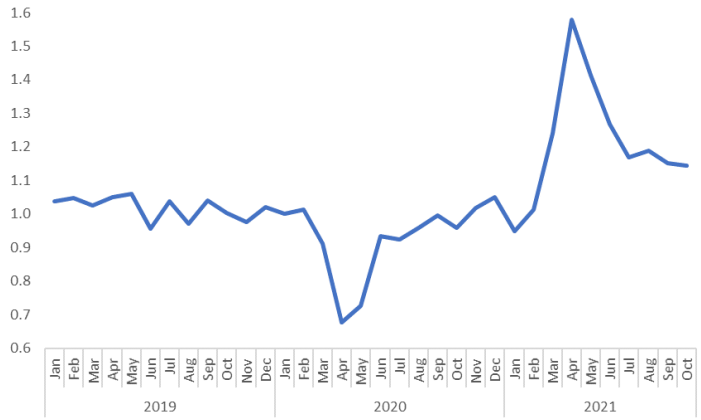


Intra and Extra EU trade: EUR bn nominal values; trade is defined as the average between imports and exports.
Source **:** EU trade by CPA 2.1 [DS-1062396].

The single market is one of the most important assets of the EU and its further deepening is one of the goals of the EU. Intra-EU trade is a good proxy for single market integration. In October 2021, intra-EU trade was 56% higher than extra EU trade. The initial effect of the COVID-19 crisis was larger on intra-EU trade, but the recovery was also faster. Both intra and extra-EU trade grew in 2020 and in the first three quarters of 2021.

[19] The indicators presented here describe only partially the complexity of the industrial transition towards a circular economy. The Commission in 2018 adopted a comprehensive framework of indicators to measure the transition towards a circular economy. The indicators of the framework follow the lifecycle of products and offer a snapshot on how well we save our resources. As such, the framework will continue being a fundamental element of industrial policy strategy https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework

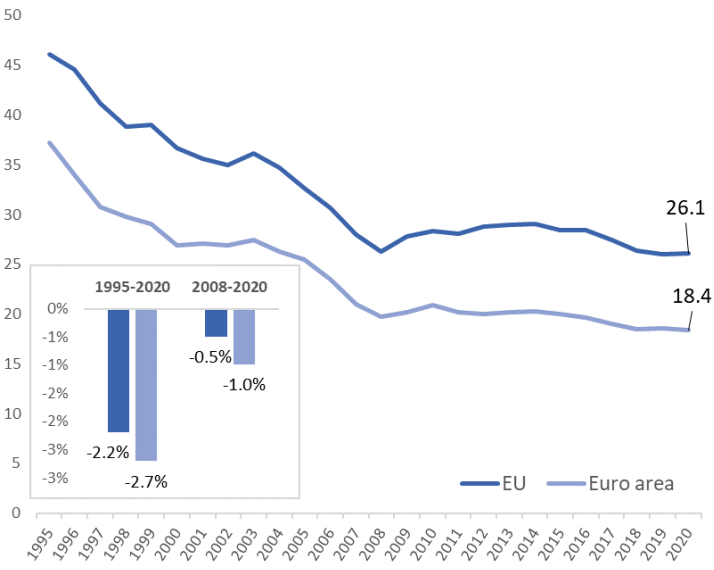
[20] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives; Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (OJ L 150, 14.06.2018, p. 109-140).



Intra-EU exports: share over the same period of previous year.
Source **:** EU trade by CPA 2.1 [DS-1062396].

The COVID-19 crisis initially resulted in a significant downturn in intra-EU exports with a drop of over 30% in April 2020 as compared to April 2019. However, the situation has improved significantly and in October 2021, intra-EU exports were 14% higher than in October 2020, but still lower than the same month in 2019.

Price convergence

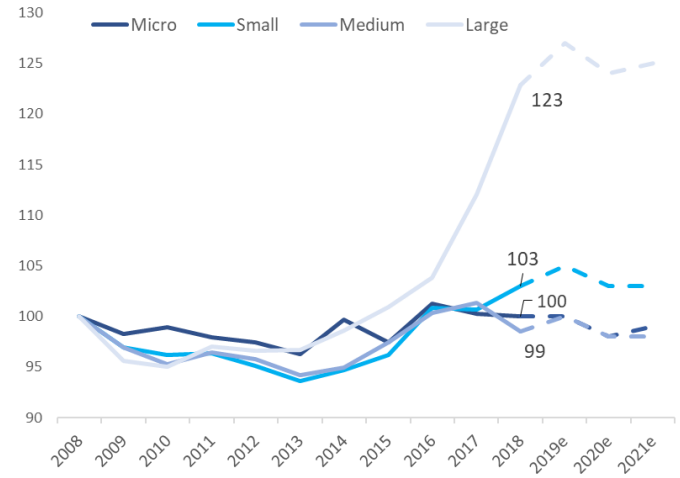


Price dispersion across Member States: coefficient of variation of price level indices (PPP for GDP) and their average growth rates (small box).
Source: Eurostat [prc_ppp_conv].

To assess the integration of the European economy, it is useful to consider the differences in price level among different Member State economies. In the years running up to 2008 the dispersion in price levels in the EU drastically decreased, but increased again with the financial crisis. Between 2014 and 2019 , we could observe again a slow decrease. In 2020, dispersion remained stable.

3.6. SMEs

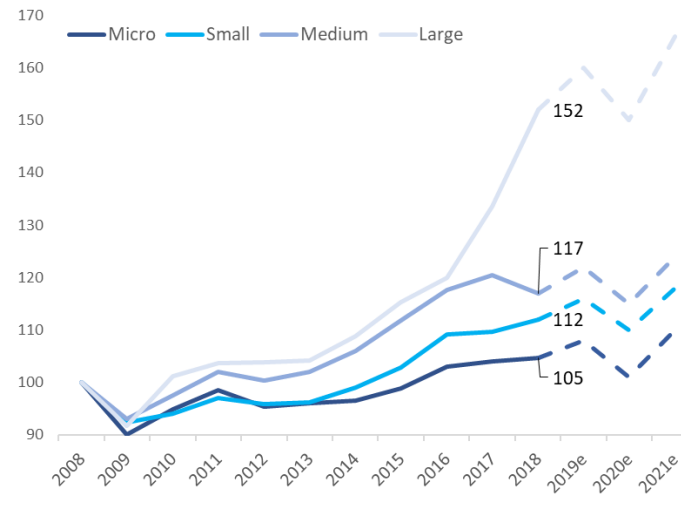
Employment in SMEs



Number of persons employed: by size class, index: 2008=100.
Source: Eurostat [sbs_sc_sca_r2]. Estimates for the period 2019-2021 produced by JRC, based on Eurostat Structural Business Statistics, Short-Term Business Statistics and National Accounts Database.

In the last years, the increase in employment has concentrated more in large enterprises. This could signal a polarisation trend in the EU industrial fabric.

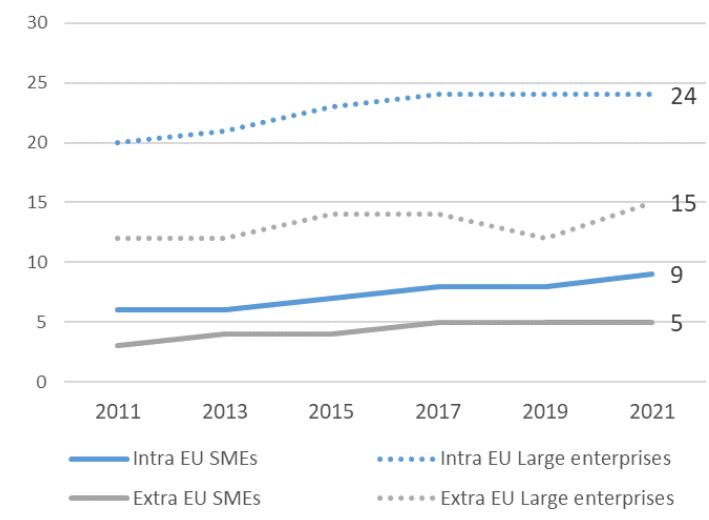
Value added in SMEs



Value-added: by size class, index: 2008=100.
Source : Eurostat [sbs_sc_sca_r2]. Estimates for the period 2019-2021 produced by JRC, based on Eurostat Structural Business Statistics, Short-Term Business Statistics and National Accounts Database.

In terms of value-added, all companies have increased their contribution. However, the difference across size class is striking, with large companies increasing their value added significantly more than micro, small and medium companies, in particular since 2016.

Share of SMEs e-trading across EU borders through e-commerce



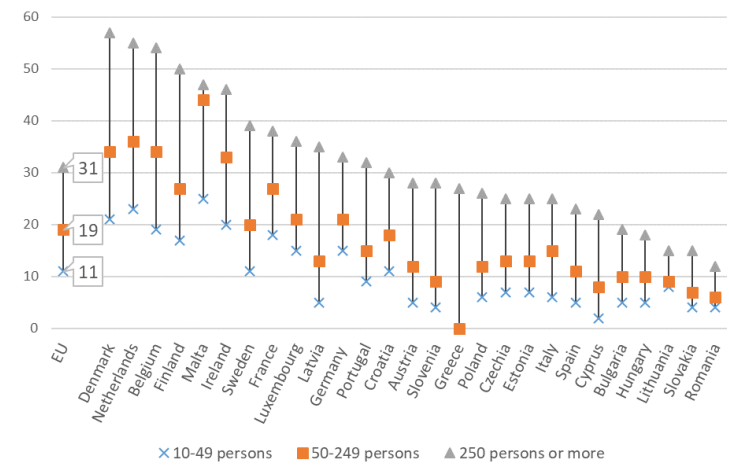
Enterprises with e-commerce export: percentage of enterprises
Source : Eurostat [isoc_ec_eseln2].

A significant share of European firms export thanks to e-commerce. The share is much larger among large enterprises.

Both SMEs and large enterprises are more likely to export thanks to e-commerce within the Single Market.

This indicator only captures a share of the total number of SMEs trading cross border, as other SMEs may be trading goods or services across EU borders without using e-commerce.

