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By Debbie Woods,
Devyani Gajjar
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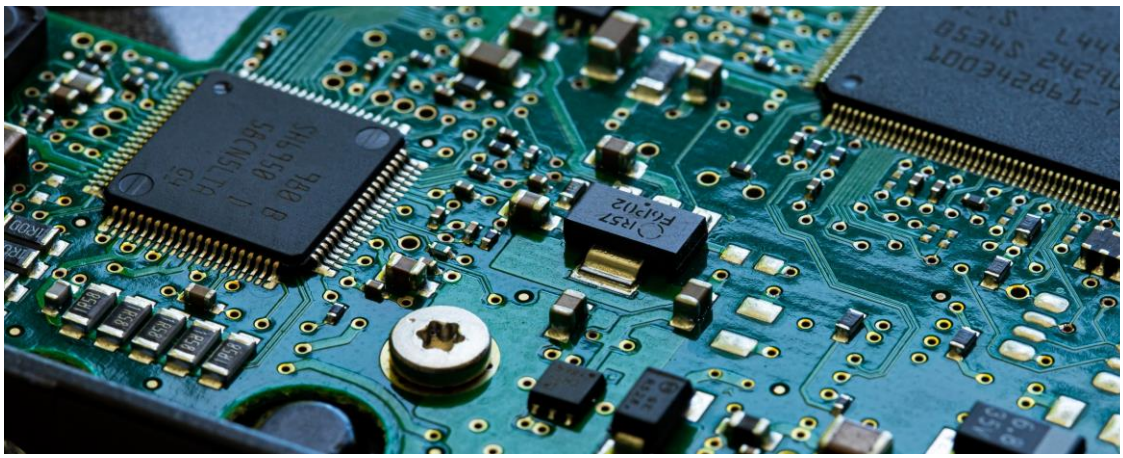
Supply of semiconductor chips



Overview

- Semiconductor chips are essential in all electronic devices, including smartphones, cars, healthcare technology, defence technology, and emerging technologies important to the UK such as AI.
- Semiconductor chip production is global, with different regions specialising in different stages, creating interdependencies and vulnerabilities.
- Supply shortages can cause delays in obtaining products, price rises, potential disruptions to essential infrastructure and risks to national security.
- Geopolitical conflicts, natural disasters, skill shortages and national security concerns all have the potential to disrupt supply chains.
- A supply shortage that started in 2020 was estimated to have disrupted global GDP growth by 1% in 2021 and affect 169 sectors, including in consumer electronics, automotives and healthcare.
- In May 2023, the UK Government published the National Semiconductor Strategy to improve supply chain resilience, protect national security, and grow the domestic sector. The Strategy recognised and sought to develop the UK's strengths in several areas including chip design, research and development and intellectual property, and compound semiconductors.
- Some industries are concerned about the funding in the National Strategy. Academics and industries have identified international collaborations and workforce development as important to supply.

Background

Semiconductors (Box 1) are one of the five critical technologies in the 2023 Department for Science, Innovation and Technology (DSIT) Science & Technology Framework.[1]

Semiconductors are materials used to make small flat chips that carry electric circuits in devices.[2–4] The terms 'semiconductors' and 'chips' are often used interchangeably.[a5]

The National Semiconductor Strategy says semiconductor chips are 'the core component of all electronic devices and they underpin our economy, national security and modern way of life'.[6] They drive the technologies that are expected to be key to global competitiveness of the UK, such as artifical intelligence, electric vehicles and communications infrastructure.[7–9]

Demand for semiconductor chips is increasing alongside rising demand for emerging technologies.[10–12] The global semiconductor industry is valued at over $500 billion annually.[13,14] A report by management consultant McKinsey projected the industry to reach $1 trillion by 2030.[15]

The semiconductor supply chain is vulnerable to disruptions due to its complexity and global segmentation.[6,16–19] According to estimates by consulting firm Accenture, the inputs to a semiconductor chip product cross approximately 70 international borders.[20]

A shortage of supplies can lead to:

- delays, shortages, and higher prices for consumer technologies [17,18,21,22]
- economic losses for businesses [17,18,23,24]
- national security issues (semiconductor chips are integral to defence technologies) [6,9,17,25]
- potential disruptions to critical national infrastructure (for example, power grids, transportation networks and financial systems all rely on semiconductor chips) [6,9,17]

Since 2020, factors including the Covid-19 pandemic, natural disasters and rising demand, caused a global semiconductor shortage.[18,21,24,26,27]

As a result, there have been difficulties in obtaining products and price increases across various sectors including electronics, automotives and healthcare.[22,23,28] Goldman Sachs analysis has estimated that over 169 sectors have been affected globally.[17,29] The US Department of Commerce estimated supply chain disruption "knocked a full one percent off of GDP growth in 2021".[30]

[a] Semiconductors chips are also called microchips or integrated circuits (ICs).

