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REGIONAL GOVERNANCE AND THE SEMICONDUCTOR INDUSTRY: THE CASE FOR MORE CONTEXTUALISED AND RESPONSIVE POLICYMAKING

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Case Summary

This case study, the fifth in a series that aims to support the CSconnected Strength in Places Fund project funded by UK Research and Innovation, identifies the main governance challenges in formulating and implementing national industrial and technology policies that aim to foster regional development, whilst supporting industries such as compound semiconductors.

It explores the interface between industrial policy, multilevel governance (MLG), and regional development. Although industrial policy has seen a renaissance over the past decade or so, this case finds that in the case of the UK *National Semiconductor Strategy* (DCMS, 2023) industrial policy has emerged from a decision-making process that has been divorced from detailed regional contexts. The case finds that some of the main obstacles to developing a national industrial policy that supports effective regional development in lagging regions, in particular in the semiconductor industry, derives from the continuing predominance of the centralised national policy process.

With only limited governmental financial support available and a lack of technical capacity to adequately contemplate high tech industries, the inability of the central state to share power or relinquish control was a major limiting weakness, both in terms of supporting the continuing development of the UK semiconductor industry and in maximising its potentially positive impacts in regional development strategies.

This case highlights two important factors necessary to achieve successful industrial policies, these are:

> ***A reconfigured role for the state**, where traditional state actors must develop new approaches to coordination, steering, and networking. Collaboration networks and institutional arrangements have a clear impact on innovation, competitiveness, and economic development. Democratic accountability must, therefore, be reimagined, and thus greater transparency and accountability becomes ever more critical.*
>
> ***A significantly increased role for non-state actors** in developing industrial policy, particularly in the context of MLG. MLG and territorial governance promise the scope for greater flexibility and responsiveness for industrial policy to address location specific challenges. Moreover, the collaborative place-based ecosystems offered by regional partnerships of universities, businesses, and local and regional governments (i.e., largely non-macro state actors), offer the scope for locally rooted and creative policy and delivery.*

The case recommends a periodic review of the *National Semiconductor Strategy* with a particular focus on these two factors, but ultimately concludes that political and economic stability over the coming years with be necessary to attract the necessary business investment to achieve growth in the semiconductor industry and beyond.

1. Introduction

This is the fifth in a series of case studies to support the CSconnected Strength in Places Fund (SIPF) project, funded by UK Research and Innovation. The case study identifies the main governance challenges in formulating and implementing national industrial and technology policies that aim to foster regional development, whilst supporting industries such as compound semiconductors. In so doing, it explores the interface between industrial policy, multilevel governance, and regional development.

Moreover, this case specifically considers the previous UK Government's national semiconductor industrial strategy, focusing on the South Wales compound semiconductor cluster, as well as the wider UK semiconductor industry. In this context three main questions are addressed:

> *What are the governance challenges in formulating and implementing national industrial policies that aim to foster regional development in general, and support the compound semiconductor industry in particular?*
>
> *What are the potential solutions to addressing these governance challenges?*
>
> *What are the implications for ensuring effective future regional development policymaking in support of the compound semiconductor industry?*

Persistent regional economic inequalities are a major and seemingly intransigent policy issue for policymakers (Rodríguez-Pose et al., 2024). In the UK, former industrial areas have experienced particular problems to economically transition and have, thus, fallen further behind those areas that have successfully done so. This has subsequently limited overall UK growth (McCann and Ortega-Argilés, 2021). With the new UK Government prioritising economic growth, addressing differences in regional economic performance is expected to be an important consideration over the coming years (McCann et al., 2023).

Partially as a result of the increasing recognition of growing regional divides, industrial policy has seen a renaissance over the past decade or so, and a more interventionist economic policy agenda has re-emerged. This report finds, however, in the case of the *National Semiconductor Strategy* (DCMS, 2023), industrial policy has emerged from a decision-making process that has been divorced from detailed regional contexts.

This case concludes that national governments in the UK and elsewhere must more seriously engage with multilevel governance if they are to successfully overcome regional divides and consequently grow the overall UK economy. Moreover, given the degree of regional embeddedness, this is a particularly important finding for the compound semiconductor cluster and wider UK semiconductor industry.

