Welsh Economy Research Unit
Yr Uned Ymchwil i Economi Cymru

CSconnected

Annual Report: Compound Semiconductor Cluster in South Wales 2024

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Summary

This report is the 2024 annual update which considers the economic activity supported in Wales by the cluster of firms and institutions that form part of CSconnected activity funded by the *Strength in Places Fund,* which is managed by UK Research and Innovation (UKRI).

An important element of the CSconnected activity is to explore the changing economic contribution of the CS cluster in Wales over time, and particularly the way in which the activities of the firms and institutions supported by the UKRI funding contribute in terms of meeting place-based needs in the Welsh economy. This report estimates the economic activity supported by the CS cluster in 2024 and includes contextual information through which to better understand the economic contribution of the cluster.

Global industry conditions

During 2024 the range of export controls, tariffs, and blacklisting policies impacting the global semiconductor industry continued to grow. This is largely a consequence of the trade rivalry between the US and China. This escalating trade war is not limited to the semiconductor industry, as other sectors such as clean energy, telecommunications, and electric vehicles are also being impacted, but the highly globalised structure of semiconductor supply chains means its impacts are significantly heightened.

UK economic conditions

The economic data has shown that 2024 has been another challenging year. The UK economy is forecast to have grown by less than 1% in 2024, and with the Bank of England showing that the economy might grow by as little as 0.75% in 2025.

CS cluster firms

During 2024 there were some positive developments in cluster firms. These include the £51m investment by US-owned Vishay in Newport Wafer Fab. The construction of KLA's new European headquarters in Newport was also completed during 2024. In addition, there has been new employment generated by cluster new entrant firms.

A broader issue of skills shortages as a barrier to growth was recognised within the National Semiconductor Strategy (2023) and with related skills projects in progress including START-SEMI (Skills, Talent, And Re-education Training for Semiconductors) led by Swansea University. The Welsh Joint Education Committee (WJEC) is also the first UK awarding body to develop semiconductor qualifications as a pathway to the industry. These new qualifications, developed in partnership with industry, including CSconnected, became available to learners during 2024.

CS cluster and Welsh output

There is some indication that sales levels have fallen in the CS cluster between 2023-2024. It is estimated that total sales of the CS cluster in 2023 were around £553m, falling to an estimated £507m in 2024. There is a strong expectation that sales will increase in 2025 in line with investment completed in major facilities by both KLA and Vishay International.

The previous analyses of the CS cluster suggests that between 2021 and 2022 there was an 8.4% increase in employment (i.e. from 1,602 to an estimated 1,737 employees in 2022). The analysis for 2023 estimates employment at 1,773 (an estimated 2% increase on 2022). For 2024 it is estimated that CS cluster employed 1,806 people (an estimated 1.9% increase on 2023).

The analysis of company survey returns for 2024 suggests:

- The total payroll for the CS cluster (excluding Higher Education elements) was an estimated £108.6m, with an average salary per full time employee of £67,765.
- An estimated 18% of employees in the non-higher education parts of the cluster were involved in R&D activity i.e. close to 300 full time equivalent employees.
- In four private sector firms in the CS cluster the proportion of employees qualified to undergraduate degree level ranged from 40% to 85%.

The analysis of the CS cluster for 2024 reveals that estimated GVA directly supported is £255m. GVA per employee in the cluster excluding non-manufacturing activity is close to £155,500.

The CS cluster made a further important contribution to Welsh exports in 2024. The survey revealed that the proportion of output exported by the industrial parts of the cluster is now in excess of 90%. The total value of exports from the cluster in 2024 are conservatively estimated to be in the order of £466m.

Impact headlines

In 2024 the compound semiconductor cluster employed an estimated 1,806 employees.

The GVA directly supported by the cluster of firms and institutions in 2024 is estimated at £255.0m. This represents a 4% decrease on the figure for direct GVA reported in 2023.

In 2024 it is estimated that each £1m of GVA directly generated in the CS cluster supports an additional £0.44m of GVA elsewhere in the Welsh economy. Overall, this results in the cluster supporting directly and indirectly an estimated £366.3m of Welsh GVA.

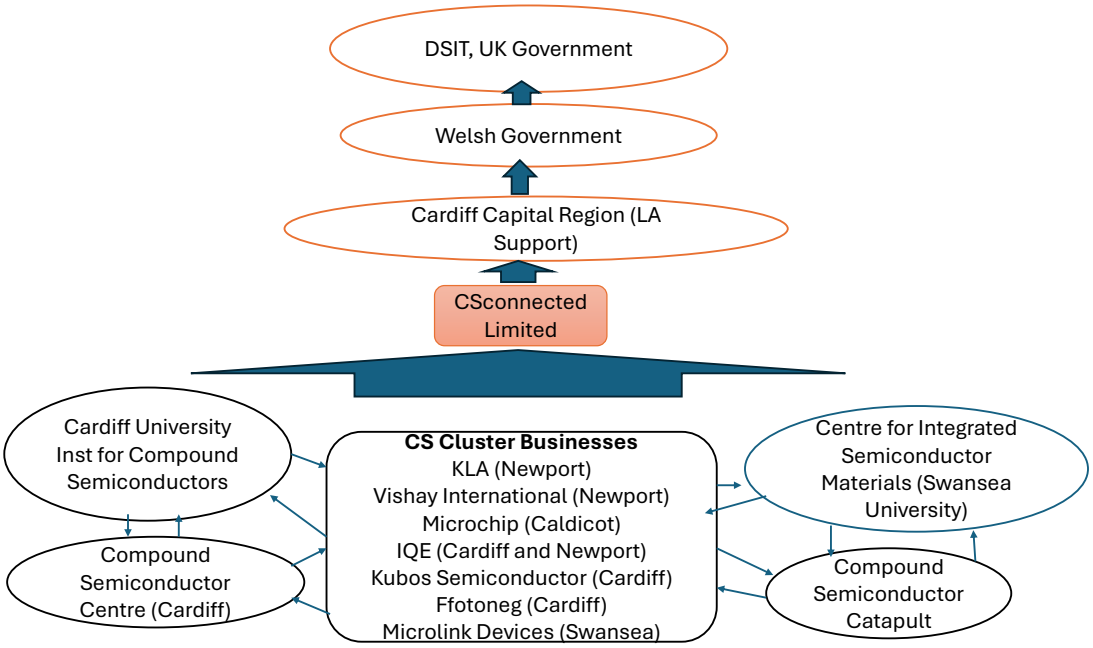
Similarly, while the cluster directly supports around 1,806 jobs, it supports an estimated further 942 jobs in Wales through its purchasing and payment of wages and salaries. In total, therefore, the cluster in 2024 could be considered to be associated with as many as 2,748 jobs in Wales (an increase of 87 jobs compared to the 2023 figure).

The CS cluster in Wales also supports a total of £434m of GVA in the UK economy in 2024. Moreover, every full-time equivalent job in the CS cluster in Wales supports a further 1.24 jobs in the wider UK economy (i.e. a total of 4,047 UK employees).

1. Introduction

This report is the 2024 annual update which considers the economic activity supported in Wales by the cluster of firms and institutions that form part of CSconnected activity funded by the *Strength in Places Fund,* which is managed by UK Research and Innovation (UKRI). The consortium consists of partners including: Cardiff University (lead), Swansea University (Centre for Integrative Semiconductor Materials), IQE, KLA, Microchip, MicroLink Devices, the Compound Semiconductor Centre, the Compound Semiconductor Applications Catapult, the Cardiff Capital Region (CCR) City Deal, and Welsh Government. Vishay International in Newport is not currently part of the Strength in Places consortium but represents an important part of the CS cluster in Wales, as do new entrants Kubos Semiconductor and Ffotoneg which are operating out of the Cardiff University Translational Research Hub (TRH). In examining economic impact, we consider the whole of the CS cluster. Figure 1.1 summarises the CS cluster in Wales and reveals institutional links and pathways to Welsh Government and UK Government.

Figure 1.1 The CS Cluster in South Wales



An important element of the CSconnected activity is to explore the changing economic contribution of the CS cluster in Wales over time, and particularly the way in which the activities of the firms and institutions supported by the UKRI funding contribute in terms of meeting place-based needs in the Welsh economy.

This report estimates the economic activity supported by the CS cluster in 2024 and includes contextual information through which to better understand the economic contribution of the cluster.

Various data have been used to develop this report. During each year of the UKRI funded research it has been possible to administer a survey questionnaire to cluster members. This survey was sent out during September-October 2024 and was used to collect information in respect of the output, employment, wages and salaries, expenditure and exports of the private sector elements of the cluster and the independent research entities. The information gleaned from this survey allows the analysis of the amount of employment and output supported by the cluster and facilitates an analysis in terms of the comparative economic significance of the sector. The survey also collects data in respect of the spending patterns of cluster members in the Welsh economy. This supports the research team in estimating the indirect impacts of the cluster on the Welsh economy (see below).

In developing the annual report series, published company accounts data from the Bureau van Dijk FAME database are also used alongside the survey data, with this providing additional insights into the spending and performance of the cluster firms. Finally, extensive use is made of published statistics from organisations such as the Office for National Statistics. This is largely in terms of regional economic data in respect of industry employment and gross value added (GVA).

The report presents estimates of the Welsh economic activity supported by the CS cluster. It is important to stress that this is an estimate up to the final quarter of the 2024 calendar year, as the companies involved in the cluster have different financial reporting year end dates. In addition, the analytical process requires assumptions to be made about the GVA directly and indirectly supported by CS cluster operations.

Part of the analysis comprises an economic modelling exercise to examine how the CS cluster supports activities in other parts of the Welsh and UK economy. While this is a modelled assessment, research work completed during 2023 investigated in more detail the supply chain linkages of cluster members with other firms in Wales and parts of England.[1] We accept that this is only one part of the value chain story in terms of the analysis of what CS cluster firms are able to purchase in the Welsh economy. During 2025 we will be completing a further investigation of the potential for CS cluster firms and institutions to sell goods and services in the UK economy. Currently the majority of goods produced by the CS cluster firms are sold in overseas markets.