The shortage raised national security concerns and led governments across the world, including the UK, to review supply chain vulnerabilities and implement policies to secure semiconductor chip supplies.[6,25,26]

Box 1: What are semiconductors and how do they work?

Silicon is the most used semiconductor material. Compound semiconductors are made of a combination of elements such as gallium nitride and silicon carbide.[31]

Semiconductor materials are processed to create tiny electrical 'switches', called transistors, that control the flow of electricity in chips. Modern semiconductor chips contain millions or billions of transistors that process, store and transmit vast amounts of information.[2–4]

Applications of semiconductor chips

Semiconductor chips have widespread applications including in:

- **Consumer electronics:** Used in all electronic devices, including laptops, computers, television, cameras, refrigerators, washing machines and microwaves.[32]
- **Telecommunications:** Used in smartphones, data centres, network routers and satellite systems.[33]
- **Transport:** Modern cars contain more than 3,000 semiconductor chips which are found in engine controls, airbag controls and navigation systems.[34]
- **Healthcare:** Essential to advanced medical technology including insulin pumps, pacemakers, imaging machines and diagnostic equipment.[35]
- **Military and defence:** Used in radar systems, guided missiles, drones and cyber security hardware used to protect sensitive data.[6,36]
- **Agriculture:** Used in farming equipment such as irrigation controllers, advanced harvesters and livestock monitoring.[37,38]

Emerging technologies using semiconductor chips

Semiconductor chips are being used and developed in emerging technologies including in:

- **Artificial intelligence (AI):** Improvements in semiconductor chip designs are integral to advancements in AI technologies (PB57).[39] The Institute of Electrical and Electronics Engineers predicts the increasing demand for AI applications will drive innovative chip designs, presenting growth opportunities.[40] A few US companies such as Nvidia, Intel and Advanced Micro Devices hold the global majority of AI semiconductor chip market shares (PB57). Some UK start-ups,

such as Mignon and Vaire Computing, are designing and developing innovative AI semiconductor chips.[41–44]

- **Quantum computing:** Semiconductors are essential for quantum technologies (PN 552).[45] Riverlane, a quantum computer company, believes the UK can lead in designing and engineering complex chips required for quantum computing.[46]

- **Future telecommunications:** UK Government funding is supporting a project to develop gallium nitride semiconductors for 5G communications.[47] Researchers, including in the UK, are building prototype chips that could aid the development of 6G and 7G communications technology.[48–51]

- **Renewable energy:** Semiconductors play a key role in technologies crucial for the Net Zero target[a] such as in solar panels converting sunlight into electricity.[52–54] The Compound Semiconductor Applications (CSA) Catapult said UK strength in compound semiconductors can support clean energy through more efficient power conversion and distribution.[55]

- **Electric vehicles[b]:** Semiconductors convert energy in the battery to power the motor. Industry representatives say the UK has expertise in silicon carbide chips, which can make smaller, lighter and more energy-efficient vehicles, and have recommended further investments towards UK capabilities for chip developments.[57,58]

Semiconductor chip supply chain

The global landscape

Semiconductor chips are produced through multiple complex stages across different geographic regions (Box 2). Each stage requires technical knowledge and specialised equipment. Different companies and regions have different specialities and are reliant on each other.[5,6,20,59,60]

The US Semiconductor Industry Association stated that the global structure and regional specialisation has enabled technological innovation, productivity for companies, and cost savings for companies and consumers.[59]

However, stakeholders across sectors have voiced concerns that the geographic concentration of different stages makes the supply chain vulnerable to disruptions, such as from natural disasters, infrastructure shutdowns or international conflicts.[5,17–20,59–62]

The US Semiconductor Industry Association has identified "more than 50 points across the overall supply chain where one region accounts for 65% or more of the