2. Regional Development, Industrial Policy and Multilevel Governance

The UK experiences significant and growing regional economic inequalities (Henley, 2010; McCann, 2016; Rodríguez-Pose, 2018). It is by no means unique in this regard as many other OECD countries also experience significant variation in regional economic performance (OECD, 2023). To address such problems regional development strategies often seek to foster innovation and economic growth, and commonly involve multi-level governance (MLG), knowledge networks, cross-border collaboration, and other policies tailored to the unique characteristics of each region (Huggins and Thompson, 2023). As MLG is concerned with the distribution of power and decision-making across various levels of government and non-governmental organisations to ensure collaborative policymaking, it is particularly salient in this case.

In this respect, therefore, institutional contexts and governance structures clearly have a significant impact on regional development strategies (Rodríguez-Pose, 2020), and those regions exhibiting low-growth trajectories tend to offer more challenging environments through which to progress such strategies (Huggins et al., 2018).

Decisions on which industries might bring regional economic benefits, and therefore justify the use of scarce public resources to help develop, should be based on careful and well-informed economic intelligence and analysis (Crawley and Munday, 2017). This is important in the case of semiconductors, as given the industry's role as a critical current and future technology and an important contributor to regional economic performance in Wales and other regions, as it clearly supports a strong case for public investment.

A balance needs to be struck in these selection debates between novelty and continuity, as well as intra- and extra-regional learning, and state versus network-centric approaches (Morgan, 2016). Policy responses must also be contextualised, and the assemblage of regional policies, collaborative networks, and institutional arrangements will impact significantly on regional innovation, competitiveness, and economic development (McCann, 2016). It is also important to note that successful approaches in one region may not necessarily be effective in another (Fernandes et al., 2020), and place-based knowledge of local circumstances is a significant requirement for successful regional development strategies (Huggins and Thompson, 2023).

Consistent with this line of thinking, smart specialisation strategies have gained traction across the EU and to varying degrees elsewhere (McCann and Ortega-Argilés, 2015; Rainnie, 2023), and are one example of 'territorial governance' that promotes policymaking driven by local knowledge. The process tends to identify the specific characteristics and assets of a region, seeking to emphasise its competitive advantages, and aims to bring stakeholders together around a shared vision (Moodie et al., 2023). Consequently, participants subsequently engage in public-private partnerships involving business, universities, and research centres in a process of entrepreneurial discovery. The development of the CSconnected UKRI agenda is an example of a smart specialisation strategy. For all such strategies, territorial governance is a vital element of place-based policymaking and with public authorities below the national level, most notably regional and local authorities, potentially playing a core role in establishing a framework for territorial governance given their unique combinations of place-based knowledge and expertise (Bailey et al., 2023).

2.1 Industrial Policy

Industrial policy both in the UK and the EU has enjoyed something of a revival in recent years. Successive UK Governments from the early 1980s largely rejected industrial policy in favour of a more liberal approach to markets and, at most, the state's role was centred on regulating competition (Criscuolo et al., 2022). The UK's experience during this period was not unique, after the late 1970s industrial policy and direct economic interventions fell significantly out of favour in most European countries (Grabas and Nützenadel, 2013). Industrial policy at this time tended to be perceived as a mechanism to support declining manufacturing. Conversely, contemporary industrial policy, in large part, is concerned with achieving competitive advantage (McCann et al., 2023; Sunley et al., 2023), which has itself become closely associated with regional or territorial governance and has been closely linked to the concept of clusters. In this respect, the geographical concentration of firms in clusters helps facilitate the complex relationships and forces that help achieve such competitive advantage (Huggins and Izushi, 2011).

The reappearance of industrial policy in the UK reflects broader global forces, but also arises from a growing recognition that the UK's regional productivity disparities are significantly undermining its overall productivity performance (McCann et al., 2023). The policy response to this agenda has, however, been in flux, seemingly searching for the right form and degree of intervention. Recent UK industrial strategy has, it is suggested, consisted of three essential criteria: the identification of a set of priority technologies as a focus for innovation; the promotion of formal collaborations between business and universities to utilise knowledge and expertise to develop new products and processes based on these technologies; and the need to 'rebalance' and 'level-up' the economy across all regions (Johnston et al., 2023).

Little attention has, however, been given to how place-based advantages might be best derived from the UK's recent approach to industrial policy (Sunley et al., 2023). There has been a lack of clarity in the interface between industrial policy and regional development in the UK, with policy has tended to be overly centralised (McCann et al., 2023). The evidence suggests that UK industrial policy has been in a period of flux, and has lacked a coherent formulation about how place-based benefits might be best derived to overcome the regional economic inequalities.