Share of SMEs using Big Data analytics



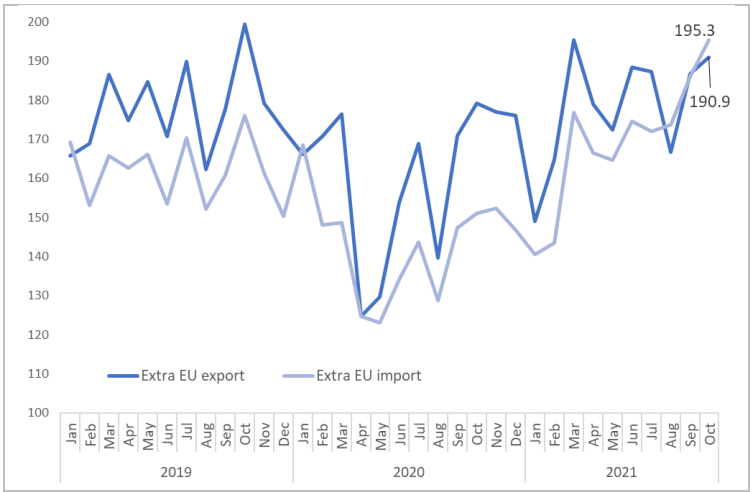
Enterprises using Big Data analytics: percentage of enterprises that analyse big data internally from any data source.
Source : Eurostat [isoc_eb_bd].

Large firms are significantly more likely to use big data analytics (31%) than small (11%) and medium (19%) enterprises.

The variation across Member States is very significant.

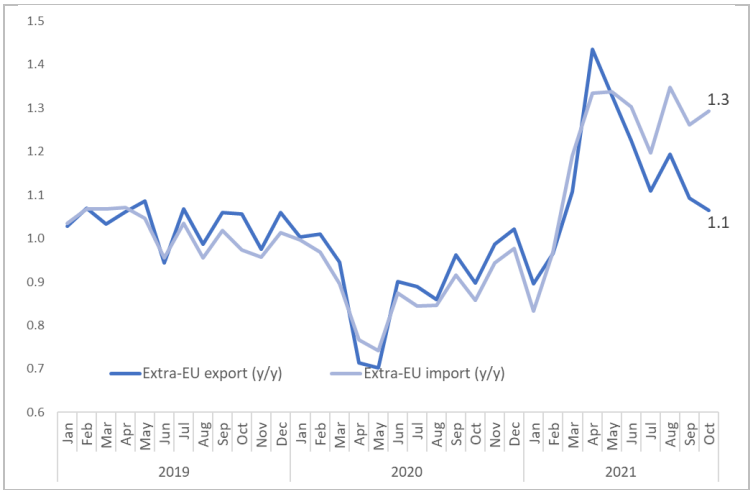
3.7. International dimension

Extra-EU trade



Extra-EU trade : EUR bn nominal values.
Source **:** EU trade by CPA 2.1 [DS-1062396].

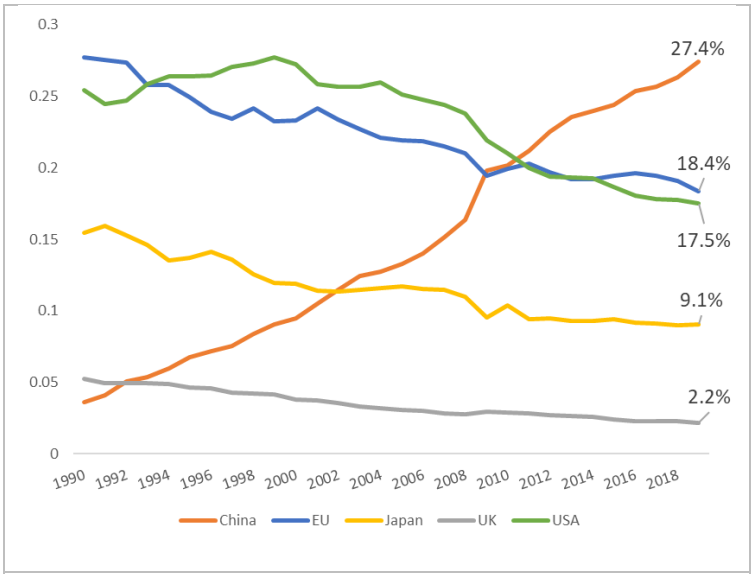
Extra-EU exports and imports have followed similar patterns in the last three years and a half, with the net trade balance being almost always positive. However, in October 2021 a small deficit emerged. The COVID-19 crisis resulted in a significant drop, particularly in exports, with a rapid recovery to pre COVID-19 levels.



Extra-EU trade: share over the same period of previous year.
Source **:** EU trade by CPA 2.1 [DS-1062396].

The year on year growth rates of extra-EU exports and imports have also followed a similar pattern in the last three years. Extra-EU exports were more severely affected by the COVID-19 crisis but also recovered faster. The strength of the recovery is visible in comparison to the situation in April and May 2020, when both exports and imports were almost 30% down on their values of the previous year.

Global market share in medium/high technology manufacturing (gross value added)

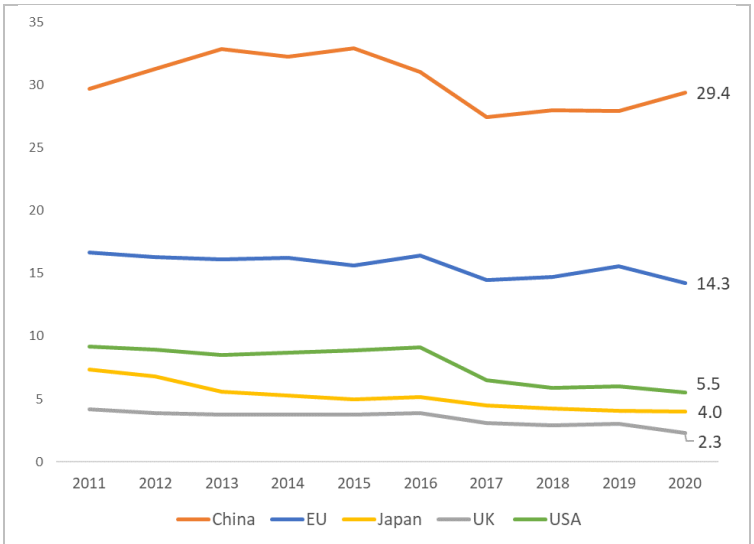


Global market share of high technology export: High-technology exports of products with high R&D intensity, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.
Source **:** UNIDO CIP dataset.

The evolution of global market share of medium and high technology manufacturing is clearly carachterised by the fast ascent of China, in parallel to a slow descent of other major industrial economies.

EU's share has declined from 27% in 1990 to 18.4%, but has been relatively stable since 2008, and was slightly larger than the USA.

Global market share of high technology exports



Global market share of high technology export: High-technology exports of products with high R&D intensity, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.
Source **:** World Bank [TX.VAL.TECH.CD] and Eurostat [COMEXT], [ert_bil_eur_a].

The European share of high technology exports have declined slightly during the last decade, but it is still significantly higher than the USA. China is by far the global leader, but part of its exports are due to EU and USA externalisation of manufacturing processes.

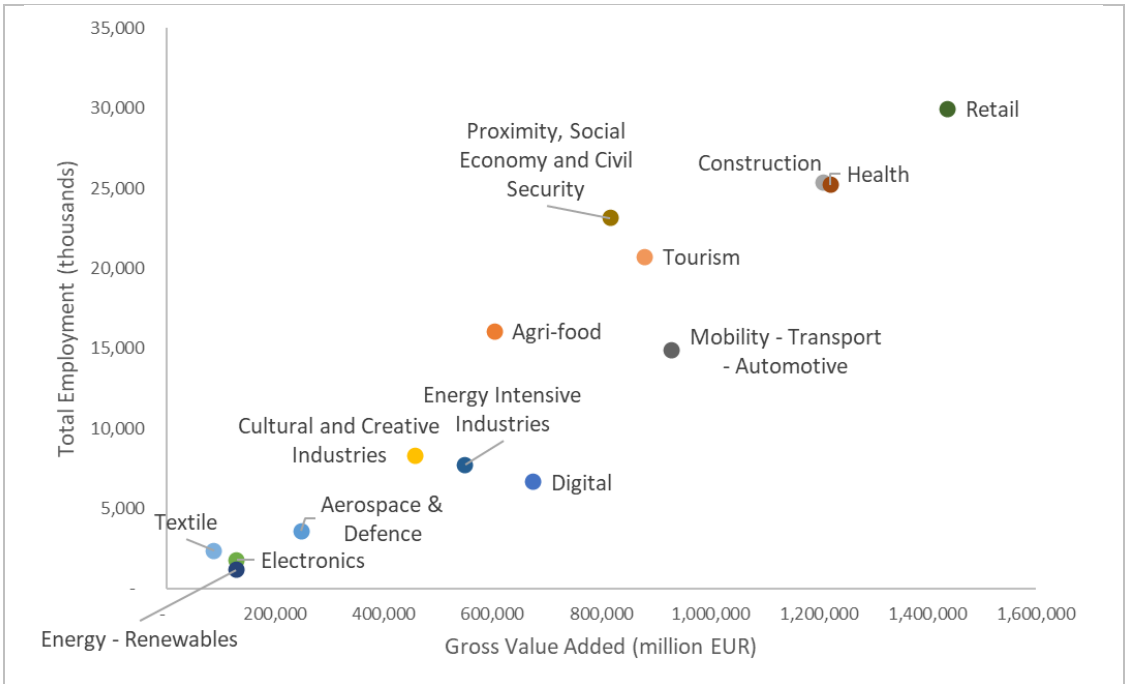
4. Key Performance Indicators for EU Industrial Ecosystems

The KPIs presented in this section describe the ecosystems in more details. The granularity of the sectoral classification for the data sources available is not ideal to describe the ecosystems precisely. Hence, the indicators below should be interpreted with caution.

The methodology followed for the calculation of these indicators is explained at the end of this annex. Due to data availability, most of the indicators presented below do not capture the COVID-19 crisis period.