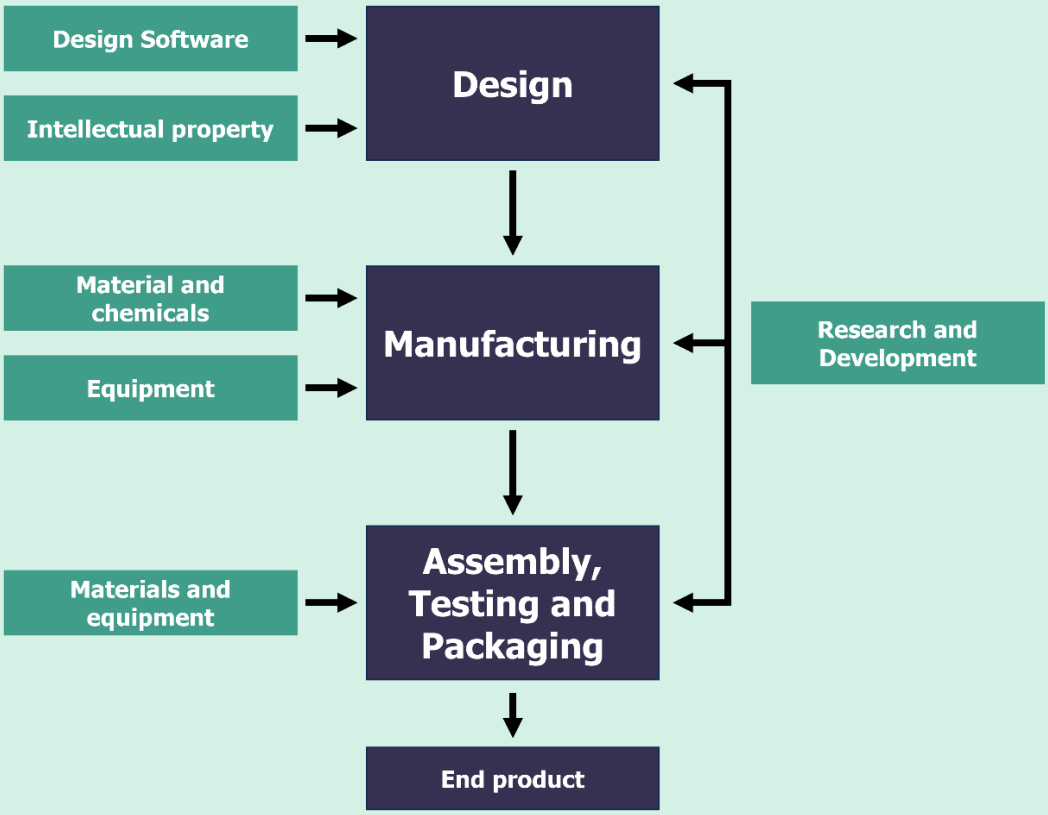
[a] Under the Climate Act Change Act 2008, the UK has a legally binding commitment to reduce greenhouse gas emissions by 100% by 2050 (PN714).

[b] To achieve its Net Zero target, the UK Government has set out that by 2035 all new cars and vans will be zero emission.[56] Electric vehicles offer one method of reducing emissions (see HoC Research Briefing on Electric vehicles and infrastructure).

total global supply".[59] For example, one Dutch company, ASML, produces 100% of the most advanced chip manufacturing equipment, and 75% of manufacturing is in China, Taiwan, South Korea and Japan.[59]

Box 2: The semiconductor supply chain

The semiconductor supply chain can be split into three stages. Different inputs feed into these stages.[60]



Design: Requires large investment in research and development (R&D) and a concentration of expertise.[59] Between 2006 - 2020, costs of designing advanced semiconductor chips increased more than 18 fold.[63] Semiconductor Industry Association estimated advanced design costs to be around £542 million in 2020.[63] The US leads in overall chip design and particularly in design software.[25,59,64] The UK hosts the headquarters of Arm, one of the leading design companies that licenses its designs to many of the major chip design companies in the world, including Qualcomm and NVIDIA.[59,65] According to the Semiconductor Industry Association, 20% of the worlds semiconductor design engineers are based in India.[59]