2.2 Multilevel Governance

The concept of multilevel governance (MLG) offers significant scope to explore the connections between places and industrial policy. There are several areas where MLG and industrial policy overlap with regional development, for example: territorial cohesion and 'spatial justice' (Madanipour et al., 2022; Medeiros et al., 2023); innovation ecosystems and regional competitiveness (Diemer et al, 2022; Fernandes et al., 2021); and regional resilience and adaptation to shocks (Webber et al., 2018; Sutton and Arku, 2022).

MLG has a propensity to disperse power, both vertically between levels of government (local, regional, national, supranational), and horizontally across various quasi-governmental and non-governmental organisations that seek to ensure policy harmonization across sectors and regions. Furthermore, the complementary concept of 'territorial governance' and its focus on the integration of regional actors, and their respective knowledge, into locally driven policymaking processes, has been offered as a means of overcoming some of the limitations of MLG in terms of policymaking between various spatial scales (Moodie et al., 2023).

The precise factors and conditions that determine the success of place-based industrial policy are not fully understood (Beer et al., 2023). Place-based industrial policy presents challenges, not least that policy tends to favour those regions and places that already have certain advantages such as stronger physical and social infrastructure, and business networks and industrial ecosystems (Bailey et al., 2023). To counter this trend, incentive zones (for example, special economic zones, free zones, industrial parks, free-trade zones, free ports, foreign trade zones, and export processing zones) are increasingly promoted as a means to encourage more regionally varied economic growth (Frick and Rodríguez-Pose, 2022). The effectiveness of these incentive zones varies significantly, however, and regions with greater institutional and/or economic advantages often benefit most (Arbolino et al., 2023). The vertical and horizontal mix of policy, and successful coordination between governments at different levels, are critical to help correct any weaknesses that exist (Bailey et al., 2023).

2.3 Key Issues

One core issue to arise from this framing discussion relates to how national industrial policies and multilevel governance, and the interaction between these, impacts on regional development efforts in underperforming regions. In this respect the compound semiconductor cluster in South Wales is a useful lens because the cluster sits within a context of multi-level governance structures and also within a context of a more disadvantaged region.

When considered through the lens of MLG and territorial governance, successful industrial policy appears to require two important dynamics:

> ***A reconfigured role for the state,*** *where traditional state actors must develop new approaches to coordination, steering, and networking. Collaboration networks and institutional arrangements have a clear impact on innovation, competitiveness, and economic development. Democratic accountability must, therefore, be reimagined, and thus greater transparency and accountability becomes ever more critical.*
>
> ***A significantly increased role for non-state actors*** *in developing industrial policy, particularly in the context of MLG. MLG and territorial governance promise the scope for greater flexibility and responsiveness for industrial policy to address location specific challenges. Moreover, the collaborative place-based ecosystems offered by regional partnerships of universities, businesses, and local and regional governments (i.e., largely non-macro state actors), offer the scope for locally rooted and creative policy and delivery.*

Following the identification of these key issues, the next sections of this case consider how these are playing out in the evolution of the compound semiconductor cluster in South Wales. It considers how the furtherance of UK industrial policy (here the *National Semiconductor Strategy*) in the context of a geographically grounded cluster connects to MLG and territorial governance experiments, and then with the overall aim of supporting regional innovation.

3. The UK's Semiconductor Industry

Semiconductors are a critical technology, a core component of electronic devices and, consequently, underpin modern economies, and national security, as well as emerging technologies in areas such as renewable energy, artificial intelligence, and electric vehicles (Huggins et al., 2023). The global market in semiconductors is US$500 billion and is projected to rise to US$1 trillion by 2030 (Burkacky et al., 2022; SIA, 2023). Semiconductors have a highly globalised value chain that has evolved over a significant period and, it is argued, this has brought major benefits such as increases in production and technological advancements (BCG/SIA, 2022). The globalised industrial structure of semiconductors also has inherent weaknesses, however, such as a lack of flexibility in relation to supply and demand, geographical skills shortages, vulnerability to natural disasters, and it is particularly exposed to geopolitical conflict (Woods and Gajjar, 2024).