Headline indicators: the size and performance of ecosystems

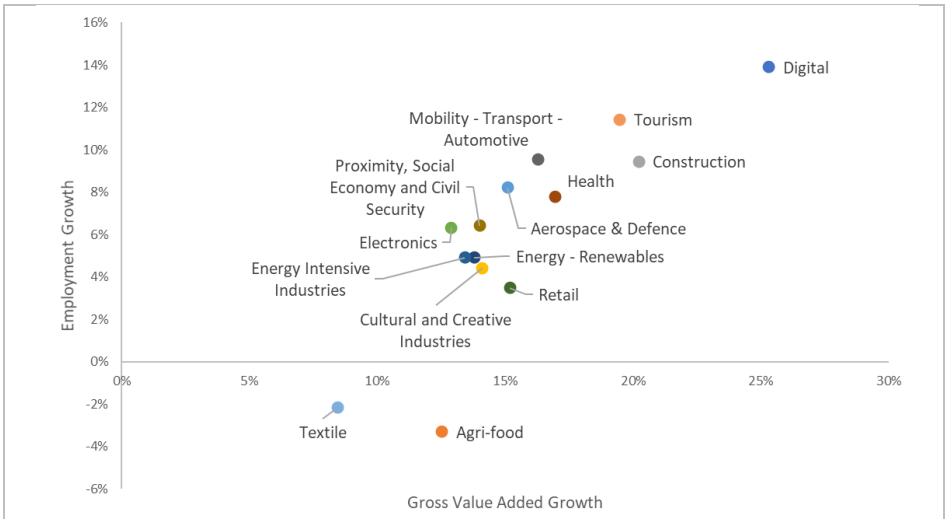
The 14 industrial ecosystems, as defined in this document, represent roughly 80% of the European business economy in terms of value added and employment.[21] They differ significantly in terms of size. Their size is influenced by several factors. For instance, Retail, by far the largest ecosystem, serves virtually all ecosystems, ensuring the contacts to final consumers. Energy Intensive Industries or Aerospace and Defence, are instead very "upstream" ecosystems. For this reason, although based on indicators as value added and employment they may look less relevant, their strategic value is fundamental, as their output is relevant for all other ecosystems.



Value Added and Employment, 2018.
Source: European Commission analysis based on Eurostat [nama_10_a64] and [nama_10_a64_e]. Data refer to 2019, most recent year available.

[21] In this document, business economy is defined as total economy excluding financial services and public administration. While both financial services and public administration are clearly of great importance for the functioning of all industrial ecosystems, given their special nature, their inclusion in the calculation of the indicators would make some results more difficult to interpret.

All ecosystems have grown in gross value added between 2015 and 2019, with Digital, Construction and Tourism showing the largest growth rates. Looking at employment dynamics, the Digital, Tourism and Mobility-Transport-Automotive ecosystems show the largest increase while Textiles and Agri-food have marginally reduced total employment between 2015 and 2019.



Change in Value Added and Employment, 2015-2019
Source: European Commission analysis based on Eurostat [nama_10_a64] and [nama_10_a64_e].

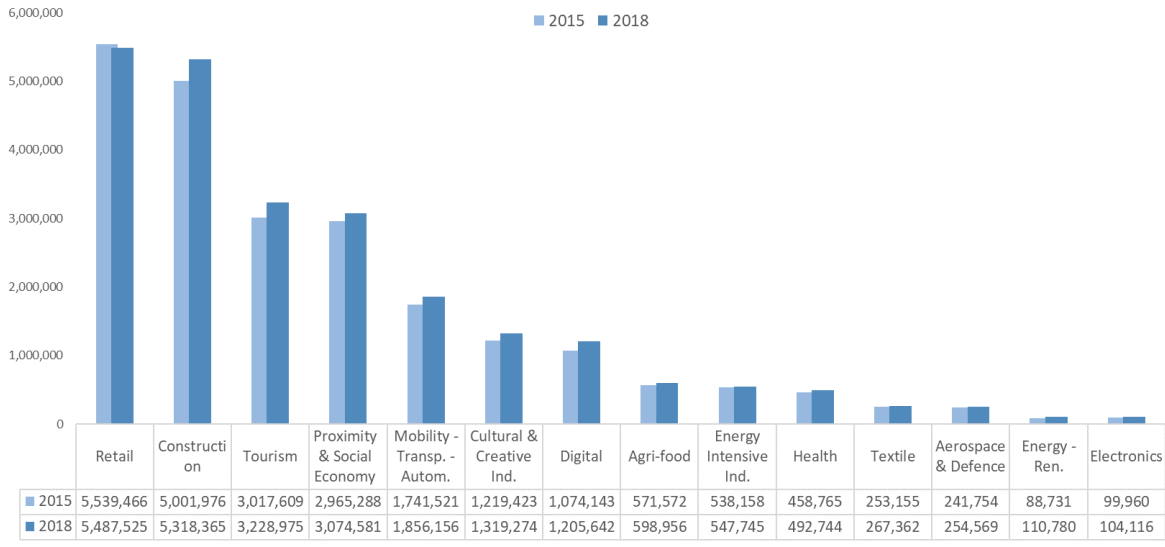
Gross Value added and Employment by ecosystem, 2019

	Gross Value Added (million EUR)	Total Employment (thousands)
Aerospace & Defence	246,999	3,605
Agri-food	602,983	16,083
Construction	1,208,032	25,380
Cultural and Creative Industries	457,117	8,299
Digital	674,286	6,663
Electronics	128,765	1,780
Energy - Renewables	127,452	1,183
Energy Intensive Industries	549,115	7,734
Health	1,221,472	25,232
Mobility - Transport - Automotive	929,684	14,875
Proximity, Social Economy and Civil Security	816,070	23,137
Retail	1,436,417	29,987
Textile	86,298	2,356
Tourism	880,561	20,739

The share of SME's value added and employment varies significantly by ecosystem. Construction and Textile have the largest share of employment and value added related to SMEs among the ecosystems for which data is available.

	Share of Persons Employed in % by size class, EU-27, 2019					Share of Value Added in % by size class, EU-27, 2019				
Ecosystem	0-9	10-49	50-249	250 or more	SME	0-9	10-49	50-249	250 or more	SME
Aerospace & Defence	10.7%	14.3%	19.9%	55.1%	44.9%	7.3%	11.6%	16.5%	64.7%	35.3%
Agri-food										
Construction	36.5%	23.7%	15.3%	24.5%	75.5%	29.2%	24.7%	17.3%	28.8%	71.2%
Cultural and creative industry	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Digital	23.6%	15.6%	16.5%	44.3%	55.7%	12.0%	11.8%	16.0%	60.2%	39.8%
Electronics	9.7%	13.9%	21.1%	55.3%	44.7%	5.7%	11.1%	18.8%	64.4%	35.6%
Energy-Renewables	12.0%	10.8%	16.5%	60.6%	39.4%	11.4%	8.7%	13.8%	66.1%	33.9%
Energy Intensive Industries	11.9%	15.8%	23.1%	49.1%	50.9%	5.7%	10.8%	20.8%	62.7%	37.3%
Health	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Mobility-Transport-Automotive	23.7%	17.3%	15.7%	43.3%	56.7%	12.7%	14.4%	15.5%	57.3%	42.7%
Proximity, social economy	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Retails	32.0%	19.1%	13.0%	35.8%	64.2%	21.9%	20.2%	16.8%	41.0%	59.0%
Textile	20.4%	26.3%	27.7%	25.6%	74.4%	13.6%	23.6%	26.9%	35.9%	64.1%
Tourism	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
European Commission calculation based on Eurostat data (National Accounts and Structural Business Statistics) and methodology developed by DG GROW.										

The number of firms varies significantly across ecosystems, signalling differences not only of size, but also of market structure. For instance, Retail and Proximity, Social Economy and Civil Security count also a very large number of small and labour intensive firms, while in other ecosystems more capital-intensive activities can lead to relatively more concentration (e.g. Energy-Renewables).

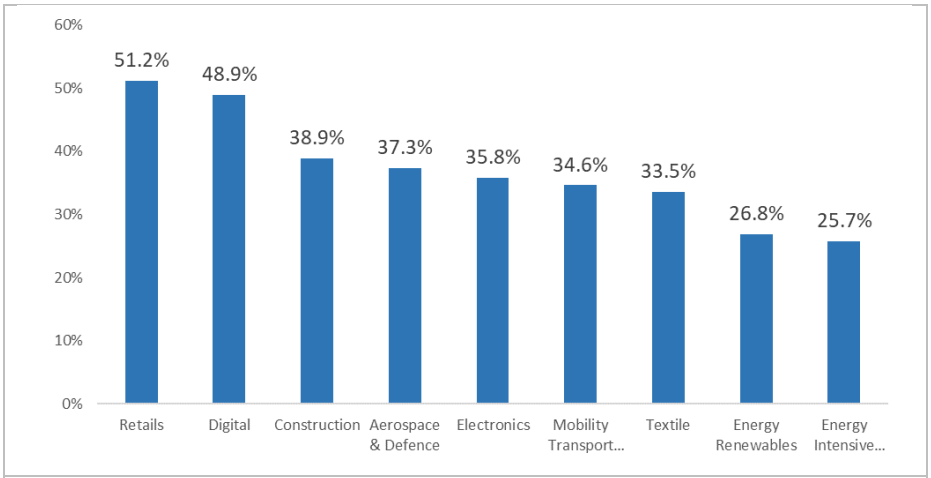


	Retail	Construction	Tourism	Proximity & Social Economy	Mobility - Transp. - Autom.	Cultural & Creative Ind.	Digital	Agri-food	Energy Intensive Ind.	Health	Textile	Aerospace & Defence	Energy - Ren.	Electronics
2015	5,539,466	5,001,976	3,017,609	2,965,288	1,741,521	1,219,423	1,074,143	571,572	538,158	458,765	253,155	241,754	88,731	99,960
2018	5,487,525	5,318,365	3,228,975	3,074,581	1,856,156	1,319,274	1,205,642	598,956	547,745	492,744	267,362	254,569	110,780	104,116

Number of Firms, 2015-2018.
Source**:** European Commission analysis based on Eurostat, Structural Business Statistics.

Strenght of the ecosystems: Value added to production value

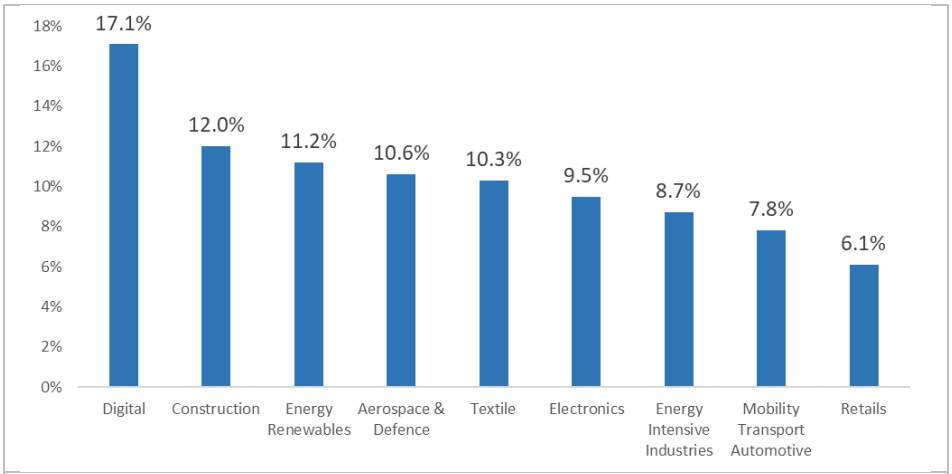
The share of value added to the value of production measures. what is left of the production value after taking into account intermediate consumption. It is a measure of the strength of the ecosystems, as it measures their capacity to generate value added using the intermediate inputavailable. Retail and digital are the best performong among the ecosystems for which data is available.