Manufacturing: Requires high capital expenditure, and many highly specialised inputs and skilled workers.[59] East Asian countries lead in manufacturing, particularly Taiwan and South Korea.[5] Raw materials are sourced from across the world.[5,25,59] Manufacturing equipment is prepared largely in the US, Europe and Japan.[59,64]

Assembly, testing and packaging: Compared to other steps, this is a lower skill and capital-intensive process, but it is labour intensive. Due to lower wages and input costs, East Asian countries lead in this sector particularly China, Taiwan and South Korea, but there are also some firms in the US.[5,59,64]

The UK's semiconductor industry

The Business, Energy and Industrial Strategy Select Committee (BEIS Committee) report on 'The semiconductor industry in the UK' stated the UK accounts for 0.5% of global semiconductor sales. It also stated that UK products have global reach, with 90% of silicon semiconductor chips created in the UK exported.[17] Expert Market Research estimated the UK semiconductor market size to be over $13 billion in 2023.[66]

According to the National Semiconductor Strategy, the UK has strengths[a] in R&D, chip design, intellectual property, and in compound semiconductor chips.[6,17] The UK also manufactures equipment relevant to the supply chain.[6] There are around 25 manufacturing facilities across the UK producing chips for specialised end uses but none produce the most advanced silicon semiconductor chips.[6,17] Clusters of firms have formed around existing manufacturing facilities (Table 1 and Figure 1).[6,17]

[a] The National Semiconductor Strategy defines these strengths as particular areas of strategic advantage.[6]

Table 1: Clusters of semiconductor firms in the UK

Region	Details
Cambridge	A world-leading technology and research cluster with a high proportion of the UK's startups and spinout companies.[67] Home to the global headquarters of Arm, a specialist in chip design and intellectual property that employs around 3,000 people in the UK and is valued at about $120 billion.[68,69]
Midlands	Specialises in power semiconductor devices used in electric vehicles.[70] A 2024 report by Midlands Engine stated that the cluster employs over 4,000 people.[70]
North east	The North East Advanced Material Electronics cluster works on advanced compound semiconductor technology design and manufacture, and it stated that it employs 1,800 people.[71]
Northern Ireland	Has world-leading capabilities in nanotechnology and photonics.[a] Compound Semiconductor Applications (CSA) stated that half of the world's data centres use technologies manufactured here.[73,74]
Scotland	Strengths in semiconductor design, intellectual property.[75,76] CSA stated that Scottish photonics are a £1 billion industry, employing 4,000 skilled engineers.[74]
South Wales	Hosted the world's first compound semiconductor cluster. A report by CSconnected of the clusters 2023 economic activity estimated that it supports a total of £543 million gross value added to the UK economy and directly employs 1,773 people.[77]
South west	Bristol, Swindon and Gloucester are a hub for semiconductor development in photonics and electronics.[75] The CSA website said photonics companies generate over £500 million and employs over 3,000 skilled staff.[74]

[a] Photonics involves processing information by using light like in fibre optics.[72]

Figure 1: Geographic location of major UK semiconductor firms

Source: Chart provided by Mapping (De)Globalization.[78] Data sourced from Bloomberg Professional.[79]

Vulnerabilities to the supply chain

Slow adaptations to changing supply and demand

The semiconductor chip industry tries to anticipate future demand.[80,81] However, due to the long, complex and costly production process the supply chain can be slow to

adapt to unexpected market changes.[80,82–85] Delays in scaling up capacity or changing production lines can lead to shortages of technologies.[85,86]

For example, in 2020 the supply chain was slow to adapt to fluctuating demands for chips. The pandemic led to a rise in remote working which drove increased demands for electronics such as laptops and some products were difficult to obtain as a result.[87–89]

Demand for vehicles dropped and so car makers scaled back orders of chips. When demand increased, chip production was unable to keep pace. The auto industry had to shut down production lines leading to difficulties for consumers to buy certain cars. Multiple reports estimated that, in 2021, over 9.5 million vehicles were removed from production and the global automotive industry lost more than $200 billion in revenue due to semiconductor chip shortages.[18,90–92]

Skills shortage

There is a global and UK skills shortage in the semiconductor sector, with some companies warning it could impact semiconductor innovations and UK competitiveness on a global stage.[93–95] The UK Electronics Skills Foundation estimated that 80% of UK companies involved in chip design have unfilled vacancies (see workforce and capacity development).[95]