The annual review of economic activity supported by the cluster also serves to inform a series of KPIs for the UKRI funded Strength in Places CSconnected project. These KPIs include:

- KPI 1 Direct employment in core cluster firms and new inward investors.
- KPI 2 Exports of cluster firms.
- KPI 4 Total GVA supported by cluster activity directly and indirectly.

The next section provides an update on the international semiconductor industry context surrounding cluster development in 2024. The third section reviews the UK and regional economic context surrounding the cluster. The fourth section focuses on the economic contribution of the CS cluster in Wales, with the fifth section considering the wider economic impact of the cluster on the Welsh and UK economy. The final section provides some conclusions. In particular, the report considers the risks facing the cluster and its challenges.

[1] See https://csconnected.com/media/04fjigeo/weru-csconnected-sipf-supply-chain-case-study-2024.pdf

2. Global semiconductor industry conditions

2.1. Introduction

During 2024 the range of export controls, tariffs, and blacklisting policies impacting the global semiconductor industry continued to grow. This is largely a consequence of the trade rivalry between the US and China. This escalating trade war is not limited to the semiconductor industry, as other sectors such as clean energy, telecommunications, and electric vehicles are also being impacted, but the highly globalised structure of semiconductor supply chains means its impacts are significantly heightened. As trade is becoming increasingly divided along geopolitical lines the implications for global trade are significant. In general, uncertainty has been affecting the market value of firms involved in the whole semiconductor supply chain. Recent trends in the PHLX Semiconductor Sector Index (SOX – a market capitalisation weighted index of firms involved in the design, distribution, manufacturing and sale of semiconductors) are shown in Figure 2.1 which reveals little growth in the second half of 2024, following strong growth in the April to July 2024 period.

Figure 2.1 Jan-Dec 2024 PHLX Semiconductor Index

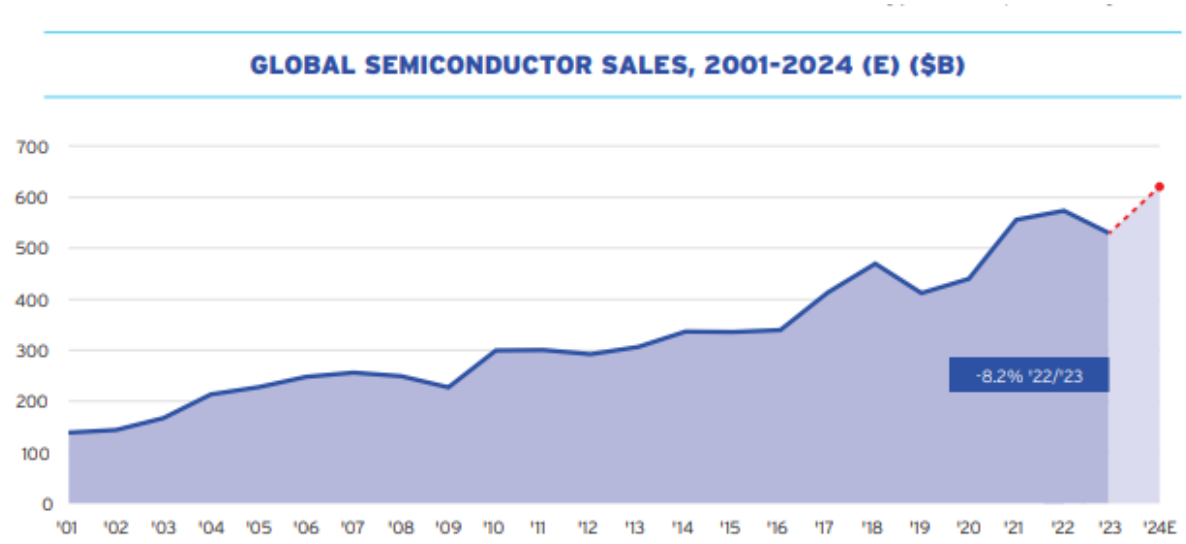
Source: https://indexes.nasdaqomx.com/index/History/SOX

At the same time, research by the IMF has indicated that a group of 'non-aligned' countries are gaining importance in the global market as they are increasingly acting as a bridge between East and West[2]. Within this context, the adaptability and resilience of multinational enterprises (MNEs) has proven to be an important dynamic in supporting global semiconductor trade. How long the role performed by non-aligned countries can persist, and how resilient MNEs ultimately prove to be, remains uncertain. In May 2024, the G7 established a Semiconductor Point of Contact Group to promote semiconductor trade and growth in the industry, but with the election of a Donald Trump led government in the US uncertainty has increased.

[2] IMF (2024). *Changing Global Linkages: A New Cold War?* Accessed November 2024: https://www.imf.org/en/Publications/WP/Issues/2024/04/05/Changing-Global-Linkages-A-New-Cold-War-547357

Nevertheless, chips are forecast to become a US$1tn global industry within 6 to 8 years, and double again within 8 years after that. During 2024, the industry was expected to grow 20%, partly driven by a recovery in memory and AI-related demand, although automotive and industrial applications were expected to remain sluggish.[3] During the first half of 2024 global semiconductor sales increased by 19.2% compared with sales during the first half of 2023,[4] demonstrating its continued recovery from the downturn experienced in recent years since the Covid-19 pandemic.

Figure 2.2 Global Semiconductor Sales Estimates (reproduced from 2024 State of the US Semiconductor Industry)



Source: SAA, 2024 p23 SIA_2024_State-of-Industry-Report.pdf

Significant state-led semiconductor investments resulting from initiatives such as the US Chips Act, the EU Chips Act, the China Integrated Circuit Industry Investment Fund, and those of other governments over the last 2 to 3 years has been followed by significant private sector investment. Semiconductor firms have committed to significantly increase investments, with studies predicting around US$2.3tn in private sector investment in wafer fabrication between 2024 and 2032, compared with US$720bn in the ten previous years.[5] These investments are leading to greater geographical distribution of semiconductor manufacturing, which in turn is leading to greater resilience in the industry's product chain.

[3] Financial Times (12.9.24). *Export clampdowns and a smartphone face-off.* Accessed October 2024: www.ft.com/content/38c59347-99fa-4ed0-ad81-d8c19f6687bc

[4] SIA (2024). *State of the US Semiconductor Industry.* Accessed November 2024: https://www.semiconductors.org/2024-state-of-the-u-s-semiconductor-industry/

[5] BCG/SIA (2024). *Emerging Resilience in the Semiconductor Supply Chain*. Accessed November 2024: https://www.bcg.com/publications/2024/emerging-resilience-in-semiconductor-supply-chain

2.2. Global Overview

The United States (US)

The US approach to the semiconductor industry has been driven by a combination of national and economic security concerns. The impact of the US Chips and Science Act is continuing to be felt across the global semiconductor ecosystem as efforts to rebalance the manufacture of chips away from Asia and, most notably, advanced chip production away from Taiwan have continued. Consequently, productive capacity is being built in the US, thanks to their own stimulus packages, as well as those in the EU and elsewhere. Since the passing of the Chips Act, by August 2024 semiconductor ecosystem firms had announced over 90 new manufacturing projects in the US, totalling US$450bn in announced investments across different 28 states.[6]

The Chips Act has led to a 15-fold increase in the construction of new manufacturing facilities for computing and electronic devices. Despite these significant developments, however, the US is still not expected to achieve self-sufficiency in chips. Consuming, as it does, over a quarter of the world's semiconductors, this was always likely to be a significant challenge. Nevertheless, chips initiatives are significantly reducing the US' vulnerabilities, which appears to have been one of the central aims. By 2032, the US is expected to be producing 28% of the world's most advanced chips. If it achieves these forecasts this will be a substantial step in reducing its weaknesses.[7]

Although the US Chips Act is leading to greater production yields within the US, an insufficient supply of skilled labour is a significant barrier to further growth and causing a delay in bringing new investment online.[8] Increasing domestic employment was an important goal behind the Act and this is a critical issue in the US' reshoring efforts. Consequently, a meaningful share of chips act funds is now being directed toward schools and vocational programmes in areas where future chip production is expected.[9] Even with these investments, there is a significant projected shortfall of 67,000 skilled US semiconductor industry employees by 2030. There are warnings that current workforce development initiatives are unlikely to fill this gap.[10]

[6] SIA (2024). *State of the US Semiconductor Industry.* Accessed November 2024: https://www.semiconductors.org/2024-state-of-the-u-s-semiconductor-industry/

[7] BCG/SIA (2024). *Emerging Resilience in the Semiconductor Supply Chain*. Accessed November 2024: https://www.bcg.com/publications/2024/emerging-resilience-in-semiconductor-supply-chain

[8] Financial Times (13.8.24). *Chipmakers face a labour crisis.* Accessed November 2024: www.ft.com/content/e4dc9ec2-1fcf-48cb-b774-8b112bd48398

[9] Financial Times (7.10.24). *The perils of America's chips strategy.* Accessed October 2024: www.ft.com/content/52cfb4b6-d562-4caa-a7da-35a717ac4072

[10] McKinsey and Company (2024). *Reimagining labor to close the expanding US semiconductor talent gap.* Accessed November 2024: https://www.mckinsey.com/industries/semiconductors/our-insights/reimagining-labor-to-close-the-expanding-us-semiconductor-talent-gap

The US is also seeking to make it difficult for China to obtain chipmaking tools, as well as restricting the servicing, maintenance, and software updates of the equipment it already has. Such moves would particularly impact ASML in the Netherlands and Tokyo Electron in Japan, the market leaders in this area.[11] The US has, therefore, moved toward establishing complementary export control regimes with Japan and the Netherlands, which would mean Japanese and Dutch firms are not targeted by the US foreign direct product rule. There is some caution, particularly in Japan, where there are fears China may retaliate by restricting the export of gallium and graphite, action that it has already been taken in relation to US firms.