The UK's share of the global semiconductor market is just 0.5 percent, but it does have strengths in certain areas, such as research and development, chip design, intellectual property, and compound semiconductors (Alsop, 2023; DCMS, 2023). The UK also has several semiconductor clusters, including the compound semiconductor cluster in South Wales, which directly employs close to 1,800 people (Munday et al., 2024). In spite of these areas of strength, there are weaknesses. The House of Commons BEIS committee (BEIS Committee, 2022, pp. 17-18) observed, '*there is…a mismatch between the output from UK fabs, which are relatively few in number and which commonly use older technology to produce niche products, and the requirements of UK manufacturing or technology firms…. [But] on the other hand, manufacturers may not be fully aware of what can be acquired within the UK'*.

There are growing tensions in the global semiconductor market that impact the UK industry. There are concerns in relation to national security arising from import pressures from Asia, and, in particular, from China's growing share in particular segments of the semiconductor value chain (Miller, 2022). There are also increasing concerns related to exports, witnessed particularly in US-China trade relations, and foreign ownership of domestic firms or facilities. Although foreign ownership of semiconductor firms is typical – for example, just 28 percent of UK located semiconductor firms are UK owned - there has been a growing anxiety concerning those owned by Chinese investors (these account for 5 percent of UK located semiconductor firms) (Woods and Gajjar, 2024).

In November 2022, the former UK Government used powers under the 2021 *National Security and Investment Act* to require Nexperia, a Dutch company owned by China's Wingtech Technology, to sell the firm Newport Wafer Fab, which it had acquired in 2021. The UK Government had initially approved the sale to Nexperia, but, after significant criticism and much delay, the decision was reversed. In using its powers under the Act, the UK Government explained: '*The Secretary of State considered that a risk to national security from this acquisition relates to the technology and know-how that could result from a potential reintroduction of compound semiconductor activities at the Newport site, and the potential for those activities to undermine UK capabilities'* (BEIS Committee, 2023, p. 4). Subsequently, Newport Wafer Fab was purchased from Nexperia by US-owned Vishay International and the deal was completed in March 2024 following the approval of the UK Government (Vishay, 2023; *Financial Times*, 8th November 2023).

Regardless of this outcome, the inability of the UK Government to make timely decisions regarding the sale of Newport Wafer Fab as well as lengthy delays in bringing forward its *National Semiconductor Strategy* (presented in May 2023), resulted in governance challenges that impacted the development of the semiconductor cluster in South Wales. Furthermore, the limited powers and resources of the devolved Welsh Government in this case exposed some of the limitations of UK multilevel governance, particularly with respect to industrial policy.

It is important to note that similar issues have often occurred in the context of concerns over digital sovereignty (see: Adler-Nissen and Eggeling, 2022; Chander and Sun, 2021; Floridi, 2020; Hummel et al., 2021). There are, for example, parallels with the case of SoftBank's sale of UK-based Japanese owned chip business Arm to California-based Nvidia, which collapsed in 2022 (*Financial Times*, 8th February 2022), and with the blocking of Huawei's involvement in the UK's 5G rollout (see: King, 2019; Schmitz and Seidl, 2022). The UK Government's previous experiences in these cases may have had a lasting and adverse impact on its decision making processes.

Given the above, the following sections explore the governance framework within which these developments have played out in respect of the UK's policy position regarding semiconductors, the relationships between different tiers of government including the UK and Welsh Governments, the City Deal-funded Cardiff Capital Region, and the development of the South Wales cluster.

4. UK Industry Strategy and Multilevel Governance: the South Wales Compound Semiconductor Case

4.1 The BEIS Committee inquiry into the UK semiconductor industry

In 2022 the House of Commons Business, Energy and Industrial Strategy (BEIS) Committee held an inquiry into the semiconductor industry in the UK (BEIS Committee, 2022). The inquiry came against the backdrop of the global shortage of semiconductors that began in 2020 and the significant disruptive impact this had on worldwide manufacturing. The inquiry was held prior to the publication of the UK Government's semiconductor strategy in 2023, and was particularly concerned by the significant delay in the Government bringing forward that strategy.

The BEIS 2022 report noted: '*The DCMS [UK Government Department for Digital, Culture, Media and Sport] strategy has already been nearly two years in the making, and there was some frustration in submissions to our inquiry about the pace of the work and the need for the Government to get on with support for the sector…*' (p. 26). Significantly, the Committee highlighted what it believed to be a lack of clear policy governance in relation to the UK's semiconductor industry. It said: '*Many Government departments have intersecting interests in the UK semiconductor industry. But the sector is uncertain about where primary responsibility within Government lies and to which part of Government they should address concerns'* (p. 3).