Natural and artificial disasters

Natural and artificial disasters can disrupt entire supply chains.[59] Semico Research highlighted that 61% of manufacturing facilities are in moderate to high-risk earthquake areas including Japan, Taiwan and West Coast US.[96]

Several disasters, including the Texas winter storm, factory fires and earthquakes in Japan, and drought in Taiwan, disrupted semiconductor manufacturing and contributed to the global semiconductor shortage from 2020.[89,97–99]

To an extent, measures can be put in place to reduce the risks of natural disasters, such as building codes and preparedness plans.[100]

Some experts believe the supply chain should be geographically diversified by having more manufacturing outside East Asia.[101,102] However, this can present challenges such as the large initial costs required and shortage of specialist construction skills.[103]

Geopolitical conflicts

Geopolitical conflicts between different countries impact the semiconductor supply chain, leading to chip shortages and increased technology costs.

Taiwan Semiconductor Manufacturing Company (TSMC) is the world's largest chip manufacturer, producing over 90% of the most advanced chips.[59,104] One think tank, SNV, describes TSMC as "the most critical single point of failure" in the semiconductor supply chain.[105]

China, which regards Taiwan[a] as a breakaway province, has increased its military exercises around the island since 2020 (HoC Library Research Briefing, Taiwan: Relations with China). While experts have differing views about the likelihood of Chinese military action against Taiwan, it is a longstanding cause for concern.[106–108]

Some industry experts and academics have said that military action could lead to significant disruptions in chip supplies.[16,59,109–114] Semiconductor Industry Association analysis predicted that disruption to semiconductor manufacturing in Taiwan would create significant global economic disruptions, potentially costing $490 billion in revenue for electronic device manufacturers.[59] It estimated that it could take a minimum of three years and $350 billion of investment to build enough capacity in the rest of the world to replace the Taiwanese facilities.[59]

Some consultancies and associations have warned that the war in Ukraine could exacerbate chip shortages due to a reduced availability of raw materials found in Russia and Ukraine.[115,116] For example, 70-80% of the global neon gas supply, essential for chip manufacturing, was produced by Ukrainian companies and long-term disruption could cause downstream supply issues.[115–117]

National security risks from exports or foreign ownership

The National Semiconductor Strategy cited various national security risks associated with semiconductors including:

- **Acquisition of UK semiconductor companies by hostile states:** Sensitive technologies could be acquired and used to build adversaries military capabilities.[6]
- **Exports to hostile states:** Through exports, adversaries could gain access to semiconductor-related knowledge that could help build military capabilities.[6]

Dubbed the "Chip War," the US and China have implemented mutual trade restrictions on some semiconductor-related exports to try and reduce the other countries' capabilities to technically advance further, including military advancements.[118–120,120] China has placed global restrictions on the supply of gallium, which is an important mineral for the compound semiconductor industry, one of the UK's key strengths.[121,122] Trade restrictions can disrupt the supply chain and increase costs for manufacturers globally.[118,119,123–125]

The National Security and Investment Act 2021 allows the Government to intervene in investments that may pose a national security risk.[6,126] The 2022 enhanced military end-use control provisions allow the Government to prevent exports that may be intended for military use.[6,17,127]

[a] Taiwan is an island in the South China Sea. The People's Republic of China in mainland China considers Taiwan a breakaway province but Taiwan's constitution considers itself sovereign. The UK, like most other countries, does not recognise Taiwan as a state, nor maintain formal diplomatic relations with the island (see HoC briefing on Taiwan: History, Politics and UK relations).