Ratio of value added to production value, 2019
Source**:** European Commission calculation based on Eurostat data (National Accounts and Structural Business Statistics) and methodology developed by DG GROW.'

Strenght of the ecosystems: Gross Operating Rate

The gross operating rate represents the share of value added minus personnel costs to turnover. It measures the ecosystem's capacity to generate a surplus through its standard activities, after the compensation of labour. The Digital ecosystem is the best performing among the ecosystems for which data is available.

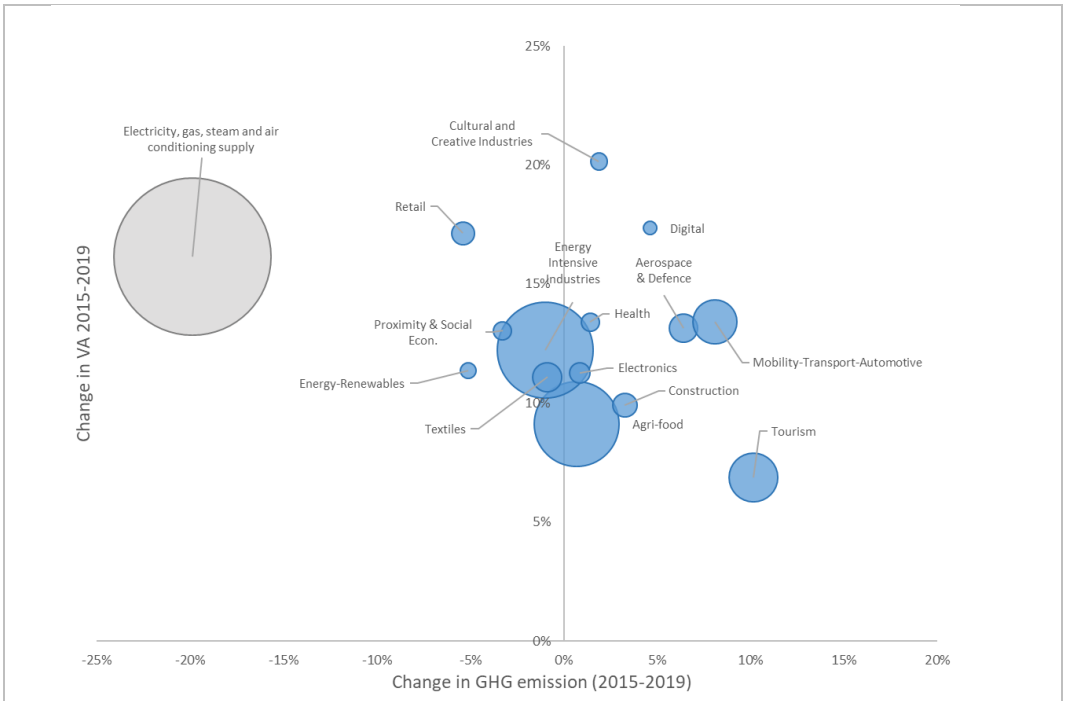


Gross Operating Rate, 2019

Source**:** European Commission calculation based on Eurostat data (National Accounts and Structural Business Statistics) and methodology developed by DG GROW.

Green transition: GHG emissions

Reducing Greenhouse gas emission is a top priority of the Commission. The increased ambition of the decarbonisation target (-55% by 2030) will require an effort from all ecosystems.

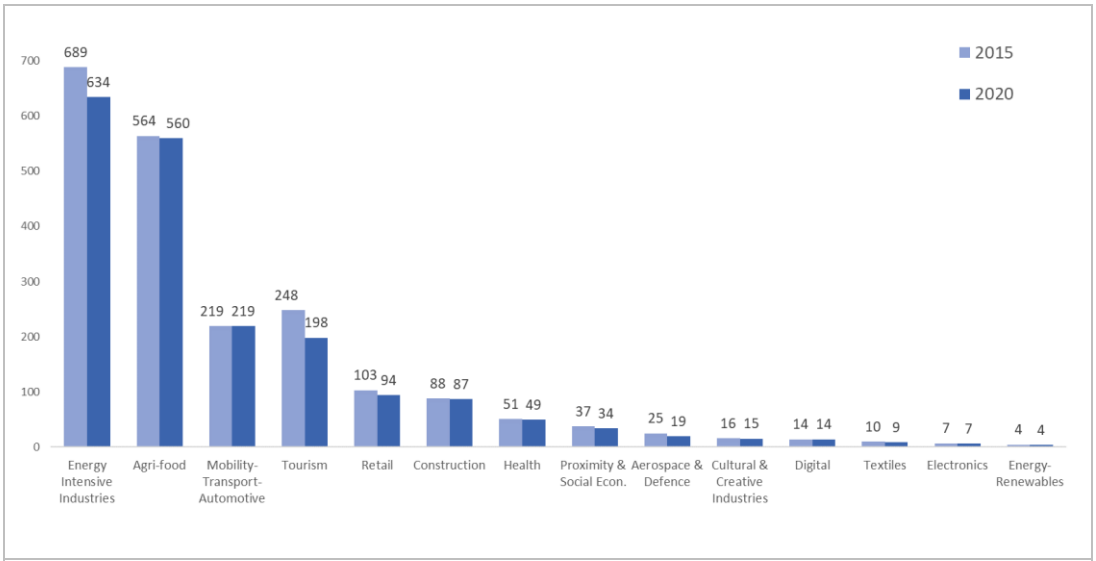


GHG emission intensity (2019)**, change in GHG emissions and changes Value Added** (2015-2019).
Source**:** European Commission analysis based on Eurostat [nama_10_a64] and [env_ac_ainah_r2]. The size of the bubble represents GHG emission intensity in 2018. The ecosystem Energy-renewables does not include emissions from energy generation, as they are assumed to be zero. The grey bubble represents the full energy sector (NACE D35), included for the sake of comparison.

In the graph above, GHG emissions are assumed to be nil for the generation of renewable energy, which is included in the Energy-Renewables ecosystem.[22] Nonetheless, the corresponding share of value added attributable to renewables is still included in the Energy-Renewables ecosystem. For the sake of comparison, the NACE sector "Electricity, gas, steam and air conditioning supply" (D35) is presented in the figure under a different colour to distinguish it from the industrial ecosystems. The sector D35 includes emissions and value added for both renewable and non-renewable energy supply. As shown by the size of the bubbles, "Energy Intensive Industries" and "Agri-food" had the highest level of GHG emissions intensity in 2019. Most ecosystems have reduced their GHG emission intensity between 2015 and 2019, as the positive change in Value

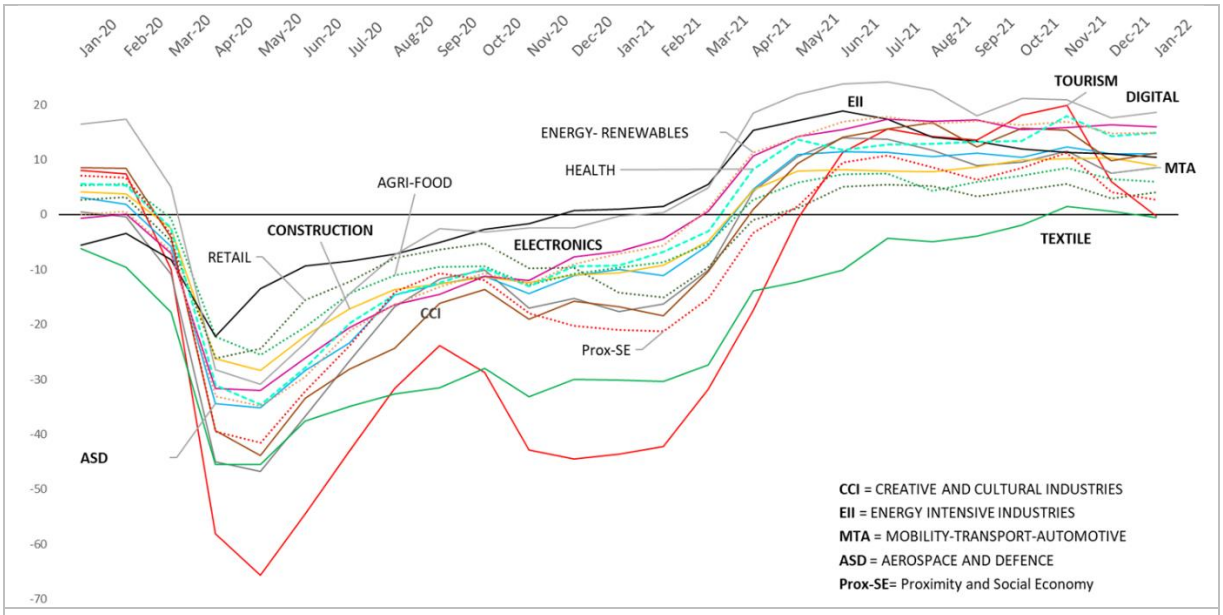
[22] This is of course an imprecise assumption, as even the generation of renewable energy requires a minimum of emissions.

Added is larger than the change in GHG emissions. For completeness, the next figure shows the latest available figures on emissions per ecosystem.



GHG emissions, 2015-2019, million tonnes.
Source**:** European Commission analysis based on Eurostat [env_ac_ainah_r2].