In a subsequent debate on semiconductors in the House of Lords (2023), the Government observed, that whereas: '*The ownership of the semiconductor strategy sits squarely with DSIT. There is a range of Acts—to do with export controls and protection of investment from states seen to be hostile to us—that of course come under other departments…*'. This is potentially a key weakness in the UK's approach with different responsibilities existing in different places, with a simultaneously siloed approach existing in relation to specific industries. With regard to the overall support offered to the industry, the BEIS Committee (2022) inquiry report concluded, that '*it is not clear to us that the support or attention currently offered by Government is at anything like the scale which is needed…*' (p. 5).

The BEIS Committee (2022) sought to codify what it called the 'role of government' in relation to the semiconductor industry. The Committee identified seven specific areas where the Government should seek to intervene in the industry, which are summarised in Figure 1. In relation to one of these roles, the attraction of overseas talent, the Committee observed that the UK Government's restrictions placed on international students wanting to study at UK universities, which large businesses have said will harm their investment decisions in the UK, only appear to have added to these concerns (*Financial Times,* 13th May 2024).

In identifying these seven roles for government, however, the Committee does not seem to have explicitly considered issues of multilevel governance in the UK. There was no substantive mention made of the MLG context and whether or not this is likely to be an aid or barrier to effective policymaking. Nor did the Committee distinguish between the role of government and the wider understandings of governance. Consequently, its conclusions and recommendations appear to relate solely or mainly to the UK Government.

Figure 1: The 'roles of government' in the semiconductor industry

Government Role	*Explanation*
Grants or tax credits.	Incentives for domestic and international research and development investment.
Tax-advantaged investment schemes.	To support venture capital.
Direct funding.	A pragmatic approach to existing (non-manufacturing) UK strengths that require less capital intensive investment.
Bridging the gap between research and commercialisation.	For example, university laboratories being fitted with manufacturing equipment to enable a smoother transition to foundries.
Helping secure inward investment.	Concerns over lack of joined-up approach or significant incentives.
Ensuring a sufficient skills base.	Firms seeking to renew their skills base face difficulties in recruitment and retention
Facilitating the attraction of overseas talent.	A mixed picture.

Source: BEIS Committee (2022, pp. 30-38).

Issued to coincide with the publication of its much delayed National Semiconductor Strategy in May 2023, the UK Government's substantive response to the Committee's report (BEIS Committee, 2023) made clear its intension to establish a UK Semiconductor Advisory Panel that would be chaired jointly by government and industry, but that its primary role would be delivering the Government's strategy.

In its response to the Committee the Government emphasised the need to ensure security of a minimum level of chip supply by providing a '*…baseline level of manufacturing [that] could provide a low volume of chips for critical infrastructure'* (p. 6-7). Instead of seeking to develop a significant presence in chip manufacture, the UK Government's response sought to outline that its strategic response would '*…maintain and build on the UK's leading edge in chip design and IP; make the UK one of the top global centres for compound semiconductor innovation; and build on our existing research base…[and build] a foothold in the next generation of future semiconductor technologies*….'. It also said it would seek to support commercial R&D and SME growth, with funding for new enabling infrastructure across the country, including for the creation of a compound semiconductor 'open-foundry' ecosystem (p. 8).

Although it provided little detail on where and how these aims would be achieved, it was clear that the strategy had been highly influenced by the role of the UK's existing regional semiconductor clusters, including the compound semiconductor cluster in South Wales. Nevertheless, the UK Government's response appeared to limit ambition and, as explored below, can be considered by international and industry standards to provide limited funding for the implementation of the UK National Semiconductor Strategy.

Much of the evidence to the Committee's inquiry was provided by the semiconductor industry. In its evidence, IQE told the inquiry: '*Intellectual property and design expertise are important aspects of the semiconductor supply chain but these activities can be moved around the world relatively easily*', whereas manufacturing had low geographic mobility due to the large capital-intensive facilities required (IQE, 2022). Whereas the Welsh Government observed in its own evidence to the inquiry: '*…It is unrealistic to create a full end-to-end semiconductor supply chain in the UK, and relationships with partners in Europe and the US will remain key'* (Welsh Government, 2022, p. 2).