China

China is continuing to invest heavily in its semiconductor industry and has announced a further US$47bn funding as part of its third phase National Integrated Circuit Industry Investment Fund. It is also seeking to boost domestic demand for the semiconductors it produces within China.[12] Nevertheless, Chinese semiconductor firms continued to experience the deleterious impacts from US trade restrictions during 2024. A growing number of Chinese corporations are, consequently, seeking to establishing themselves in non-aligned countries (such as Singapore, Ireland, Hungary, and Mexico), to find ways of circumventing US and western restrictions on Chinese-based companies.[13]

One important segment where trade restrictions are impacting on the Chinese semiconductor industry is in electronic design automation (EDA) software, which chip manufacturers utilise to test blueprints of new generations of chips. Although accounting for only a small percentage of the global semiconductor market, it is a critical element within the overall product ecosystem. Nearly all EDA software is currently produced by three US-based companies (Synopsys, Cadence, and Siemens EDA). Despite China's latest (2021) five-year economic plan identifying chip design software as a top priority for the industry, research by Goldman Sachs has indicated that its EDA sector would need to spend US$9bn per year (29 times more than it achieved in 2023) on R&D for ten years to catch up with US-based global leaders.[14]

[11] Financial Times (17.9.24). *US and Japan near deal to curb chip technology exports to China.* Accessed October 2024: www.ft.com/content/3fa44901-33e4-4ab4-9f7b-efe1575a6553

[12] SIA (2024). *State of the US Semiconductor Industry.* Accessed November 2024: https://www.semiconductors.org/2024-state-of-the-u-s-semiconductor-industry/

[13] Financial Times (5.12.24). *China's new back doors into western markets.* Accessed November 2024: www.ft.com/content/5583db36-5141-413f-9687-2c3f4968ff07

[14] Financial Times (24.10.24). *China struggles to break US chip design 'chokehold'.* Accessed October 2024: www.ft.com/content/d3cd1f85-652c-4613-85c6-9cae033d8042

China, for its part, has extended export controls on rare earth elements. China produces 60% of global supply rare earth elements and processes 90%, and so its actions in this area are likely to have meaningful consequences. Whereas the US and its allies are seeking new sources of replacement supplies, timing will be critical, and options such as domestic refining are often impacted by planning controls and other issues such as higher costs.[15] Nevertheless, because of initiatives such as the US Chips Act and other moves to rebalance the global semiconductor ecosystem, China's share of global semiconductor capacity is forecast to fall significantly between 2022 to 2032.[16]

Europe

The implementation of the EU Chips Act has continued to frame the bloc's approach to the industry during 2024. The Act is seeking to invest US$47bn public and private funding in Europe's semiconductor ecosystem and aims to grow the EU's global share of semiconductor production to 20% by 2030. Europe is also seeking to capitalise on the global trade environments that are being conditioned by US-China relations, and given its existing strengths and the scale of its planned interventions it appears well placed to do so.

Recent developments have, however, to some extent threatened the EU's growth ambitions. During 2024, two major investments in Germany by Wolfspeed and Intel, which would have built a Euro3bn Euro factory in Ensdorf and a Euro30bn factory in Magdeburg, were shelved. Investors cited slower than expected increases in demand for EVs, which they now believe they can meet with existing production facilities within the US, for their decision to postpone the planned developments. This is likely to dent the EU's goal to double its share of the global chip market from 10% to 20% by 2030.[17] As elsewhere, the election of Donald Trump is also likely to make EU-US trading relations more difficult.

Dutch chipmaking equipment supplier ASML surprised the global semiconductor market in October 2024 when it announced a significantly lower-than-expected sales outlook, calling into question upbeat forecasts of AI-driven chip growth. One possible explanation for the decline in ASML's outlook may be due to its customers Intel and Samsung, which are experiencing difficulties in maintaining chip manufacturing for external customers[18]. There have been contradictory messages from TSMC, which announced a significant increase of 54% year-on-year jump in net profit, further raising its growth forecast[19] and supporting the view that ASML's outlook may be due to specific factors rather than industry-wide trends.

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[15] Financial Times (8.9.24). *The battle to secure economically critical metals.* Accessed November 2024: www.ft.com/content/33743ce8-c791-4e85-baa2-ab52307f7918

[16] BCG/SIA (2024). *Emerging Resilience in the Semiconductor Supply Chain*. Accessed November 2024: https://www.bcg.com/publications/2024/emerging-resilience-in-semiconductor-supply-chain

[17] Financial Times (23.10.24). *Germany's chip ambitions hit after US the group shelves plant plans*. Accessed October 2024: www.ft.com/content/b31d96e7-9c1c-44d9-b358-ebe8ce7842c1

[18] Financial Times (17.10.24). TSMC profits jump 54% on back of AI chip boom. Accessed October 2024: https://www.ft.com/content/164dfcc2-1d1d-4de6-bfba-7d346a9f8bab

[19] Financial Times (24.10.24). *Chip fortunes diverge and Tesla catches a break.* Accessed October 2024: www.ft.com/content/f226abd4-5c76-4be3-bd8f-c99c5696396d

Taiwan, South Korea, and Japan

Taiwanese-US relationships appeared to be strengthened late in 2024 when it was announced that the two countries were preparing to negotiate a deal to end so called 'double taxation' obligations for each other's companies to pay tax in both jurisdictions. This, it is anticipated, would assist the expansion of Taiwanese firms into the US in line with the aspirations of the 2022 US Chips Act. Thus far, the largest impact had been investments from TSMC into building two fabs in Arizona. With a third new fab planned, a deal on ending double taxation might encourage TMSC's suppliers to follow suit and invest in the US.[20]

Elsewhere, Taiwanese group Foxconn has announced it is investing in Mexico to build the world's largest factory making Nvidia's most advanced AI servers. Although Foxconn continues to operate several significant factory complexes in China, including the world's largest iPhone plant, the move is seen as part of the drive to steer new investment away from China, and comes alongside its other recent investments in India, which are also aimed at iPhone production.[21]

South Korea is also investing heavily in its semiconductor industry. In May 2024, it announced a further US$19bn package to support design and manufacturing, following from its 2021 K-Belt Semiconductor Strategy. This most recent initiative followed an announcement earlier in 2024 to build the world's largest semiconductor mega cluster supported by an investment of US$472bn over 20 years.[22] In addition to its dialogue with the US over export control regimes, Japan is also seeking to significantly invest in its semiconductor industry. It is also supporting leading-edge chip innovation through Rapidus, a consortium of Japanese companies, IBM, and European nanoelectronics research hub Interuniversity Microelectronics Centre, aimed at producing 2-nanometer chips.[23]

The UK

The 2024 UK general election brought about a change in government and, consequently, a further change in the UK's ministerial responsibility for the semiconductor industry. With the appointment of Lord Vallance as Minister of State for Science, Research, and Innovation in July[24], however, it is now generally anticipated that period of political (and economic) stability will ensue. Resulting from the UK's National Semiconductor Strategy in 2023, the previous UK government announced the formal launch of a new UK Semiconductor Institute in May 2024.[25] It was also announced in March 2024 that the UK had joined the EU Chips Joint Undertaking[26].

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[20] Financial Times (30.10.24). *US and Taiwan set for talks to end double taxation for companies*. Accessed October 2024: www.ft.com/content/9218cfae-af74-4cc0-9b6e-b9017cdb7361

[21] Financial Times (8.10.24). *Nvidia supplier Foxconn to makes Blackwell AI servers in Mexico.* Accessed October 2024: www.ft.com/content/dded14c5-673f-430e-819b-0e8780541a82

[22] SIA (2024). *State of the US Semiconductor Industry.* Accessed November 2024: https://www.semiconductors.org/2024-state-of-the-u-s-semiconductor-industry/

[23] BCG/SIA (2024). *Emerging Resilience in the Semiconductor Supply Chain*. Accessed November 2024: https://www.bcg.com/publications/2024/emerging-resilience-in-semiconductor-supply-chain

[24] https://www.gov.uk/government/ministers/minister-of-state-for-science-research-and-innovation

[25] https://www.gov.uk/government/news/new-independent-institute-to-steer-uk-semiconductor-innovation-and-support-semiconductor-strategy

[26] UK Government (13.3.24). *Press Release.* Accessed January 2025: https://www.gov.uk/government/news/35-million-boost-for-british-semiconductor-scientists-and-businesses-on-international-chip-research

The Semiconductor Institute will act as an independent organisation with representation from government, universities, and the private sector, to support growth in the UK's semiconductor industry. It is anticipated that the Institute will set its key areas of focus in line with those outlined in the National Semiconductor Strategy, including intellectual property, compound semiconductors, design, and research and development. The UK has chosen not to focus on boosting its own domestic manufacture of semiconductors, particularly as its own financial support for the industry is a tiny proportion of that delivered by other governments.[27]

It is unclear whether the recent change of government will lead to any significant increase in UK Government financial support over and above the £1bn over ten years announced by the previous government, or whether there will be any revisions to the Strategy. With a strengthened focus on industrial policy and a new Green Paper published in October, including a specific focus on areas such as advanced manufacturing[28], a further enhancement of government support for industries such as semiconductors may emerge over the coming years. With UK public finances under pressure, however, the nature and scale of any additional industrial support may be limited.

2.3. Looking Forward

The election of Donald Trump in the US has cast an even greater degree of uncertainty over the global semiconductor ecosystem. The industry had already been contending with growing geopolitical tensions in the years since the Covid pandemic. Donald Trump has in February 2025 announced tariffs on Chinese imports of steel and aluminium to the US on top of a general tariff on Chinese imports, and with further tariffs expected on Mexican and Canadian goods entering the Us economy.[29] The situation is unlikely to improve in the years ahead. Whether his administration presses ahead with all of the tariff threats remains to be seen, but tensions are likely to increase.

The aims of the Biden era Chips Act to reshore semiconductor production within the US will continue to be supported by the Trump presidency, which has promised domestic jobs and growth, but how these objectives are pursued may be very different. The Chips Act offers the 'carrot' of subsidies and tax breaks to encourage investors to establish new fabs within the US, Trump's approach is far more likely to be based on the 'stick' of trade tariffs on semiconductor imports into the US – an encouragement for foreign investors to set up shop within the US. Such a radical change in tone is likely have disruptive impacts well beyond US-China trade relations, as a recent study has found[30].