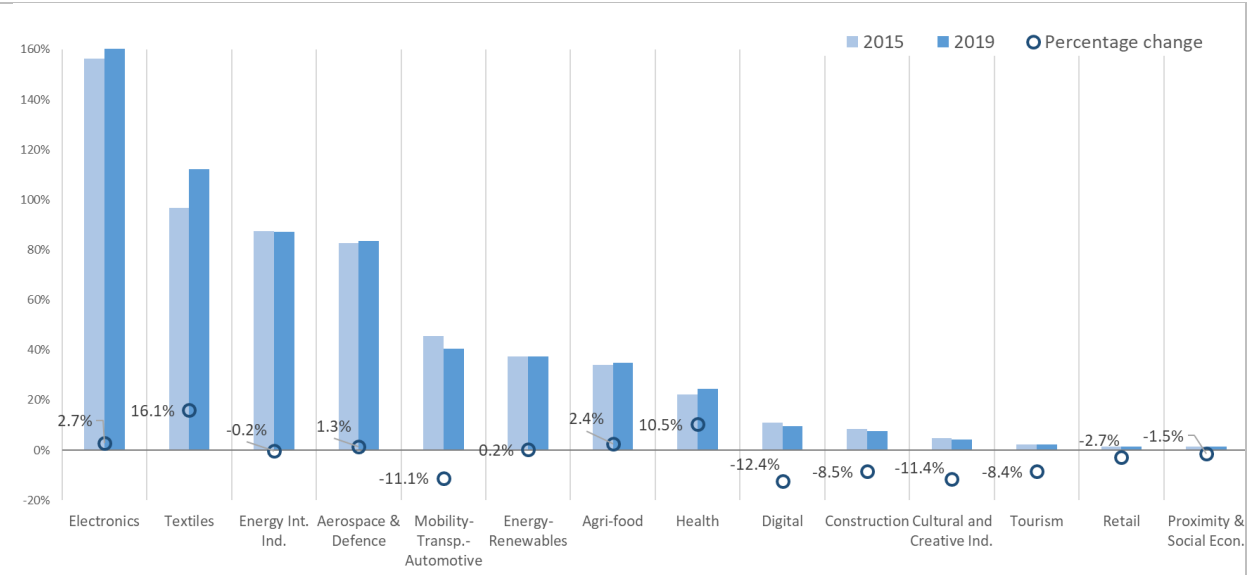
Short-term indicators: Economic confidence



Confidence Indicator by Ecosystem – 2020-2022, monthly.
Source: European Commission analysis based on data by the Joint Harmonised EU Programme of Business and Consumer Surveys. Note: For "Retail", "Agri-food", "Proximity, Social Economy and Civil Security", "Energy-Renewables", and "Health", data coverage is partial, so they are depicted using dotted lines and the related values have to be interpreted with caution. Data for Cultural and Creative Industries may underestimate the impact of the crisis, as data for some relevant sectors are not available.

Survey data helps complement the analysis by providing very timely information before the publication of official statistics. Data from the Joint Harmonised EU Programme of Business and Consumer Surveys can provide useful insights when used to build an economic sentiment indicator for each ecosystem.[23] In the most recent months, the confidence indicator remained rather stable or slightly improved in most industrial ecosystems. The important exception is Tourism, for which confidence levels dropped dramatically and turned negative, something that had not happened since April 2021. the decline of confidence in Tourism during the December and January is remarkable, moving from being the second best performing ecosystem to the worst performing one, together with Textiles.

International dimension: Trade

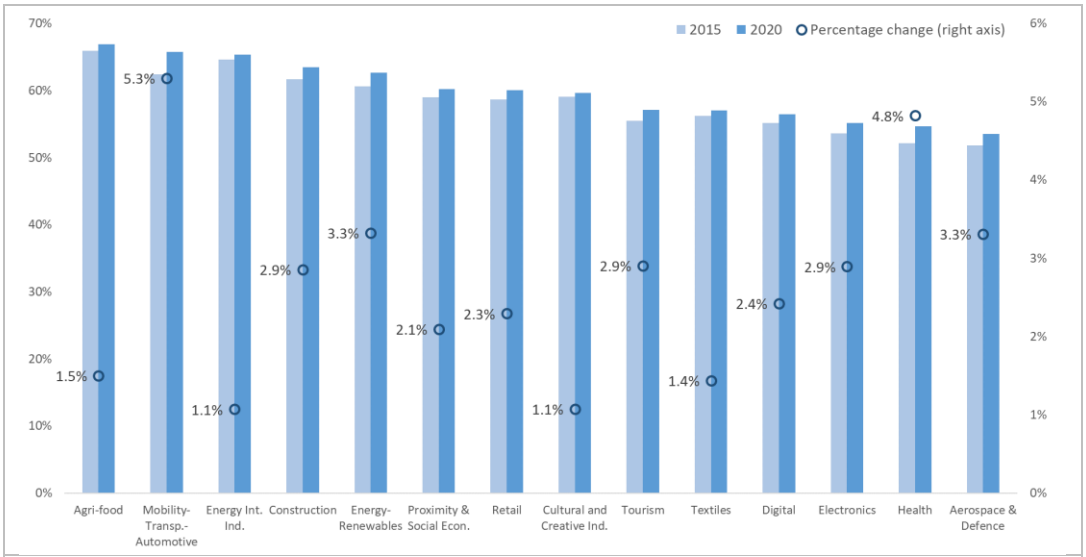


Export Intensity: extra EU exports as percentage of value added.
Source: European Commission analysis based on Eurostat, EU trade since 1988 by CPA 2.1 [DS-1062396].

The fourteen industrial ecosystems differ significantly in their export intensity, with "Electronics", "Textiles" and "Energy Intensive Industries" showing the highest values. Given the profoundly different nature of the ecosystems analysed here, this divergence should not be interpreted as a signal of dismal performance by some of them. Indeed, export of goods is clearly not a core activity for ecosystems as Proximity, Social Economy and Civil Security, or for a service ecosystem as Retail. The change in export intensity across ecosystems between 2015 and 2019 has been relatively small. "Textile" is a notable exception, with an increase of export intensity of 9 percentage points.

[23] We build a profile of the economic sentiment for each ecosystem, by aggregating the data for the different sectors. We calculate a weighted average of the values of those sectors included in the definition of each ecosystem; the weights are based on the share of value added that each sector has in the total value added of the ecosystem, as a measure of the relevance of that sector to that ecosystem. This surveys-based indicator is highly correlated (80%) with the data on actual changes in turnover, for each ecosystem in each month.

All ecosystems rely more on intra EU trade than on extra EU trade. The changes since 2015 across ecosystems are relatively small.

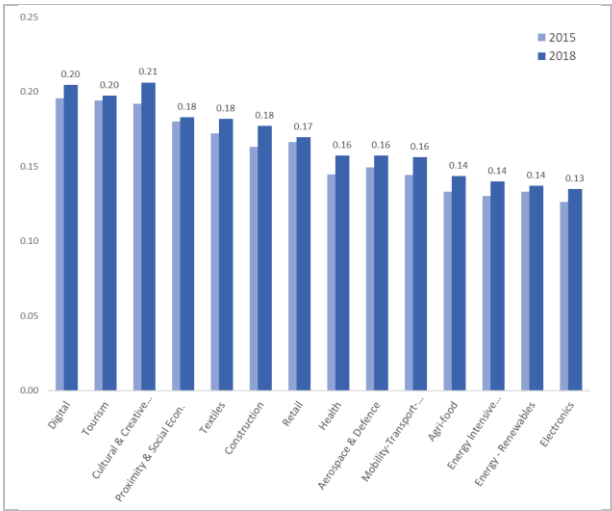


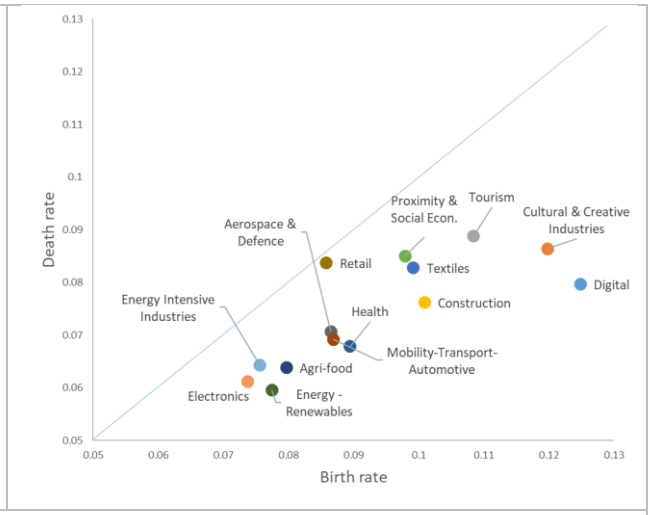
Intra EU Trade: share of total ecosystem trade.
Source: European Commission analysis based on Eurostat EU trade since 1988 by CPA 2.1 [DS-1062396], last update 18 March 2021.

Resilience: the dynamism of ecosystems

The ecosystems differ less significantly in their level of dynamism, as measured by entry and exit of firms and by the churn rate, defined as the sum of birth and death rate of firms. These indicators proxy the degree of "creative destruction" of the ecosystems, which contribute to aggregate productivity growth of business.[24] The separate analysis of birth and death rates shows that for all ecosystems the birth rate is higher than the death rate. However, for Retail the births and deaths are very similar.

[24] See, for instance, Calvino, F., C. Criscuolo and R. Verlhac (2020), "Declining business dynamism: Structural and policy determinants", OECD Science, Technology and Industry Policy Papers, No. 94, OECD Publishing, Paris, https://doi.org/10.1787/77b92072-en.





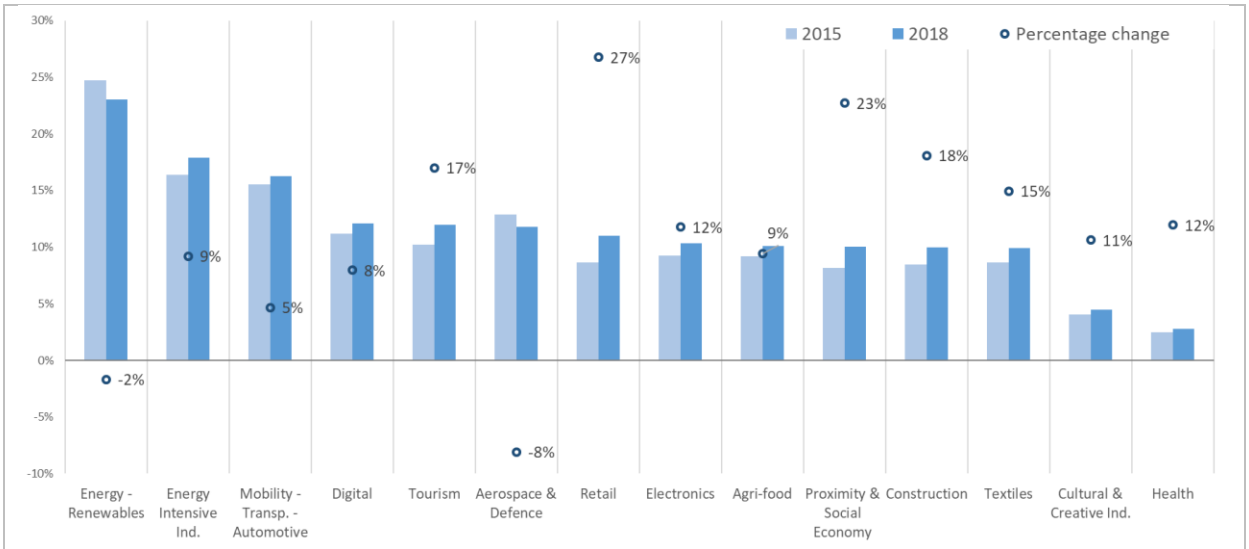
Churn rate of businesses of EU ecosystems, 2015-2018
Source: European Commission analysis based on Eurostat [bd_9bd_sz_cl_r2]. Data refer to 2018. Data are not fully available for for Agri-food, Creative & Cultural Industries, and Proximity and Social economy.