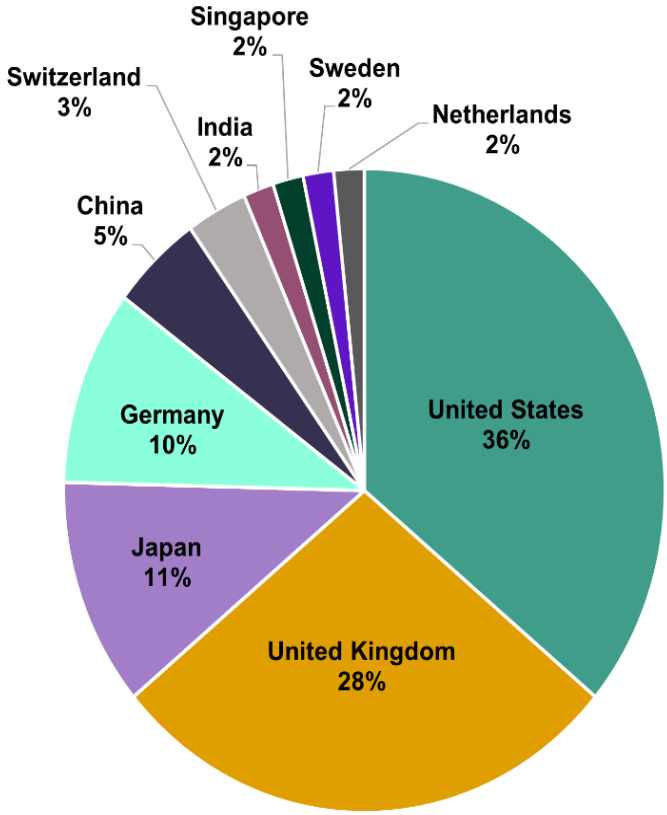
In November 2022, the Government used the National Security and Investment Act 2021 to order Chinese-owned Nexperia to sell Newport Wafer Fab[a], a semiconductor manufacturing company in South Wales, over national security concerns.[17,126]

Members, Peers and some academics have voiced concerns about the loss of intellectual property over the Nexperia takeover.[17,25,129] Some stakeholders said that Newport's national security concerns were diminished due to it not producing the smallest cutting-edge chips.[129,130] However, some academics argued the Newport facilities carry out government-funded semiconductor research including a defence contract for military-related radar systems.[129]

Newport Wafer Fab was bought by US company Vishay in March 2024.[130,131] Members criticised the Government for delaying approval of this purchase and said it cost investment and jobs.[130] Around 100 out of 550 workers at the Newport Wafer Fab were made redundant during the intervening period.[130]

The Mapping (De)Globalization academic research centre[78] has provided data on who owns the leading 61 UK semiconductor companies (Figure 2). [b] This data shows that most UK semiconductor firms are US or Europe-owned and 5% are owned by Chinese investors.

Figure 2: Parent company location of 61 major UK semiconductor firms.



Source: Chart provided by Mapping (De)Globalization[78] with data sourced from Fame[132], Orbis Database[133] (Bureau Van Dijk) and Refinitiv Eikon.[134]

[a] Nexperia had taken over Newport Wafer Fab in 2021.[128]

[b] Leading companies according to revenue in the last financial year with a qualifying baseline of £10 million. Data gathered from Bureau Van Dijk's Fame[132] and Orbis[133] database and Refinitiv Eikon.[134]

Policies for improving UK supply chain resilience

National approach overview

The 2022 BEIS Select Committee report recommended the UK Government form a national strategy.[17]

In May 2023, the UK Government published the National Semiconductor Strategy. The Strategy aims to improve supply chain resilience, protect national security, and grow the domestic sector by focusing on existing UK strengths in R&D, design and IP, and compound semiconductors. The Government announced up to £200 million for the UK semiconductor sector over the years 2023-2025 and up to £1 billion over the next decade.[6]

Academics, learned societies and industry stakeholders have said the UK National Semiconductor Strategy acknowledges the importance of the sector and the need to co-ordinate effective governance and has provided a starting point for focus on measurable actions and results.[135–140] techUK stated that actions should be quick. Some reports state that more actions could be planned, such as R&D tax relief and export support (see below).[138,141–143]

Building on existing expertise vs onshoring manufacturing capacity

To secure semiconductor supply chains, various governments have implemented industrial policies with some, including the US, EU and China, aiming to onshore semiconductor production (Table 2).[6,17,61,144–149]

Table 2: Some international semiconductor policies

Region	Policy
United States	In August 2022, the US introduced the CHIPS and Science Act directing $52 billion over the next ten years. The Act aims to support R&D and to strengthen domestic manufacturing and workforce development, such as through direct grants, government loans, and tax credits for chip production to encourage private investment.[61,150,151] Companies that receive funding under the CHIPS Act will not be permitted to expand their advanced manufacturing activities in countries the US Government has deemed a national security concern, primarily China.[152,153]
European Union	In February 2022, the EU announced the European Chips Act, which aims to increase Europe's share of global chip manufacturing from 10% to 20%. The EU also announced the

	mobilisation of €43 billion of public and private investment to support the Chips Act until 2030.[144]
China	Since 2014, the Chinese government has been working towards the aim of self-sufficiency in the semiconductor industry. According to the Semiconductor Industry Association, the Integrated Circuit Industry Investment Fund, or the Big Fund, has invested up to $73 billion in China's semiconductor industry.[148,154]