[27] https://www.statista.com/topics/10981/semiconductors-in-the-uk/#topicOverview

[28] HM Government (2024). *Invest 2035: The UK's Modern Industrial Strategy.* Accessed November 2024: https://assets.publishing.service.gov.uk/media/6711176c386bf0964853d747/industrial-strategy-green-paper.pdf

[29] https://www.bbc.co.uk/news/articles/cn93e12rypgo

[30] The Engineer (7.10.24). *Study identifies risks for UK semiconductor industry.* Accessed January 2025: https://www.theengineer.co.uk/content/news/study-identifies-risks-for-uk-semiconductor-industry/

3. Local economic conditions around the CS cluster

3.1. Introduction

This section presents a summary of the national and local economic and business environment within which the CSconnected cluster of businesses operate. While the activities of the CSconnected cluster of businesses have a global outlook, with much of the outputs produced for export markets, economic conditions in the UK and Wales are still important in terms of the strength of labour markets and more general conditions for business investment.

3.2. UK and Wales economic headlines

Economic growth

The UK economy experienced a recession in the latter part of 2023, with two consecutive quarters of declining GDP. UK GDP declined by 0.1% in 2023Q3, and by 0.3% in 2023Q4. Over the whole of 2023 the UK economy grew by 0.1%. Excluding the pandemic, the ONS noted that this was the 'weakest annual change in real GDP since the financial crisis in 2009'.[31] In the context of the poor UK economic performance in 2023, the first half of 2024 saw some positive economic growth, with the economy expanding by 0.7% in 2024Q1 and by 0.4% in 2024Q2. However, the more recent GDP data has been much weaker. The revised GDP estimates showed the economy had no growth in 2024Q3[32]. The monthly indicators showed that the economy declined by 1% in October 2024. It is then likely that final quarter GDP data will be disappointing, and with the average forecast for GDP growth during the whole of 2024 being 0.8%.[33]

Inflation and interest rates

Along with subdued economic growth, 2024 can also be characterised by generally falling inflation (Figure 3.1), although with some higher upturn back above the Bank of England's target rate of 2% during the latter months of 2024. Lower inflation during the year gave the Bank of England some flexibility to reduce the Bank rate in November to 4.75%, a rate that was then held in December. The rate was then reduced to 4.5% in February and with expectations that rates may fall further in 2025, although this prospect remains uncertain. The Bank of England has also reported that their estimates of 2025 UK economic growth have been reduced from 1.5% to 0.75%.[34]

[31] https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/quarterlynationalaccounts/octobertodecember2023

[32] https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/quarterlynationalaccounts/julytoseptember2024

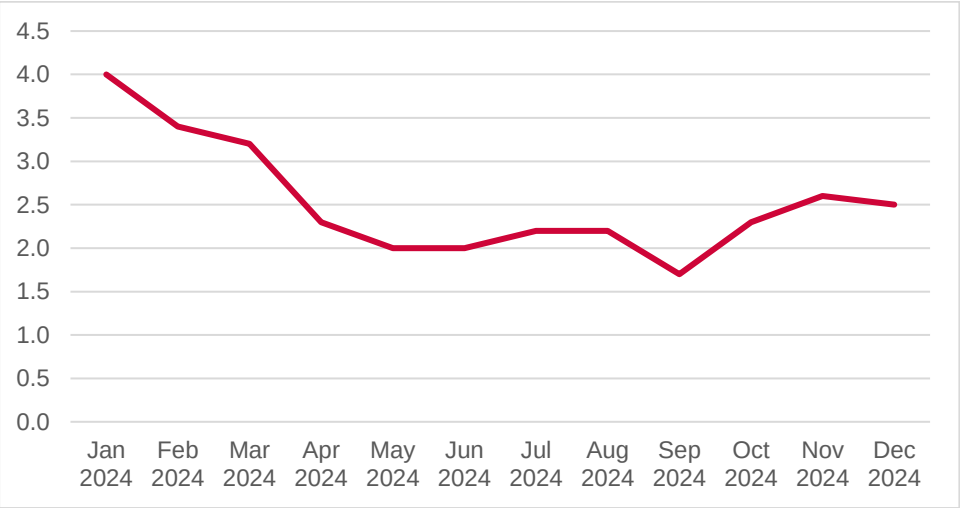
[33] https://www.gov.uk/government/statistics/forecasts-for-the-uk-economy-december-2024

[34] See https://www.ft.com/content/2d2ad006-524b-443d-8654-43cd6f1e41cd#post-7cbcb09b-3ba4-4789-8718-c52c109e4272

Business Investment

The ONS estimated that total UK business investment increased by 1.9% in 2024Q3, and that this figure was 5.8% above the level in 2023Q3.[35] However in manufacturing, UK business investment declined by just over 1% during 2024Q3, and by 2.5% compared with 2023Q4.

Figure 3.1 Annual UK CPI inflation, %



Source: ONS, January 2025.
https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/consumerpriceinflation/december2024

Employment

The number of payroll employees in the UK in November 2024 was estimated at 30.4m[36], an increase of 76,000 employees (or 0.3%) compared with the figure for November 2023. The increase was largest in the health and social work sector. However, a fall in payrolled employees during the year to November 2024 was seen in a number of other sectors, including manufacturing, construction, wholesale and retail, information and communication, professional, scientific and technical, and administrative and support services.

[35] https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/businessinvestment/julytoseptember2024revisedresults

[36] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/earningsandemploymentfrompayasyouearnrealtimeinformationuk/december2024

In Wales, the number of payrolled employees increased by 4,800 (or 0.4%) to 1.32m in the year to November 2024.[37] The UK regional data on payroll employees by sector is updated less frequently, but data for October 2024 shows the percentage increase in payroll employees over the year was highest in energy production and supply (6.6% or 355 employees).[38] During the year to October 2024, there were decreases in the number of payrolled employees in a certain sectors, including a decrease of 0.53% in payrolled employees in manufacturing, and a decline of 3.3% in payrolled employees in accommodation and food service activities.

Unemployment and economic inactivity

According to the Labour Force Survey (LFS), the UK unemployment rate for the three-month period to October 2024 was an estimated 4.3%, an increase of 0.3 percentage points from the figure for the quarter August to October 2023.[39] In Wales, the unemployment rate for the three-month period to October 2024 increased 2.4 percentage points during the year to 5.5%.[40]

The UK inactivity rate (LFS, seasonally adjusted, all aged 16 to 64 years) in the period August to October 2024 was 21.7%. This was 0.2 percentage points below the rate a year ago (August to October 2023),[41] The economic inactivity rate in Wales, in the period August to October 2024, decreased 0.2 percentage points on the year to 25.2%.[42] A degree of caution should be exercised in interpreting LFS data due to on-going quality issues.[43]

Exports

The trade in goods data for the UK regions[44] show that there had been a decrease in the value of exports from all UK countries, except Northern Ireland, in the twelve months ending September 2024 compared with the previous year.[45] The value of goods exported from Wales decreased by 9.5% to £18.0bn in the twelve months ending September 2024.

[37] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/realtimeinformationstatisticsreferencetableseasonallyadjusted

[38] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/realtimeinformationstatisticsreferencetableseasonallyadjusted/current

[39] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/employmentintheuk/latest#unemployment

[40] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/regionallabourmarket/latest

[41] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/employmentintheuk/latest#economic-inactivity

[42] https://www.gov.wales/labour-market-overview-december-2024-headline-results-html

[43] The ONS has indicated that smaller achieved sample sizes have created increased volatility in LFS results. Data for Wales currently has large confidence intervals. The ONS advise that these data be used with caution, and users take account of information from a number of different sources.

[44] A degree of caution should be applied when interpreting data on trade. Data are typically published in current or nominal prices which means they have not been adjusted to remove the effects of inflation.

[45] https://www.uktradeinfo.com/trade-data/regional/2024/uk-regional-trade-in-goods-statistics-third-quarter-2024

Total export values in Wales decreased in most product categories over the year to September 2024.[46] For example, the value of Mineral Fuels exports fell to £2.2bn in the year ending 2024Q3, from £3.8bn in the previous twelve months. The export values of Chemicals fell to £2.4bn in the year ending 2024Q3, from £2.5bn in the previous twelve months. However, the export value of Welsh Machinery and Transport products increased to £8.4bn in the year ending 2024Q3, from £8.2bn in the previous twelve months. This broadly defined group includes the products of many CS cluster firms. The contribution of CS cluster firms to Welsh export earnings is significant particularly in the context of declining earnings from other product groups.

In the year to September 2024 the value of goods imported fell in Wales by 5.2% to £20.9bn when compared to the previous twelve months.[47] Imports of Machinery and transport products increased by almost 4% during the year to September 2024 to just over £8bn. In the year to September 2024 the value of exports of machinery and transport products exceeded the value of imports by £370m.