The data used to calculate this indicator do not cover the whole economy. The ecosystems Agri-food, Health, Cultural and creative industries as well as Proximity, Social economy and Civil security are only partially covered, hence result should be interpreted with caution.

Resilience: Investments in tangibles

The table below shows a measure of investment intensity, given by the ratio of investment in tangibles to Value Added. The Energy-Renewable ecosystem shows the highest investment intensity, which is not surprising given the capital-intensive nature of energy generation.

Most ecosystems increased their investment intensity from 2015, with the only exceptions for Aerospace & Defence and Energy – Renewables, for which the ratio has slightly decreased, mostly due to a strong increase of value added creation. However, this measure does not take into account investments in non-tangible goods, whose importance is rapidly increasing.



Investment in tangibles as a share of Value Added: 2015 and 2018 (%).
Source: European Commission analysis based on Eurostat, Structural Business Statistics [partial data coverage of some ecosystems notably Agri-food; Cultural and Creative Industries; Health; Proximity, Social Economy and Civil Security and Tourism].

The data used to calculate this indicator do not cover the whole economy. The ecosystems Agri-food, Health, Cultural and creative industries as well as Proximity, Social economy and Civil security are only partially covered, hence results should be interpreted with caution.

Methodology for constructing the data used for the analysis of industrial ecosystems

The industrial ecosystems in this report are composed of a number of related industries and competences that show strong inter-industry interdependencies. The industries are identified according to their main activities. The data used to compile indicators on the ecosystems are derived from official statistics, including national accounts, Structural Business Statistics, and Short-term business statistics. These statistical sources use the NACE rev.2 classification to identify enterprises according to their main activity.

The NACE rev.2 classification has also been used to define the 14 industrial ecosystems, as reported in the table below. The mapping provided in this list is based on 2-digits classification. This level of granularity is not optimal to identify all the elements of the ecosystems, but most of the data sources we used to calculate indicators are only available at the 2-digits level. This affects the precision of the indicators. The most relevant issues were alleviated by defining weighs for those 2-digits sectors that include activities relevant for different ecosystems. Weights have been calculated based on more granular datasets when available, or based on existing studies. They are reported in the column "Share". As ecosystems naturally overlap, some sectors are attributed to more than one ecosystem.

Ecosystem	NACE_R2	Description	Share*
Aerospace & Defence	C25	Manufacture of fabricated metal products, except machinery and equipment	0.01^
Aerospace & Defence	C26	Manufacture of computer, electronic and optical products	0.44
Aerospace & Defence	C27	Manufacture of electrical equipment	0.24
Aerospace & Defence	C30	Manufacture of other transport equipment	0.68
Aerospace & Defence	C33	Repair and installation of machinery and equipment	0.08^
Aerospace & Defence	H51	Air transport	0.09
Aerospace & Defence	H52	Warehousing and support activities for transportation	0.18
Aerospace & Defence	J61	Telecommunications	0.07
Aerospace & Defence	N80	Security and investigation activities	1
Agri-food	A	Agriculture, forestry and fishing	1
Agri-food	C10	Manufacture of food products	1
Agri-food	C11	Manufacture of beverages	1
Agri-food	C12	Manufacture of tobacco products	1
Construction	C31	Manufacture of furniture	1
Construction	F	Construction	1
Construction	M71	Architectural and engineering activities; technical testing and analysis	1
Construction	N81	Services to buildings and landscape activities	1
Cultural and Creative Industries	C18	Printing and reproduction of recorded media	1
Cultural and Creative Industries	C32	Other manufacturing	0.08
Cultural and Creative Industries	G47	Retail trade, except of motor vehicles and motorcycles	0.01
Cultural and Creative Industries	J58	Publishing activities	1
Cultural and Creative Industries	J59	Motion picture, video and television programme production, sound recording and music publishing activities	1
Cultural and Creative Industries	J60	Programming and broadcasting activities	1
Cultural and Creative Industries	J62_63	Computer programming, consultancy and related activities;	0.004
Cultural and Creative Industries	M71	Architectural and engineering activities; technical testing and analysis	0.15^

Cultural and Creative Industries	M73	Advertising and market research	1
Cultural and Creative Industries	M74	Other professional, scientific and technical activities and veterinary activities	0.44
Cultural and Creative Industries	N77	Rental and leasing activities	0.0001^
Cultural and Creative Industries	P85	Education	0.1
Cultural and Creative Industries	R90-R92	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities	0.8
Cultural and Creative Industries	S94	Activities of membership organisations	0.02
Cultural and Creative Industries	S95	Repair of computers and personal and household goods	0.26
Digital	C26	Manufacture of computer, electronic and optical products	0.29
Digital	J58	Publishing activities	1
Digital	J61	Telecommunications	0.97
Digital	J62	Computer programming, consultancy and related activities	1
Digital	J63	Information service activities	1
Digital	S95	Repair of computers and personal and household goods	0.48
Electronics	C26	Manufacture of computer, electronic and optical products	1
Electronics	C28	Manufacture of machinery and equipment n.e.c.	0.10^
Energy - Renewables	C27	Manufacture of electrical equipment	0.38
Energy - Renewables	D35	Electricity, gas, steam and air conditioning supply	0.29
Energy Intensive Industries	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1
Energy Intensive Industries	C17	Manufacture of paper and paper products	1
Energy Intensive Industries	C19	Manufacture of coke and refined petroleum products	1
Energy Intensive Industries	C20	Manufacture of chemicals and chemical products	1
Energy Intensive Industries	C22	Manufacture of rubber and plastic products	1
Energy Intensive Industries	C23	Manufacture of other non-metallic mineral products	1
Energy Intensive Industries	C24	Manufacture of basic metals	1
Health	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	1
Health	C32	Other manufacturing	1
Health	Q86	Human health activities	1
Health	Q87_Q88	Residential care activities and social work activities without accommodation	1
Mobility - Transport - Automotive	C27	Manufacture of electrical equipment	0.03
Mobility - Transport - Automotive	C29	Manufacture of motor vehicles, trailers and semi-trailers	1
Mobility - Transport - Automotive	C30	Manufacture of other transport equipment	0.32
Mobility - Transport - Automotive	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles	1
Mobility - Transport - Automotive	H49	Land transport and transport via pipelines	0.52
Mobility - Transport - Automotive	H50	Water transport	0.69
Mobility - Transport - Automotive	H52	Warehousing and support activities for transportation	0.39
Proximity & Social Economy	G47	Retail trade, except of motor vehicles and motorcycles	0.16
Proximity & Social Economy	I	Accommodation and food service activities	0.14
Proximity & Social Economy	L	Real estate activities	0.08
Proximity & Social Economy	N81	Services to buildings and landscape activities	0.28
Proximity & Social Economy	N82	Office administrative, office support and other business support activities	0.11
Proximity & Social Economy	Q87_Q88	Residential care activities and social work activities without accommodation	1
Proximity & Social Economy	S95	Repair of computers and personal and household goods	1
Proximity & Social Economy	S96	Other personal service activities	1
Proximity & Social Economy	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	1

Retail	G46	Wholesale trade, except of motor vehicles and motorcycles	1
Retail	G47	Retail trade, except of motor vehicles and motorcycles	1
Retail	H53	Postal and courier activities	1
Textile	C13	Manufacture of textiles	1
Textile	C14	Manufacture of wearing apparel	1
Textile	C15	Manufacture of leather and related products	1
Tourism	H49	Land transport and transport via pipelines	0.45
Tourism	H50	Water transport	0.21
Tourism	H51	Air transport	0.91
Tourism	I	Accommodation and food service activities	1
Tourism	N79	Travel agency, tour operator and other reservation service and related activities	1
Tourism	N82	Office administrative, office support and other business support activities	1
Tourism	R90-R92	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities	0.67
Tourism	R93	Sports activities and amusement and recreation activities	1

*Shares shown in the table are computed based on value-added. Shares computed based on employment data are also used for the analysis but not shown.
^ Additional share on top of horizontal component (cfr. below).

Some sectors are horizontal in nature and, as such, they contribute to the well-functioning of all the ecosystems. These are marked as "Horizontal" in the table above. To take into account their contribution, these sectors have been distributed across ecosystems using Input-Output tables,. which allows to calculate how much each horizontal sector is used by the rest of the ecosystems. In particular, it is possible to calculate the share of value added of the horizontal sector which is embodied in the output of other sectors in the ecosystem. In general terms, these weights ($\boldsymbol{Weight}_{is}^{kz}$) are defined as follows:

$$\boldsymbol{Weight}_{is}^{kz} = \frac{v^{kz}\boldsymbol{\Lambda}_{is}^{kz}\sum_{j=1}^{N} f_j^{is}}{va^{kz}}$$

where $\boldsymbol{\Lambda}$ measures the total euro worth of country-sector *kz* goods required to meet 1 euro worth of country-sector *is'* final demand, defined as ($\sum_{j=1}^{N} f_j^{is}$). Note that the final demand of country-sector *is* is consumed by different countries *j*. The value created by country-sector *kz* is captured by v^{kz}. The total value-added generated by country-sector *kz* is denoted as va^{kz}. In this setting, *kz* is the EU's horizontal sector and *is* captures the different non-horizontal sectors of the EU. Once these weights are defined at a NACE rev. 2 level, the second step uses the definition of different ecosystems in order to capture to what extend horizontal sectors are important for the different ecosystems. The weights are summarised in the table below:

	C25	C28	C33	E36	E37-E39	M69_M70	M71	M72	N77_N78
Aerospace & Defence	6.74%	6.79%	7.76%	1.74%	2.74%	2.50%	3.37%	5.65%	2.71%
Agri-food	6.62%	7.82%	11.85%	12.18%	9.48%	7.72%	6.02%	7.21%	8.21%
Construction	30.52%	19.84%	15.54%	10.25%	13.67%	11.51%	25.68 %	10.41%	12.92%
Cultural and Creative Industries	0.90%	1.26%	1.32%	2.47%	1.89%	2.77%	2.03%	2.72%	2.85%
Digital	2.09%	3.05%	3.29%	2.22%	2.78%	5.13%	4.42%	6.90%	5.17%

Electronics	1.96%	2.26%	1.53%	0.69%	1.02%	1.17%	1.46%	5.07%	1.30%
Energy - Renewables	1.56%	1.60%	1.64%	1.13%	1.43%	0.97%	1.17%	0.83%	0.85%
Energy Intensive Industries	3.63%	4.01%	4.74%	4.01%	8.62%	4.91%	3.68%	3.06%	3.13%
Health	5.16%	5.62%	6.86%	11.10%	8.53%	8.76%	7.61%	14.22%	10.00%
Mobility - Transport - Automotive	23.55%	27.76%	16.53%	5.82%	9.82%	8.62%	9.29%	13.00%	8.55%
Proximity, Social Economy and Civil Security	2.35%	3.00%	3.57%	7.65%	5.37%	5.72%	4.42%	4.65%	6.12%
Retail	4.42%	5.73%	6.47%	7.41%	7.76%	13.45%	8.00%	8.14%	12.69%
Textile	0.85%	1.00%	0.97%	1.29%	1.44%	1.15%	1.12%	1.15%	0.99%
Tourism	3.68%	5.01%	7.17%	10.46%	7.12%	6.76%	5.49%	4.85%	8.28%

All weights refer to 2014, i.e. the latest year for which Input-Output tables are available. It should be noted that the list of "Horizontal" sectors does not include financial services. Financial services are obviously of primary importance for industrial ecosystems, as without those most of the daily operations and investments would be impossible. Insurance services are also of the essence. However, the relevance of these services is also reflected in the impact their inclusion would have on several indicators. Since in the analysis of KPIs we want to focus on the industrial component of ecosystems, we opted for excluding financial activities.

Annex 5: Investment volumes in a number of areas of relevance for the EU's green, digital and resilient transformation

This Annex presents an illustration of investment volumes which can currently be observed **in nine industrial areas, in support of a green, digital and resilient EU**, that is: raw materials, batteries, solar PV, hydrogen, steel, cement, chemicals, clouds services, and cybersecurity. However, this assessment is not more than an illustration and does not represent an exhaustive analysis of the selected sectors With the exception of hydrogen[25], such volumes relate to budgets of pipeline projects and commitments of, or goals set by, the industry to contribute to policy objectives: whilst in some cases such contribution has been validated by public authorities (e.g. approved IPCEIs), in other cases it only reflects an ambition of industrial actors to play a role in the achievement of EU policy objectives. Such private sector endeavours are often the response to public sectors calls: therefore, this Annex also outlines ongoing EU initiatives and support instruments and tools which have been used to channel private sector commitments. For cloud and cybersecurity, numbers draw on the analysis made in the preparation of the NGEU, and extrapolates those numbers to get an aggregate investment figure up to 2030.[26]

These nine areas have been selected in view of their relevance for most ecosystems and the important role they play for the competitiveness of tomorrow's industry. The nine areas share one or more of the following characteristics, which have been used as selection criteria. *First*, the importance of the product or technology as enabler of the EU's green and digital industrial transformation: this is the case for example for batteries, solar panels, hydrogen, clouds services and cybersecurity.[27] *Second*, the large magnitude of the transformation effort ahead, including for the decarbonisation of energy intensive industries, decontamination circularity of production activities, as well as innovation and digitalisation: this is the case for example for cement, steel and chemicals. *Third*, the fact that in the Commission's assessment of strategic dependencies the EU has been found to be highly dependent on third countries for access to the products and technologies at stake and therefore that their resilience has to be strengthened:[28] this is the case for raw materials, solar PV and cloud services[29].

[25] For hydrogen, the investment relate to policy targets in the European Hydrogen Strategy.
[26] SWD (2020) 98 final, table 2.
[27] For instance, the EU experienced significant supply challenges and price spikes in construction materials in 2021, such as steel and cement.
[28] The Industry Strategy update highlighted the importance of better understanding the EU's strategic dependencies and presented a comprehensive assessment, which identified them across a number of sensitive ecosystems (COM(2021)350 final). The Commission carried out a *first round of in-depth reviews* on strategic dependencies, which covered raw materials, batteries, semiconductors, cloud, hydrogen and active pharmaceutical ingredients. An upcoming *second round* addresses rare earth permanent magnets, chemicals, solar panels, cybersecurity, and IT software.
[29] In addition, the EU's dependence on a number of critical raw materials has spill-over effects to a wide range of key areas where these raw materials act as inputs to EU value chains (including e.g. batteries, clean hydrogen, green steel and chemicals).

The investment volume per each of these areas is presented in Table 1. The total cumulative investment volume for the nine selected areas at around **EUR 405 billion for the period up to 2030**, **which corresponds to ca. EUR 45 billion annually**.

Table 1: Overview of cumulative investment volume over the period 2022-2030 for nine industrial areas of relevance

	Industrial Ecosystem	**Investment, EUR** ***overall estimate not available – number reflect pipeline**	**Link to relevant policy priorities**
Raw Materials	Mobility-Transport-Automotive, Aerospace & Defence, Energy Intensive Industries, Digital, Renewable Energy, Electronics	12bn*	Relevant for the green and digital transition and for EU resilience
Batteries	Mobility-Transport-Automotive, Renewable Energy, Electronics Aerospace & Defence	172bn	Relevant for the green and digital transition and for the EU resilience.
Solar PV	Renewable Energy, Aerospace & Defence.	8.1bn[#]	Relevant for the green transition and for the EU resilience
Hydrogen	Mobility-Transport-Automotive, Energy Intensive Industries, Renewable Energy, Aerospace & Defence.	24-42bn	Relevant for the green transition.
Cement	Energy Intensive Industries, Construction	7.7bn*	Relevant for the green transition.
Steel	Energy Intensive Industries, Aerospace & Defence	25bn*	Relevant for the green transition.
Chemicals	Energy Intensive Industries, Agrifood	20bn	Relevant for the green transition and for the EU resilience.
Cloud services	Digital, Electronics, Aerospace & Defence	100bn	Relevant for the digital and green transition.
Cybersecurity	Digital, Electronics, Aerospace & Defence.	27bn	Relevant for the resilience and digital transition.
Total		**405bn**	

Note: Figures related to the digital transformation (i.e. cloud services and cybersecurity) are currently being updated in view of the 2030 digital decade targets. For these areas, figures have been extrapolated from estimates in table 2 of SWD (2020) 98 final. For hydrogen, the midpoint of the range (33bn) is used in the sum. Note that only expected electrolyser costs and technology mix is considered in the hydrogen estimate.

[#]: Figure for the Solar PV goal includes investment up to 2025

Source: EC elaboration based on data collected and/or estimated through consultations with relevant public stakeholders, industrial associations and alliances.

The following sections dive deeper into the nine areas of relevance, providing details on: the investment volumes related to policy or industry goals; project pipelines that have been committed, announced or planned by industry; and the policy support instruments at EU level.

Raw materials

The area of raw materials is critical to underpin the creation and development of a number of clean technologies (e.g. e-mobility, batteries, wind turbines). The European Raw Material Alliance has already identified 28 industrial projects in the EU that would require an investment of EUR 12 billion.[30] Out of those 28 projects, 14 focus on the entire rare earth magnets value chain: mining, processing separation, metallurgy and magnets recycling and aim to satisfy 15-20% of the EU demand (depending on the material) by 2030. The private investments should be the main source of finance.

The main support tools in this area include the Alliance, led by EIT Raw Materials, to identify investment needs and develop a project pipeline[31]; Horizon Europe and InvestEU investments in R&I and capacities (e.g. sourcing, processing, recycling); the Clean Technology Materials Task Force, joint between the Commission industrial alliances and investors, to foster investment funding; in the Innovation Fund, CRM value chain investments can be eligible; and a new public-private Sustainable Battery Materials Fund announced by European Battery Alliance set to invest some EUR 400 million on exploration and sustainable processing of battery raw materials.

Batteries

In the area of batteries, according to EIT InnoEnergy, a battery production capacity of 1000 GWh per year by 2030 is associated with investments of around EUR 172 billion. In this context, InnoEnergy[32] has reported that around EUR 32 billion has been already committed in investment by businesses in the ecosystem by 2030. Projects cover the whole value chain focusing on raw materials extraction and processing, manufacturing of active materials, cells and modules, and recycling. Most of this investment (around 95%), both committed and planned, is coming from the private sector.

A good example of support tools in this area are the two Important Projects of Common European Interest (IPCEI) which allow Member States to devote public resources (in this case state aid) to supporting the development of a number of breakthrough technology projects across the value chain. The two battery IPCEIs have been established involving 12 Member States and nearly 60

[30] Source: European Raw Material Alliance (ERMA) and "Rare Earth Magnets and Motors. A European Call for Action".
[31] The EU's needs for non-fossil raw materials in the low-carbon economy will be multi-fold and cannot be met by recycling alone See Raw Materials Scoreboard: https://op.europa.eu/en/publication-detail/-/publication/eb052a18-c1f3-11eb-a925-01aa75ed71a1.
[32] InnoEnergy's estimates.

companies for which up to EUR 6.1 billion in State aid has been approved, leveraging an expected further EUR 14 billion in private investments. Other support tools include a dedicated partnership for battery-related research (Batt4Eu) under Horizon Europe with planned EUR 925 million and InvestEU funding in support of R&I activities and capacities (e.g. projects on battery manufacturing, including circularity aspects).

Solar Power

The European Solar Initiative (ESI) estimates that an EU manufacturing capacity of solar PVs of 20GW by 2025 is associated with investments of EUR 8.1 billion (EUR 2.4 billion for the manufacturing of polysilicon; EUR 1 billion for ingots; EUR 1.2 billion for wafers; and EUR 3.5 billion for cells and modules). Across all of those components a substantial project pipeline is being developed. In particular, around 14 projects have been developed, covering wafer, ingot, cell and module manufacturing[33]. A significant share of projects is however for the moment in a draft stage with financing yet to be secured.