Unlike the US and EU, the UK's strategy has avoided building large-scale advanced silicon manufacturing, meaning the UK will currently continue to rely heavily on Taiwan for production of advanced semiconductor chips.[135] An IP lawyer has said the UK is potentially at risk from disruptions in Taiwan due to political tensions with China.[155]

Onshoring manufacturing facilities could secure sections of the supply chain by decreasing reliance on single companies or nations for certain production steps. This would lessen the impact if those companies or nations encountered issues.[59] Challenges include high financial and technical barriers to establish and staff manufacturing facilities. The US has faced construction challenges, such as delays due to labour and material shortages and uncertain costs due to changing prices of raw-materials.[156,157]

Building an advanced silicon plant takes years. Costs of building manufacturing facilities depend on the complexity of semiconductor chips being produced.[17,158–160] Estimated costs differ, with various articles from 2021-2023 quoting between $10-28 billion.[17,158,159,161] Articles from 2023 and 2024 estimate costs of compound semiconductor manufacturing facilities between $1-3 billion.[162–164]

Stakeholders have mixed views on the UK approach. Some support the UK Government's decision to focus on its strengths like intellectual property, research and design, and viewed building local manufacturing capabilities to be unfeasible.[75,138,141,143] The BEIS Select Committee report concluded it was not realistic for the UK to onshore the entire supply chain.[17]

Others thought more investment in establishing UK manufacturing was required to secure the UK's chip supply.[155,165–167] techUK have called for more clarity on how the Government will support manufacturing.[165] They have also called for the findings to be published of a UK government commissioned study to understand national capabilities, including manufacturing feasibility (the UK Semiconductor Infrastructure Initiative[a]) that concluded in December 2023.[165]

Older and less expensive manufacturing facilities produce semiconductor chips used in many sectors, such as automotives and some military systems.[170] TechWorks, a tech industry association, has said the UK Government should support the upgrading

[a] The study aimed to understand the technical and economic feasibility of developing capabilities to grow the UK sector and contribute to supply chain resilience. For example, the study would examine "where a baseline level of manufacturing could provide a low volume of chips for critical infrastructure".[6,169]

of these facilities to remain competitive, such as through access to finance for step-up expenditure.[142]

Policy think tank experts have suggested building domestic manufacturing plants may not be sufficient to address national security concerns as most chips will still need to go to East Asia for assembly, testing and packaging stages.[171,172] These experts suggest countries should focus on a different problem and recommend investing in solutions to screen malicious hardware rather than re-engineering the supply chain.[171]

Financial investment

Some policy institutes, MPs, and industry leaders have criticised the UK Government for committing significantly less financial investment, £1bn over 10 years, than other countries semiconductor industrial strategies (Table 2).[135,166,173,174] Some stakeholders have asked for clarification on how the money will be spent and how the strategy will deliver its aims.[165,174] Many industries, learned societies and MPs have raised concerns that more public and private investment may be needed to advance the sector.[135,136,175–177]

TechWorks has said more support is required for companies across the supply chain, including in R&D, manufacturing and scale up.[142,178]

Semiconductor start-ups can face high costs for design equipment and competition from large international companies.[17,179] In October 2023, the Government announced a two-year pilot £1.3 million programme, named 'ChipStart', to provide start-ups with technical and commercial help.[41,180] Feedback from a selection of the first ChipStart cohort was positive but the amount of funding drew criticism from some semiconductor industry stakeholders.[181,182]

Experts from Chatham House, an independent policy institute, have said that foreign investment could help the UK semiconductor sector grow, but the prospect of blocked deals from the Government for national security reasons could deter investors.[135] techUK has said increased transparency on how the Government will implement the National Security and Investment Act 2021 could help to ensure low-risk investments are not held up.[183]