The UK and Welsh Government budgets

The UK Government budget was published in late October 2024. To fund an increase in spending, and to fill the 'black hole' in the public finances,[48] increased taxes and government borrowing were announced.[49] Significant amongst the tax increases is an increase in employer national insurance contributions (NICs), and a reduction in the threshold above which this is paid, to take effect from April 2025.The full effects of all the budget measures are yet to be seen, however business groups have warned of inflationary consequences and falling business confidence[50] as well negative impacts on investment, employment and recruitment.[51] [52] Together with recent increases in the costs of financing government debt, and expected slow economic growth in 2025, there are related concerns about potential future tax increases ahead if the planned level of public spending is to be maintained,[53] despite pledges that the Chancellor 'will not raise taxes to top up public spending later in the parliament'.[54]

Additional spending announced in the UK budget resulted in extra funding to the Welsh Government. The draft Welsh budget, published in December 2024 allocated an additional £1.5 billion across all departments during 2025-26.[55] Most of the additional funding has been allocated to the NHS in Wales. There are some concerns about how much of the budget will subsequently be spent on increased employer NICs,[56] whilst other analysis suggests that the increase in funding may not be enough to prevent real term cuts in some spending areas.[57]

[46] https://www.uktradeinfo.com/trade-data/regional/2024/uk-regional-trade-in-goods-statistics-third-quarter-2024/#datasets

[47] https://www.uktradeinfo.com/trade-data/regional/2024/uk-regional-trade-in-goods-statistics-third-quarter-2024

[48] https://www.ft.com/content/baed2255-1887-49e1-8afa-293dbef1c698

[49] https://commonslibrary.parliament.uk/research-briefings/cbp-10124/

[50] https://www.ft.com/content/a291bc1f-b288-486e-8301-8464bfe20fa5

[51] https://www.ft.com/content/19dfff61-8a5f-400b-a5a7-17d82c84c331

[52] https://www.ft.com/content/57e2cd0a-8467-4ef9-b9b9-1822c8855605

[53] https://www.ft.com/content/2a53391c-2db3-413f-a5ee-2add76fd0966

[54] https://www.ft.com/content/ee47df5c-b7da-4ab2-ade7-d90f25e75652

[55] https://www.gov.wales/draft-budget-2025-2026

[56] https://www.bbc.co.uk/news/articles/cy53nk65py4o

[57] https://blogs.cardiff.ac.uk/thinking-wales/making-sense-of-the-welsh-governments-draft-budget-for-2025-26/

3.3. Local economic developments, needs and priorities.

Section 3.2 has outlined the economic context facing CS cluster firms. The economic data has shown that 2024 has been another challenging year. The UK economy is forecast to have grown by less than 0.8% in 2024, with the average 'independent' forecast for 2025 of 1.2% GDP growth.[58] In manufacturing, the number of payrolled employees has fallen in the UK and Wales, with the value of goods exports also generally in decline in the year to 2024Q3. In both Wales and the UK, indices of production output are below 2022 (base year) levels, and in Wales the index is almost 10% below 2022 levels.[59] The slowdown in activities at Tata steel in south Wales is expected to impact the Index of Production in the latter part of 2024 and into 2025, as well as the value of exports from Wales. Set alongside the low economic growth in the coming year, the direct and indirect impacts of the steel industry changes will hamper efforts to improve the poor levels of productivity growth and high economic inactivity in Wales. Whilst the increase in employer NICs announced in the budget will impact Welsh businesses (although with some reliefs for small businesses), including Cluster members in Wales in the coming year.

During 2024 there were some positive developments in cluster firms. These include the £51m investment by US-owned Vishay Intertechnology in Newport Wafer Fab, which ended a long period of uncertainty for the plant. The construction of KLA's new European headquarters in Newport was also completed during 2024. In addition, there has been new employment generated by cluster new entrant firms (see next section).

A broader issue of skills shortages as a barrier to growth was recognised within the National Semiconductor Strategy (2023)[60]and with related skills projects in progress including START-SEMI (Skills, Talent, And Re-education Training for Semiconductors) led by Swansea University.[61] The Welsh Joint Education Committee (WJEC) is also the first UK awarding body to develop semiconductor qualifications as a pathway to the industry. These new qualifications, developed in partnership with industry, including CSconnected, became available to learners during 2024.

58 https://assets.publishing.service.gov.uk/media/6790b5a3e2b9324a911e263e/Forecasts_for_the_UK_economy_January_2025.pdf

59 https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Economic-Indices/Indices-of-Production-and-Construction/indexofproduction-by-quarter-area

60 National semiconductor strategy - GOV.UK

61 UK research investment to boost UK semiconductor industry – UKRI

The compound semiconductor industry has been recognised as important[62] in achieving the aims of the Welsh Government economic[63] and innovation strategies,[64] and with south-east Wales Investment Zone aiming to support the sector's growth and development over the next 10 years.[65] Two Investment Zones for Wales were announced in the 2023 UK Autumn Budget, one in north-east Wales and the other in south-east Wales with £160m of funding each to focus on helping to deliver growth in at least one key future sector. The south Wales Zone, hosted by the Cardiff Capital Region, will focus around the compound semiconductor industry, with the Welsh and UK governments working collaboratively to co-develop and assess investment zone proposals.[66]

Within the challenging economic context, including the specific productivity problem in Wales,[67] the contribution of the cluster to local and national economic development is explored in the next section. This will be considered in terms of the maintenance of manufacturing employment and high productivity activity, the contribution to manufacturing output and trade, and the contribution to Welsh R&D activities.

[62] Plenary 09/01/2024 - Welsh Parliament

[63] Economic mission: priorities for a stronger economy [HTML] | GOV.WALES

[64] Innovation strategy for Wales | GOV.WALES

[65] Written Statement: Extension to timescales for Welsh Freeports and Investment Zones (6 March 2024) | GOV.WALES

[66] Memorandum of Understanding between the UK government and the Welsh Government: Investment zones [HTML] | GOV.WALES

[67] Welsh productivity performance: lost cause or still waiting for a miracle? | Welsh Economic Review

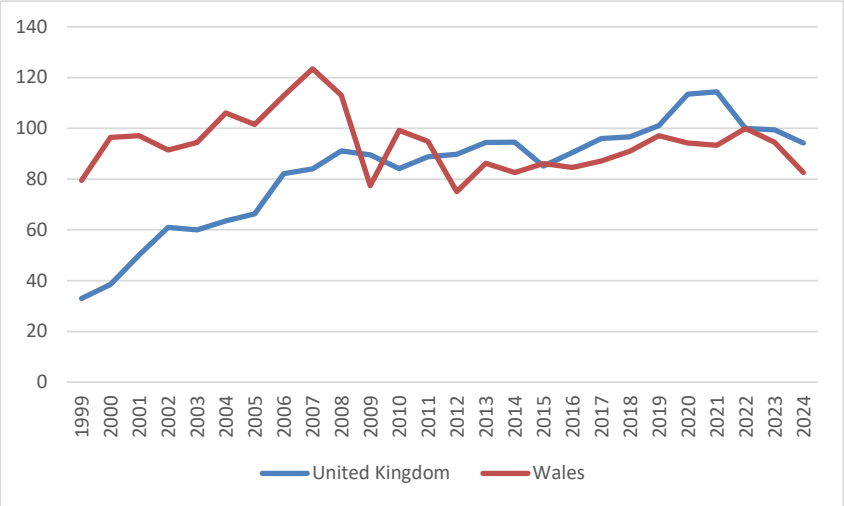
4. The economic role of the CS cluster

4.1. CS cluster and Welsh output

There is some indication that sales levels have fallen in the CS cluster between 2023-2024. It is estimated that total sales of the CS cluster in 2023 were around £553m, falling to an estimated £507m in 2024. There is a strong expectation that sales will increase in 2025 in line with investment completed in major facilities by both KLA and Vishay International.

The CS cluster sits within the broad computer and electronics products sector, and the machinery sector. Figure 4.1 reveals recent trends in the index of output in these sectors for Wales and the UK. For Wales output in the Computer and Electronics Products sector as a whole fell by an estimated 20% in the year to 2024Q2 indicating that output levels as a whole on the CS cluster are holding up better than output in the wider sector. The sharp fall in overall sector output between 2023 and 2024 is clearly shown in Figure 4.1. It is important to note here that these are estimated figures with 2024 values based on numbers available in the first two quarters.

Figure 4.1 Index of Computer and Electronic Products Output Wales 1999-2024Q2 (2022=100)

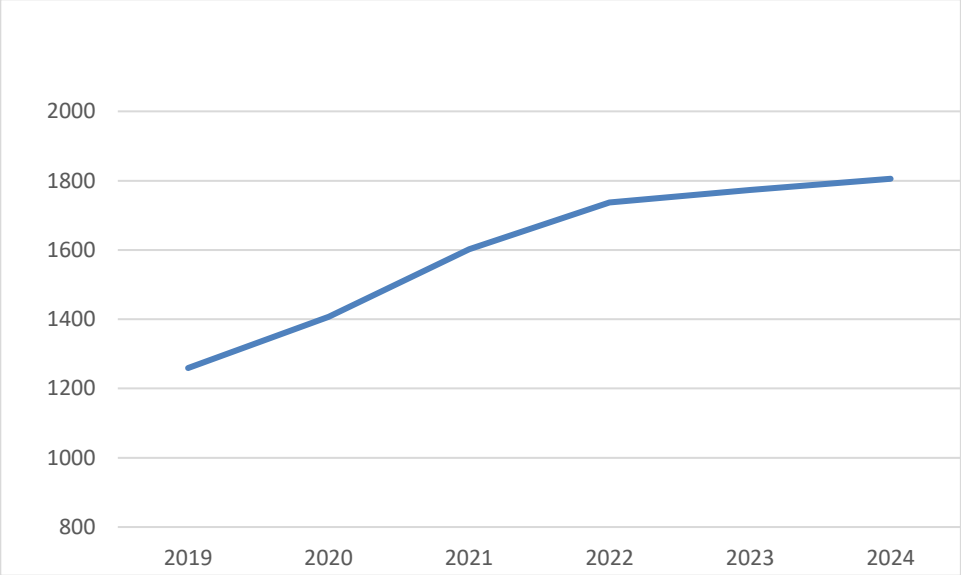


Source: Statswales

4.2. CS cluster employment

The previous analyses of the CS cluster suggests that between 2021 and 2022 there was an 8.4% increase in employment (i.e. from 1,602 to an estimated 1,737 employees in 2022). The analysis for 2023 estimates employment at 1,773 (an estimated 2% increase on 2022), with around 80% of this employment in the private sector companies that make up the CS cluster, and the remainder employed by universities and research institutes. For 2024 it is estimated that CS cluster employed 1,806 people (an estimated 1.9% increase on 2023- see also Figure 4.2).

Figure 4.2 Time trend of estimated employment in the Welsh CS Cluster 2019-24



Source: Annual Survey Series

Our analysis suggests that employment in the private sector manufacturing elements of the CS cluster has been maintained in spite of some reduction on aggregate sales during the period. Employment has also been maintained in the higher education institution-linked elements of the cluster. Particularly encouraging has been new employment created in new starts such as Kubos and Ffotoneg in Cardiff. Note that Figure 4.2 reports on direct employment in the CS cluster. This takes no account of employment that is supported in Wales and the wider UK through the spending of the cluster partners.