Main support tools include the industry-led European Solar Initiative platform to accelerate the deployment of EU solar PV manufacturing projects; InvestEU will be able to support the scaling up of production of viable technologies and investments in R&I and capacities; Innovation Fund also partially providing scaling-up project;[34] and the Clean Energy Transition co-funded European partnership (EUR 210 million) under Horizon Europe to support R&I; various innovation support schemes deployed under RRF and the European Structural and Investment Funds for the development and commercialisation of innovative solar technologies.

[33] That project pipeline includes notably: a) an expansion of current cell and module manufacturing from 1.4 GW to 4.3 GW by Mever Burger (DE); from 100 MW to multi-GW by Oxford PV (DE); from 80 MW to 3 GW by 3SunFactory (IT) If realised, that project pipeline would bring the industry close to achieving the 20GW manufacturing capacity objective; b) new cell and module manufacturing by Giga PV with a 1 GW capacity in PL; 5 GW capacity by Green Fab in DE and 5 GW by Greenland factory in ES; c) New ingots and wafer production located in Norway and Spain.

[34] For instance, Innovation Fund awarded financial support for the development of an industrial-scale pilot line for innovating PV panels in Italy, see Innovation Fund – Focus on - Results of the first call for large-scale project

Hydrogen

The EU set itself ambitious targets for the production of clean hydrogen to decarbonise industry and transport sectors, planning to install 40 GW of renewable hydrogen electrolysers by 2030, up from 0.1 GW today. The EU Hydrogen Strategy[35] expects the installation of 40 GW electrolysers to be associated with investments of around EUR 24 - 42 billion.[36]

Following decades of research, European industry is now getting ready for deploying hydrogen technologies and applications at market-scale. The European Clean Hydrogen Alliance (ECHA) in November 2021 presented a pipeline of over 750 hydrogen projects that its members are preparing to undertake by 2030 and that include, among others, the installation of 21 GW of electrolyser capacity requiring an estimated investment of EUR12.5 billion[37]. Extrapolating this figure to reach the 40 GW target of the Hydrogen Strategy imply project-related investment needs of the order of EUR 24 billion.

Main support tools in this area include a number of EU funding instruments[38] (around EUR 800 million/year) in support of hydrogen production and offtake projects;[39] the preparation of a series of hydrogen IPCEIs that will allow state aid to be provided to breakthrough innovations in the hydrogen value chain as well as for large-scale open hydrogen generation and transmission projects; substantial investment (around EUR 10 billion) under the RRPs; the co-funded European Partnership on Clean Hydrogen under Horizon Europe (EUR 2 billion) to boost R&I[40]; the European Clean Hydrogen Alliance, set up by the Commission, to build an investment pipeline [41]; in the Innovation Fund supports a number of hydrogen technologies and projects, notably in energy intensive industries

Steel

In the area of the green steel, EU steel industry is responsible for 5% of total EU GHG emissions. 54 low-CO2 projects have been identified to start before 2030. The projects focus on circular economy, carbon direct avoidance, smart carbon usage, and carbon capture and storage. This project pipeline would potentially result in the abatement of one third of current emissions by 2030 (76Mt/year). The estimated investments would be EUR 25 billion in CAPEX (additional EUR 45 billion in OPEX).[42] This area has strong links with hydrogen investments, in particular those under the hydrogen IPCEI. The public funding may play a role by de-risking investments into the first of the kind facilities using the innovative technologies like hydrogen-based steel making. While

[35] A hydrogen strategy for a climate-neutral Europe, European Commission (COM(2020) 301 final.
[36] European Commission services calculations include only expected electrolyser costs and technology mix.
[37] For the project pipeline of the European Clean Hydrogen Alliance see: Project pipeline (europa.eu).
[38] See hydrogen public funding compass: Funding guide (europa.eu).
[39] GROW calculations based on available EU funding instruments.
[40] Delivering the European Green Deal | European Commission (europa.eu) ; Hydrogen and Decarbonised Gas Package (europa.eu).
[41] European Clean Hydrogen Alliance
[42] EUROFER (European Economic and Social Committee –September 2021).

markets for sustainable, green and circular products develop and green steel has still to compete in the market with cheaper conventional fossil fuels based alternatives, the public support will be needed through instruments like Carbon Contracts for Difference.

Main support tools in this area include the Research Fund for Coal and Steel (RFCS) to finance R&I projects in coal and steel; the co-programmed Clean Steel Partnership, under Horizon Europe, to pilot breakthrough technologies able to reduce CO2 emissions from EU steel industry; and InvestEU support to R&I projects in the field of clean steel. The Innovation Fund will support, among other technologies, projects in carbon capture use and storage for green steel and all the EIIs' sectors reported in next paragraphs. Furthermore, the recently adopted Climate, Environmental protection and Energy State aid Guidelines (CEEAG), which support the deployment of innovative technologies for decarbonising CO2 emitting industrial processes, provides an updated reference framework for public support that can be appropriately used in the field of steel.

Cement

In the area of cement, the industry aims to achieve savings of 2.5 Mt CO2/year until 2030, going up thereafter by 4Mt CO2/year from 2030 to 2050. Relevant projects would mostly focus on innovation and new technologies, CCS (Carbon Capture and Storage) and CCU (Carbon Capture and Utilisation), resource efficiency, low carbon products, energy efficiency. The associated investments would be EUR 7.7 billion.[43]

Main support tools in this area include the Innovation Fund to support some projects for decarbonising the cement sector; Horizon Europe will also invest in R&I (EUR 100 million for demo projects, feasibility studies on CO2 carbon capture, utilisation and storage, CO2 removal and CO2 carbon capture and utilization for production of materials, chemicals and fuels); and InvestEU will support the decarbonisation and sustainability of the cement industry.

Chemicals

In the area of chemicals, a total of EUR 20 billion of "low-carbon investments" (CAPEX) for the period 2021-2030 is estimated.[44] These investments will aim to achieve between 17% and 20% GHGs reduction by 2030 (wrt 2019). Around 78 projects have been proposed on Low Carbon Industry for abatement of 28Mt CO2/year. A substantial project pipeline is still in development stage. [45]

The investment projects will comprise carbon circularity, electrification, innovative products, process efficiency, carbon capture and storage among others (it is only an initial list of examples

[43] Cement industry estimates.
[44] Estimations from the European Chemical Industry Council (CEFIC)'s 'iC2050' model (transition modelling tool).
[45] CEFIC iC2050 Project Report.

of possible major investments in innovation toward 2050 objectives, not the complete picture of investments for GHG emission reduction by 2030). [46]

Main support tools in this area include Horizon Europe to support R&I in sustainable chemicals (EUR 15-20 million), new electrochemical conversion routes (EUR 8-12 million), energy efficiency improvement in process industries or electrification of+ processes (not only for chemical), the production of safer and more sustainable chemicals (EUR 100 million); InvestEU for decarbonisation and sustainability; and LIFE for the support the transition towards a decarbonised and toxic-free economy through its sub-programme on circular economy and quality of life, with an overall budget of around EUR 100 million annually. The recently adopted Climate, Environmental protection and Energy State aid Guidelines (CEEAG) provides an updated framework for public support that can be used in this field.

Cloud Services

In the area of cloud services, the investment gap is estimated to about EUR 11bn/y,[47] or EUR 100 billion by 2030. Twelve Member States are preparing a proposal for an IPCEI on the next generation of Cloud Infrastructure & Services (IPCEI-CIS)[48]. The Connecting Europe Facility[49] and Digital Europe programmes[50] are funding European projects aimed at deploying both infrastructures and cloud-to-edge services supported by a smart middleware for an amount of EUR 110 (2021-2023) & 140 (2021-2022) million respectively.

Main support instruments include the Digital Decade with the twofold objective of deploying 10,000 climate neutral highly secure edge nodes in the EU by 2030 at an estimated cost of around EUR 3 billion altogether, and having 75% of European enterprises take up cloud services; the recently created European Alliance for Industrial Data, Edge and Cloud[51], which will update an existing technology roadmap[52]; and substantial investments in RRPs of many Member States to modernise cloud infrastructure and support business cloudification.

Cybersecurity

In the area of Cybersecurity, associated investment amounts to around EUR 27 billion over the period 2022-2030[53]. EU funding in the 2021-2027 Multiannual Financial Framework envisaged for cybersecurity under the Digital Europe Programme and under Horizon Europe for research and innovation, with special focus on support for SMEs, is in the order of EUR 2 billion overall.

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[46] CEFIC.
[47] Extrapolated from table 2 of SWD (2020) 98 final.
[48] Ministère de l'Économie des Finances et de la relance
[49] CEF Digital | Shaping Europe's digital future (europa.eu).
[50] Work Programmes - DIGITAL | Shaping Europe's digital future (europa.eu).
[51] Cloud Alliance | Shaping Europe's digital future (europa.eu).
[52] European industrial technology roadmap for the next generation cloud-edge offering.
[53] Extrapolated from table 2 of SWD (2020) 98 final.

Main support tools include the Digital Europe Programme to invest in cybersecurity capacity and infrastructures and best practice (EUR1.5 billion from EU funding following the proposed Chips Act) and Horizon Europe to invest in cybersecurity research and innovation (approx. EUR 470m). These will be managed by the European Cybersecurity Industrial, Technology and Research Competence Centre. The Competence Centre is also the mechanism to coordinate investments between the EU, Member States and industry.[54] Funding priorities will include areas such as Security Operations Centres and Cyber Threat Intelligence, Cybersecurity upgrades in SMEs and in the health sector, Cyber secured hardware and operating systems, or training and skills.

Summary

This Annex illustrates the investment volumes in **nine industrial areas of relevance:** raw materials, solar PV, batteries, clean hydrogen, green steel, cement, chemicals, clouds services and cybersecurity. With the exception of hydrogen[55], such volumes relate to budgets of pipeline projects and commitments of, or goals set by, the industry to contribute to policy objectives: whilst in some cases such contribution has been validated by public authorities (e.g. approved IPCEIs), in other cases it only reflects an ambition of industrial actors to play a role in the achievement of EU policy objectives. Such private sector endeavours are often the response to public sectors calls.

The investment volumes are estimated to be **at around EUR 407 billion for the period up to 2030, which corresponds to ca. EUR 45 billion annually.**

These areas are relevant enablers for most ecosystems and play an important role for the competitiveness of tomorrow's industry.

[54] It will work with industry, the academic community and other stakeholders to build a common agenda for investments into cybersecurity, and decide on funding priorities for research, development and roll-out of cybersecurity solutions. For instance, The European Investment Bank is currently undertaking a market study to assess whether cybersecurity SMEs have sufficient access to market finance in order to grow in Europe.

[55] For hydrogen, the investment relate to policy targets in the European Hydrogen Strategy.