In December 2023, the UK Infrastructure Bank[a] announced £60 million investment to scale up domestic semiconductor manufacturing in the North East of England.[185]

Before the 2024 Spring Budget, TechWorks suggested various approaches for encouraging private investment including creating a matched funding scheme to support upgrades to UK facilities and changing capital expenditure rules specifically for upgrading equipment rather than only for new equipment.[186]

In 2016, Japanese company SoftBank bought Arm, the biggest semiconductor company in the UK.[187] In 2023, Arm was listed on the NASDAQ US stock market, with Softbank maintaining just over 90% of Arm's shares.[188] The UK Government had wanted Arm to be listed on the UK stock market.[188–191] Arm stated the US-only listing was the best for the company and stakeholders.[189] A BBC article said the decision by Arm has raised concerns that the UK market is not doing enough to attract

[a] The UK Infrastructure Bank was established to enable public-private financing to support climate change mitigation, Net Zero and community infrastructure.[184]

technology company stock offerings.[189] In response to the US-listing, the London Stock Exchange said the UK needs to plan for regulatory and market reforms.[188]

Collaboration with trusted partners

The BEIS Select Committee semiconductor report recommended that the Government collaborates with allies and trusted partners[17] to safeguard security of supplies, represent the UK's expertise and expand the UK's role in global supply chains.[17]

Many academic and industry stakeholders agree that international collaborations could help to secure supplies across the chain, such as with the US and EU for advanced silicon manufacturing.[135,137,138,178,183,192–194]

Some industries have highlighted the importance of supporting the UK strengths in semiconductors to strengthen international partnerships and for potential leverage to secure supplies.[138,155,195]

The Atlantic Declaration between the UK and US references collaboration on semiconductors.[196] AUKUS pillar 2, a security partnership between the UK, the US and Australia, references collaboration on critical technologies related to defence and security, of which semiconductors are integral to.[197,198]

In May 2023, DSIT announced the UK-Japan Semiconductors Partnership for collaboration in semiconductor technologies by drawing on each other's strengths to help secure supply chains.[199]

In March 2024, DSIT announced the UK had joined the European Union's "Chips Joint Undertaking" and that UK semiconductor scientists and businesses could access €1.3 billion Horizon Europe funding for collaborative semiconductor research projects.[200]

Workforce and capacity development to address skills shortages in the UK semiconductor industry

A wide range of stakeholders have recommended policy initiatives including:

- addressing a lack of awareness of the semiconductor industry, particularly among young people, by using information campaigns, changing the curriculum and improving careers advice[6,17,93,95,201–203]
- increasing numbers of home students studying relevant degrees, like electronic engineering, to address skill shortages in chip design and also increasing the numbers of specialist lecturers[6,93,95]
- funding for internship schemes to support graduates joining the sector and reforms of the Apprenticeship Levy[93,204]
- collaboration between universities and industry on upskilling to address the skill gaps, such as with engineers, caused by the increasing complexity of the field[6,93,205–207]

- UK companies compete with other countries, such as the US, for talent so some stakeholders suggest addressing skilled worker immigration barriers by streamlining the visa application process, keeping fees comparable to UK competitors, and reducing the high salary requirements[6,17,183,201,202,205,208–210]

- joint strategies with sectors sharing common skills requirements, such as Quantum technologies and photonics[93]

Some industry leaders have said establishing a national semiconductor institute could help provide advice, act as a coordinated voice and support knowledge sharing and training.[93,179] Part of the UK Semiconductor Infrastructure Initiative is researching the feasibility of a national institution.[169,211]

Since the 2020 shortage, the UK Government has announced funding, including £26.8 million in February 2024 towards developing the semiconductor skills pipeline.[203]

Cohesion of semiconductor policies with other technology policies

As semiconductors facilitate other technologies, such as AI, a report by academics and policy institutes recommended examining how the semiconductor industry is impacted by 'adjacent' technology government strategies, reviews and funding.[a] It says 'making these strategies and reviews fit together as part of a coherent whole will underpin UK strategic advantages in the long run.'[212]

[a] These include the March 2023 Independent review of the future of compute, the March 2023 National Quantum Strategy, The November 2023 Advanced Manufacturing Plan and the January 2024 critical imports and Supply Chain Strategy.

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Contributors

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Members of the POST Board*

Dr Joseph Baines, King's College London*

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