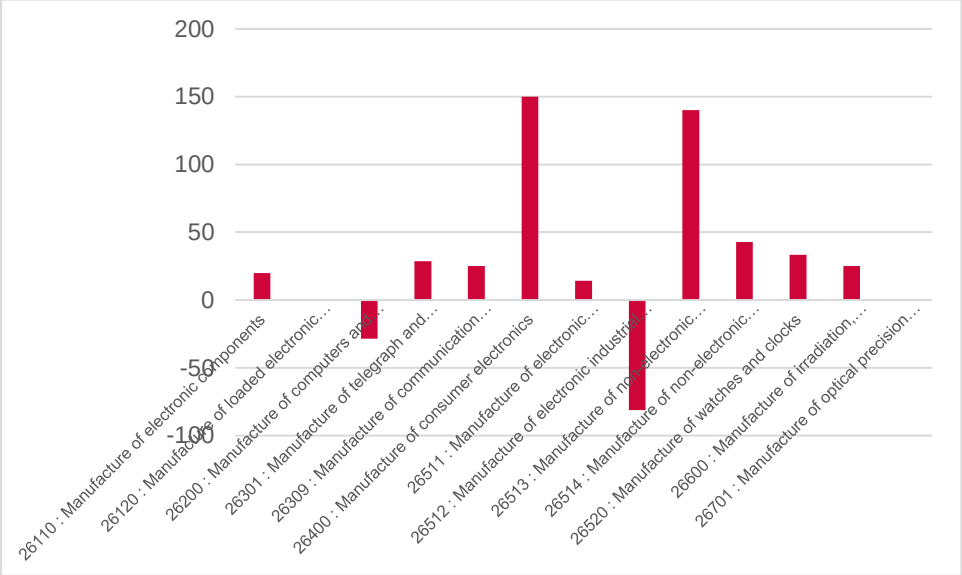
While an economic model is used to estimate supply chain effects in Wales in Section 5, it is becoming a little easier to identify firms in the Welsh supply chain and the actual activity that is supported. More information on the supply chain can be found in a 2024 CSconnected report.[68] The critical issue here is that the information in Figure 4.2 only provides a very limited perspective on the economic significance of the CS cluster and a future challenge is to better place cluster activity in the framework of the value of the whole ecosystem, which embraces not just activity supported by suppliers to the cluster but also activity 'downstream' from the CS cluster (i.e. how the activities in the cluster support activity in customer groups both currently and in the future).

The bulk of the compound semiconductor manufacturing activity in South Wales is within standard industrial classifications (SIC 2007) 26 and 27. SIC 26 and 27 together make-up the Electrical engineering and equipment sector in Wales (defined as SIC 26 - Manufacture of computer, electronic and optical products, and SIC 27 - Manufacture of electrical equipment).

[68] https://csconnected.com/media/04fjigeo/weru-csconnected-sipf-supply-chain-case-study-2024.pdf

The 1.9% estimated increase in employment in the CS cluster between 2023 and 2024 needs to be set in the context of employment in the wider sector (SIC 26 and 27). The most recent figures for 2023 reveal that total employment in SIC 26 was 7,755, and in SIC 27 was 9,778. Together these two sectors in 2023 accounted for 12.6% of Welsh manufacturing employment. Much of the CS cluster employment falls within SIC 26 and Figure 4.3 reveals changes in employment in elements of this sector between 2022 and 2023.

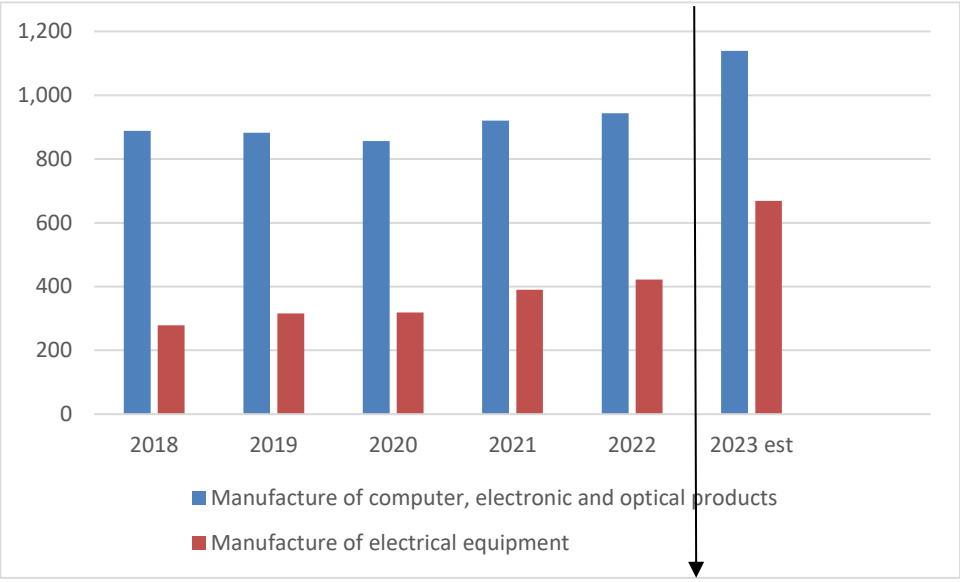
Figure 4.3 Recent % changes in Manufacture of computer, electronic and optical products employment in Wales 2022-23. (Source: ONS, BRES)



4.3. CS cluster and Welsh productivity

An important element of the economic contribution of the private sector businesses in the CS cluster relates to their productivity. Figure 4.4 reveals the estimated GVA in Wales supported in SIC 26 - Manufacture of computer, electronic and optical products, and SIC 27 - Manufacture of electrical equipment. Note here that figures for 2023 are estimated based on trends in output growth. Figure 4.4. reveals an expected increase in GVA in SIC 26 in 2023. It was noted earlier that the index of Welsh sector output appears to have fallen between 2023 and 2024.

Figure 4.4 Trends in GVA in SIC 26 and SIC 27 Wales £m 2018-2022 (2023 estimated)



Source: ONS Current price estimates of GVA. 2023 estimated based on changes in Welsh employment and with price adjustment.

The evidence continues to support the conclusion that the CS cluster as a whole is characterised by relatively high levels of productivity. For example, analysis of the most recent returns of cluster participants suggests that:

- Average sales per employee in the examined cluster firms was around £316,500 in 2024.

It is accepted that sales per employee is far from the most ideal measure of productivity, but the data does hint at the high levels of productivity, whilst also revealing the relative capital intensity of elements of the sector.

The productivity characteristics of the CS cluster also link to the types of activity being undertaken and the high skill levels of staff. The CS cluster manufacturing firms also feature relatively high levels of earnings. The analysis of survey returns for 2024 suggests:

- The total payroll for the CS cluster (excluding Higher Education elements) was an estimated £108.6m, with an average salary per full time employee of £67,765.
- An estimated 18% of employees in the non-higher education parts of the cluster were involved in R&D activity i.e. close to 300 full time equivalent employees.
- In four private sector firms in the CS cluster the proportion of employees qualified to undergraduate degree level ranged from 40% to 85%.

Additional information is available from the Office for National Statistics on levels of gross value added in Wales for sectors SIC 26 (Computer, electronic and optical products) and SIC 27 (electrical equipment). However, these sectors cover very different types of manufacturing activity, with SIC 26 including basic electronic components as well as complex semiconductor manufacture and epitaxy. Figure 4.5 shows estimated GVA in current prices for these two sectors for 2023 together with estimated employment levels from the ONS *Business Register and Employment Survey*. Comparative estimated figures are also shown for the CS Cluster of organisations and for Wales manufacturing as a whole.

Figure 4.5 Estimates of GVA for CS cluster (2024) and SIC 26 and SIC 27 (2023)

Sector	Gross value added estimated	Employees estimate	Estimated GVA per employee
CS Cluster 2024	£255m	1,806	£141,196
CS Cluster 2024 excluding Higher education, CSA Catapult and CSconnected	£236m	1,518	£155,467
SIC 26 Computer, electronic and optical products 2023	£1,139m	7,755	£146,872
SIC 27 Electrical equipment 2023	£668m	6,365	£104,948
All Welsh manufacturing 2023	£12,374m	139,000	£89,022

Source: Final 3 rows estimated for 2023 from ONS Regional Accounts GVA at Current Prices by Industry and BRES (from Nomisweb).

The analysis of the CS cluster for 2024 reveals that estimated GVA directly supported is £255m or around £141,196 per employee (noting that this includes elements of non-manufacturing activity, which works to bring down the average for the CS cluster because GVA per employment in sectors such as education, research and related services is lower than that in the manufacturing elements of the cluster). Indeed GVA per employee in the cluster excluding non-manufacturing activity is closer to £155,500. This estimate is still likely to be conservative, and it is particularly difficult to estimate some of the non-wage components of value added for the cluster.

4.4. CS cluster and Welsh trade

The CS cluster made a further important contribution to Welsh exports in 2024. The survey revealed that the proportion of output exported by the industrial parts of the cluster is now in excess of 90%. The total value of exports from the cluster in 2024 are conservatively estimated to be in the order of £466m, with total sales amounting to around £507m. For comparative purposes the total value of goods exported from Wales for the year to September 2024 was £18.0 billion (see section 3.2) meaning the exports from the CS cluster account for an estimated 2.5% of Welsh exports. In the year to September 2024 close to 60% of total Welsh exports by value went to the EU, whereas much of the exports from the CS cluster are focused on the USA and Asia.

5. CS Cluster – Wider economic impact in Wales 2024

5.1. Introduction

This section of the report updates the analyses undertaken for 2019-2023 and develops a current estimate of the economic activity of Wales supported by the CS cluster. As in each of the annual reports, the GVA supported results are estimates. While data was available from some of the industrial partners in respect of employment and output, direct GVA associated with this employment and output is estimated using a variety of sources including the ONS *Annual Business Survey, ONS Regional gross value added (balanced) by industry*[69] and the *Business Register and Employment Survey* (accessed through NOMIS). The derived estimates take into account that GVA per employee in the consortium will vary by industry, for example with developed GVA per employee estimates varying between SIC 26 and 27 (SIC 26 Manufacture of computer, electronic and optical products, and SIC 27 - Manufacture of electrical equipment), and varying again in the case of any activity supported in the higher education sector.

This part of the report also estimates how the purchasing behaviour of the cluster firms and organisations supports activity in the Welsh supply chain. As part of the annual survey the CS cluster, firms and organisations provide information in respect of their local purchasing of goods and services. Moreover, the annual survey provided information in respect of the wages and salary spending of the firms. Importantly, a large proportion of the CS cluster employees live in Wales and then purchase goods and services within the Welsh economy.

To estimate the indirect (or multiplier) impacts of the compound semiconductor cluster activity it is necessary to have a picture of the local economy that specifies how various industry sectors 'fit together' in terms of their trading relationships. This allows the effects of activity in one sector to be traced through the entire local economy. The most comprehensive picture available of the Welsh economy is an Input-Output table. Further description of the Welsh Input-Output project, its strengths and limitations, can be found in Jones (2022).[70] The latest set of tables refer to 2019 although new Welsh tables are soon to be produced by Welsh Government.

The approach adopted here involves estimating direct employment, output and gross value added connected with current cluster operations. The indirect (supply chain) and induced (household spending) effects connected with this activity are estimated using employment and GVA multipliers derived from the Welsh Input-Output framework. The multipliers used were adjusted to take account of features of the specific firms in the cluster with the analysis also incorporating information from the firms showing their local purchasing linkages (and the direction of their sales).

[69] See Regional gross value added (balanced) by industry: all ITL regions - Office for National Statistics

[70] Project_Report_Input_Output_Tables_Wales_2019.pdf (cardiff.ac.uk)

5.2. Impact headlines: Direct effects

In 2024 the compound semiconductor cluster employed an estimated 1,806 employees. As highlighted earlier in this report, the 2024 employment estimate marks a 1.9% increase on 2023 estimates.

The GVA directly supported by the cluster of firms and institutions in 2024 is estimated at £255.0m. This represents a 4% decrease on the figure for direct GVA reported in 2023. This slightly reduced GVA runs counter to the growth in employment noted between 2023 and 2024. The cause for this difference is that GVA per employment varies across different parts of the cluster, with some private sector parts of the CS cluster seeing falls in their GVA supported in Wales through the year. Then the GVA numbers reflect that some parts of the cluster see stronger conditions while others have had a more challenging year. By way of context, it is important to recognise that the overall index of manufacturing in Wales fell by around 3% in the year to 2024Q2 such that overall output levels in many parts of the manufacturing sector were down in 2024.

Based on the above numbers, the estimated GVA per employee in the whole cluster is close to £141,196, this is 6% down on the estimated figure for 2023 (£149,500). Total manufacturing GVA in Wales in 2023 was an estimated £12.4bn meaning that the CS cluster contributed around 2.1% of the total; this figure has been little changed for some years.

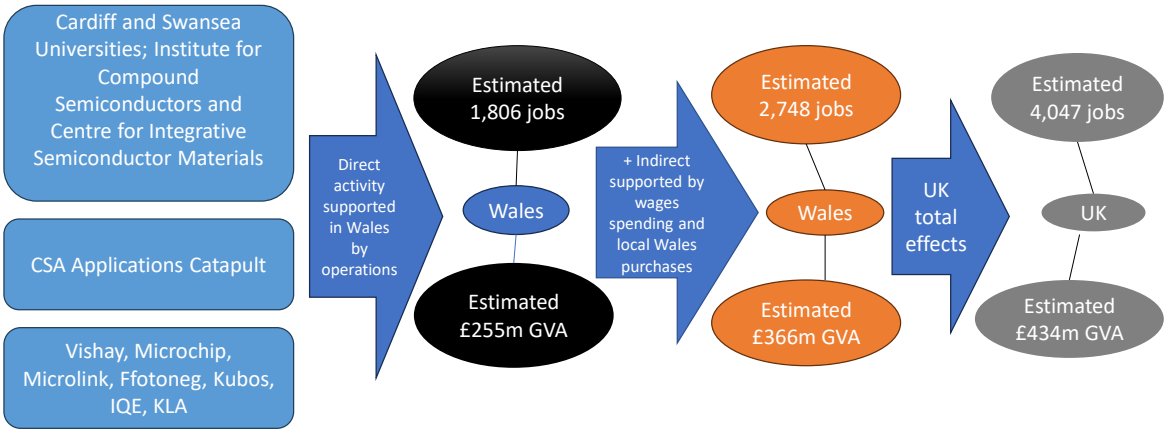
5.3. Impact headlines: Indirect effects in Wales

While the Welsh economy marks the strictly regional context for the cluster firms and organisations, the purchasing behaviour of the cluster firms also supports businesses in the wider UK economy (see later). However, much of the indirect impact of the cluster is expected to occur in Wales because of the spending of wages and salaries.

As the above analysis suggests, CS cluster members directly support around £255m of GVA and 1,806 employees. Using the Welsh Input-Output framework it is estimated that the cluster, through its purchasing of regional goods and services, and its payment of wage incomes, supports a further £111.3m of GVA in the Welsh economy. Therefore, in 2024 it is estimated that each £1m of GVA directly generated in the CS cluster supports an additional £0.44m of GVA elsewhere in the Welsh economy. Overall, this results in the cluster supporting directly and indirectly an estimated £366.3m of Welsh GVA. This is around 4% lower than the estimate for 2022 (£381.3m).

Similarly, while the cluster directly supports around 1,806 jobs, it supports an estimated further 942 jobs through its purchasing and payment of wages and salaries i.e. every employment in the cluster is connected to an estimated 0.52 of employment elsewhere in the Welsh economy. In total, therefore, the cluster in 2024 could be considered to be associated with as many as 2,748 jobs in Wales (an increase of 87 jobs compared to the 2023 figure).

Figure 5.1 Impact summary



Note: Activities of the main manufacturing firms and other CS Connected members are combined for commercial confidentiality reasons. While direct employment and turnover information was provided by cluster firms, the estimates of GVA/employee were informed by Regional Accounts Current Price estimates of Industry GVA for Wales (SIC 26, 27) and overall Welsh employment estimates in these same industries, and data from Company Accounts derived from the FAME database. Indirect and household effects were estimated using multipliers developed from the Welsh Input—Output tables for SIC 26 and SIC 27, but with some adjustment to multiplier values to allow for some purchases and sales between firms. It is noted that the firms mentioned in this figure do not share all the characteristics of the wider sector – particularly in the case of SIC 26. Multiplier estimates are therefore indicative. For the cluster firms, multiplier effects through supply chains in Wales are currently quite limited because of low local purchasing. However, the multiplier effects through wage spending are higher because of the relatively high wages and salaries paid in firms in the cluster. Type 2 UK multipliers for GVA and Employment are estimated from UK Type 1 multipliers based on the relationship between Type 2 and Type 1 effects in sectors in other parts of the UK.

5.4. UK-wide effects

As reported above, the focus of the annual report series has been upon impacts in the Welsh economy. However, in what follows we follow the procedure adopted in the 2023 annual report and estimate the whole UK effects linked to the activities of firms and organisations in the CS cluster. This exercise was challenging because of the limited information in respect of multiplier effects from UK Input-Output tables.[71] This exercise also assumes that the firms and organisations within the CS cluster share the broad characteristics of the larger industry group in the UK; for example, the whole of SIC 26 (Computer, electronic and optical products) and SIC 27 (electrical equipment). Note here that the UK wide effects embrace the Welsh effects.

[71] See UK input-output analytical tables, industry by industry - Swyddfa Ystadegau Gwladol (ons.gov.uk) These analytical tables provide information on Type 1 GVA multipliers. However, this does not include the impacts of induced household spending i.e. Type 2 effects. The approach here was to use the UK Type 1 GVA multipliers as a baseline to estimate Type 2 GVA effects (i.e. including household spending) and with use also made of the relationship between Type 1 and Type 2 GVA multipliers in the Scotland 2021 Input-Output tables case. There were no employment multipliers available for the UK for 2019. So Type 1 employment multiplier estimates are based on 2015 data for the UK (see Type I UK employment multipliers and effects, reference year 2015 - Office for National Statistics (ons.gov.uk)) and with Type 2 employment multipliers estimated in a similar way to GVA multipliers above.

The estimates here are that the CS cluster in Wales:

- Supports a total of £434m of GVA in the UK economy in 2024.
- That every full-time equivalent job in the CS cluster in Wales (1,806 employees) supports a further 1.24 jobs in the wider UK economy (i.e. a total of 4,047 UK employees).
- In both the GVA and employment impact cases, comparison with the earlier analysis in this section reveals that around 59% of the total UK GVA impact would be in Wales, and 68% of the employment effects.

5.5. A note on GVA estimates

It is important to note that it is difficult to estimate GVA connected to parts of the CS cluster in Wales. GVA can be defined as "the value generated by any economic unit that produces goods and services. It reflects the value of goods and services produced, less the cost of any inputs used up in that production process. GVA is a standard measure of the economic activity taking place in an area."[72] We use a variety of sources in this annual report series to estimate GVA, and this includes material published in annual company accounts as well as material from the annual survey of cluster members. Moreover, at a broad sector level it is possible to derive GVA estimates from published sources such as ONS regional estimates of industry GVA. However, the confidence in direct GVA estimates connected to the CS cluster would be less than those for employment estimates. Indeed, with each data source there are a series of issues which need to be considered.

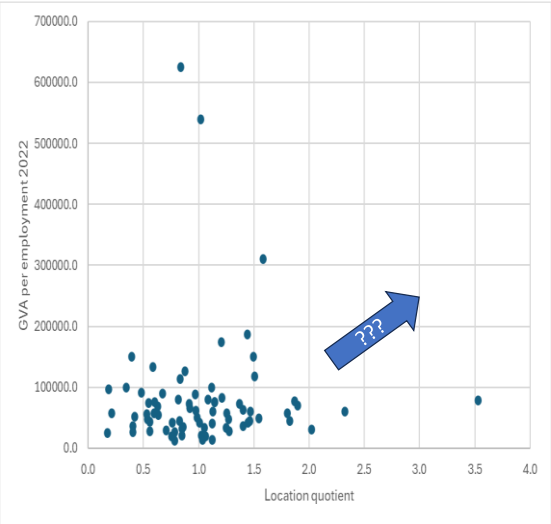
First, many of the private sector businesses in the cluster are part of national or international groups. Profits are an important part of GVA, as well as wages and salaries. However, for some firms it can be difficult to estimate the profit generated in the reference area. For example, there could be businesses in the cluster whose profits reflect wider global activities of the enterprise and may not reflect value added in local plants.

Second, GVA estimates for the UK semiconductor sector can be strongly influenced by which firms are included in the sample. The semiconductor sector is very diverse, featuring some businesses which are highly capital intensive, other such as fabless businesses have a very different cost distribution and revenue profile. At a UK level different parts of the sector are bundled together into Standard Industrial Classifications and with average GVA per employment estimates derived from such data potentially overestimating in some cases and underestimating in others. This is one of the reasons that over time in the Annual Report series, more use has been made of individual company account information in deriving estimates of GVA.

[72] See UK small area gross value added estimates - Nomis - Official Census and Labour Market Statistics

Third, the uncertainty on levels of GVA means that caution is also required in deriving firm conclusions on the comparative productivity of the sector. Ideally, improved/reliable data on GVA per labour hour worked in the CS cluster of firms would become available. Notwithstanding, in this report there is good evidence in terms of wages paid, skill levels, R&D intensity and capital intensity, and investment performance, indicating that the cluster features relatively high productivity economic activity. Indeed, the CS cluster forms an important part of the computer products sector in Wales, which as well as having stronger productivity characteristics, is also a sector in which Wales has a relative specialisation. Some of this is picked up in Figure 5.2 that shows how selected different Welsh sectors compare in terms of GVA per employment, and how far Wales is specialised in the sector.

Figure 5.2 Productivity and Wales Specialisation[73], selected sectors 2022



Computer' electronic and optical products

SIC07 description	GVA per em	LQ Wales
Insurance and pension funding	625428.6	0.8
Water transport	540000.0	1.0
Manufacture of pharmaceutical products	311000.0	1.6
Water supply and sewerage	186666.7	1.4
Electricity, gas, steam and air conditioning supply	173500.0	1.2
Manufacture of leather products	150000.0	0.4
Manufacture of other transport equipment	149750.0	1.5
Financial service activities	133833.3	0.6
Telecommunications	125625.0	0.9
Manufacture of computer, electronic and optical products	118000.0	1.5
Programming and broadcasting activities	114285.7	0.8
Manufacture of beverages and tobacco products	100000.0	1.1
Manufacture of wearing apparel	100000.0	0.3
Air transport	96666.7	0.2
Scientific research and development	90571.4	0.5
Manufacture of machinery and equipment	89333.3	0.7
Manufacture of textiles	88500.0	1.0
Manufacture of motor vehicles	82285.7	1.2
Construction of buildings	80555.6	0.8
Manufacture of rubber and plastic products	79285.7	1.1

In conclusion the processes adopted to derive direct GVA estimates in this report provides conservative estimates, and the GVA per employment figures are lower than those published in some reports.[74] For example, the UK semiconductor sector study published in September 2024 suggested: "Average GVA per employee among dedicated semiconductor companies [UK] is estimated to be approximately £460,000 (£305,000 if ARM is excluded)." Dedicated companies are defined as "Companies that specialise in the design, development, and manufacture of semiconductors. Including companies across the semiconductor supply chain spanning design, materials and manufacturing that have at least one technical employee in the UK."

[73] Location quotient is a measure of Wales relative specialisation in a sector based on employment shares compared to the UK average.

[74] See for example: Semiconductor sector study - GOV.UK

On this definition an estimated 1,518/1,806 (see Figure 4.5 earlier) of total CS cluster employment in South Wales might be considered as dedicated companies. Applying the £305,000 GVA per employee number (accepting this is an average) would suggest that Welsh sector direct GVA would be in the order of £463m (compared to our estimate in this report of around £255m (albeit with this latter including around £19m of GVA associated with non-manufacturing parts of the sector). Then applying the UK numbers would suggest that direct GVA supported in Wales is around twice our estimate. This would be hard to defend given that total sales of the private sector elements of the CS cluster in Wales are just £505m, and it would be the annual survey returns together with company accounts show that GVA would not be around 90% of reported sales of firms. The UK wide numbers from the UK Semiconductor Study might then be reflecting the characteristics of a small number of selected large firms. Our analysis of annual survey returns would suggest that no more than one Welsh firm in the CS cluster would have a GVA per full-time employee that would exceed £300,000. Then it is accepted that some parts of the CS cluster in Wales do appear to have high gross margins, but not all. This would suggest using the UK wide figures to gain GVA estimates for Wales could be difficult.

6. Conclusions

6.1 The overall picture

- Global semiconductor trade continues to divide along geopolitical lines during 2024. In the context of growing market obstacles, the adaptability of multinational enterprises (MNEs) has been an important dynamic. The resilience of MNEs is likely to be tested further, particularly given the uncertainties on the stance of the US to the industry, and wider trade, as well as the response of other governments.
- The change of UK Government in 2024 brought a focus on industrial policy and advanced manufacturing with the publication of a Green Paper. Given the pressures facing UK public finances, however, it is unclear whether there will be any additional support for the semiconductor industry over and above the £1bn over ten years announced by the previous government.
- 2024 has been another challenging year for the UK economy, which is forecast to have grown by less than 1%. Meanwhile, the average forecast for 2025 is 1.2% GDP growth. In manufacturing, the number of employees has fallen across the UK, with the value of goods exports also generally in decline. Despite this backdrop, the compound semiconductor industry has been recognised as important in achieving the aims of the Welsh Government's economic and innovation strategies.
- Investment completed in major facilities in the CS cluster (notably KLA and Vishay International) are expected to contribute to a sales increase 2025. Despite a fall in sales during 2023-24, employment levels in the cluster increased the year, partly because of new start-ups, but also the maintenance of employment levels by existing private sector manufacturing elements of the cluster and higher education-linked elements.
- Evidence continues to show that the overall CS cluster is characterised by relatively high levels of productivity, as well as contributing to the overall value of Welsh exports. It is also estimated that in 2024, each £1m of GVA directly generated in the CS cluster, supported an additional £0.44m of GVA elsewhere in the Welsh economy.

6.2 Risks impacting cluster development

Table 6.1 provides a risk register for the semiconductor industry. It should be noted that this is an indication of the risks facing the wider global semiconductor industry based in part on our commentary in Section 2 of the report, rather than any risks particularly faced by the CS cluster. The risk score is generated by multiplying the likelihood of a risk occurring by the potential impact of the risk on the semiconductor industry. On this basis, the greatest risks facing the industry appear to relate to skills supply, lower than forecast demand for semiconductor products, geopolitics, and growing obstacles to trade. The potential of a wider economic downturn affecting end product demand are also notable.

Figure 6.1: Global Semiconductor Industry Risk Register

Risk	Risk Description	Likelihood	Impact	Risk Score	Mitigation Measures
R1	Increased geopolitical tensions (supply chain and raw material disruption).	4	3	12	Diversifying supply chains, stockpiling, growth of regional clusters, investment in domestic production.
R2	Increased export controls, tariffs, and blacklisting.	4	3	12	Diversifying supply chains, stockpiling, political/policy advocacy.
R3	Reduced financial and other investment (state and industry)	2	4	8	Focus on innovation, international collaboration, political/policy advocacy.
R4	Wider economic downturn (affecting end markets).	2	5	10	Diversifying products, increased manufacturing responsiveness.
R5	Lower than forecast downstream demand for semiconductors.	3	5	15	Diversifying products, market expansion, customer engagement.
R6	Insufficient labour/skills supply (including replacement skills).	4	5	20	Investment in future/replacement skills provision, political/policy advocacy.
R7	Environmental impact (regulatory compliance requirements).	2	3	6	Adoption of green manufacturing processes, investment in R&D, employee training.

Key: Likelihood (probability of the risk occurring 1 [not very] – 5 [very]); Impact (consequences should risk occur 1 [minimal] - 5 [severe]); Risk Score (likelihood score x impact score).

6.3 Investment Zone development

Finally, it is important to indicate opportunities for the cluster, in particular the £160m funding to be made available through the South Wales Investment Zone (SWIZ), which is set to focus on the development of the compound semiconductor industry. In Wales, the Investment Zones (IZ) programme is designed to equip regional partners with a flexible and autonomous toolkit to strengthen key industries, enhance innovation capabilities, and promote growth in Wales and across the United Kingdom. The programme places a strong emphasis on fair work practices and sustainability.[75]

A central commitment of the IZ programme is to support devolution at all levels, empowering regional partners in Wales to drive growth collaboratively with the UK Government and the Welsh Government. Subject to proposals meeting specific requirements and receiving agreement from all stakeholders, the Welsh and UK Governments anticipate offering a range of tax reliefs within designated IZ tax sites. These incentives, expected to be available for up to 10 years where applicable, may include: land transaction tax relief; non-domestic rates (NDR) relief; enhanced capital allowance; enhanced structures and buildings allowance; and employer national insurance contributions relief.[76]

The choice of South Wales as an IZ focused on compound semiconductors is an indication of the confidence of policymakers in the long-term growth of the CS cluster, and the investment opportunities available should provide a platform for a more rapid expansion of activities. The engagement of a number of new firms within the cluster are testimony of the growth potential as indicated by a number of metrics highlight throughout this report. Success will lie in the formulation of a strategy that will allow the cluster to effectively circumnavigate the uncertainties inherent across the semiconductor industry. This should be based on strategic investments that heighten the local depth of the industry while at the same time broadening the international breadth and reach of the cluster.

[75] Investment Zones in Wales: technical document - GOV.UK

[76] Investment Zones place selection in Wales - GOV.UK

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