Tellingly, Rockley Photonics - another firm with a facility in South Wales at the time (for a period within the Nexperia facility) - told the inquiry: '*When we consider scale-up and volume manufacturing, the UK is a laggard as former state-of-the-art facilities have been repeatedly sold (and usually shut down at a later time) despite sometimes receiving government support. What remains are some smaller facilities…there are no longer any UK-owned volume-capable fabs in the UK*… (Rockley Photonics, 2022, p. 2). Unfortunately, Rockley Photonics subsequently exited the South Wales cluster and the UK, concluding: '*Is the Government currently providing the clarity and direction required to enable growth and security in the semiconductor industry*?… *Unfortunately, the simple answer to this question is no'* (p. 4).

The lack of a clearly formed and articulated approach across government strategic agendas for the semiconductor industry appears to have led to a largely reactionary policymaking response rather than a more proactive entrepreneurial one.

The UK Government's strategic response to semiconductors, as set out in the National Semiconductor Strategy (DCMS, 2023), was focused largely on chip design. With the average cost of constructing and equipping a single new fab estimated to be around US$10bn (although it is noted the cost of establishing a compound semiconductor fab is considerably less) this is perhaps not surprising (McKinsey and Company, 2023). On the issue of supply chain resilience, the Strategy states '…*the best way to build better resilience in supply chains will be through international action*'. (DCMS, 2023) In a debate on the semiconductor industry in the House of Lords (2023), held several months after the publication of the National Semiconductor Strategy, the DSIT minister said: '…*To build an advanced silicon fab would, first of all, cost tens of billions of pounds. It would run into not only costs of operation but substantial risks of uncompetitive yields…it makes sense that our strategy should build on the country's strengths, particularly in design.*' This would be a continuation of the UK's industrial stance since the 1980s, which has focused on niches rather than activity as scale (Munday et al., 2024b).

The importance of government financial support is heightened at critical junctures, and can make a significant difference to the potential growth of semiconductor clusters, as has proven to be the case in Taiwan (Breznitz, 2021). The previous UK Government (BEIS Committee, 2023) argued that it had invested £290 million to support semiconductor companies over the previous ten years, with a further support for international R&D collaboration, domestic R&D, the creation of a UK semiconductor infrastructure initiative, and new centres for doctoral training having been made available. Witnesses to the BEIS Committee Inquiry (2022, p. 30-31) also observed that the Government had invested around £800 million on compound semiconductor research through universities and has also funded the Compound Semiconductor Applications Catapult, which is located in Newport, South Wales.

The Committee reported concerns, however, from within the industry that later-stage technology was missing out on research funding. Other witnesses told the Inquiry that the UK Government approach had been '…*to be to pour money into arbitrary research and leave the market to decide what to take advantage of…*'.

Overall, the scale of this previous and projected investment was minimal in comparison by international standards. Moreover, the Welsh Government (2024) argued that the UK National Semiconductor Strategy will not deliver any additional funding in Wales, and that £1 billion over 10 years across the UK was not a significant amount of additional capital.

4.2 The Welsh Government

The above discussion indicates a confused and conflicting landscape within which the future strategic direction of the semiconductor industry in the UK is embedded. In the context of multilevel governance, and in relation to the South Wales Compound Semiconductor Cluster in particular, the strategic response of devolved government is an important consideration. The Welsh Government's strategic relationship with the semiconductor industry can be seen in the context of its *Economic Mission: Priorities for a Stronger Economy* industrial policy (Welsh Government, 2023). In this respect, the Welsh Government is partnering with industry, academia, and Cardiff Capital Region (a City Deal funded entity) with efforts to grow the Welsh-based semiconductor industry. The Welsh Government also highlights that its support for the Welsh semiconductor industry aligns with its innovation strategy (Welsh Government, 2023b).

The Welsh Government has indicated its understanding of the importance of the South Wales semiconductor cluster to the overall Welsh economy, which exports more than 95 per cent of its products and contributes close to £0.5 billion in exports every year - around 3 per cent of all Welsh manufacturing exports (Munday et al., 2024). In the two years up to 2024, investment had been made in the cluster by Siemens (Germany), MaxPower and MicroLink Devices (USA), and Rockley Photonics (UK) (although as indicated above this has now departed). In addition, the new European manufacturing and R&D centre of US firm KLA (a US$100 million investment) has also been made (Welsh Government, 2024). The Welsh Government has also been investing in physical infrastructure at Newport's Celtic Lakes, a key location for the cluster, which connects with Welsh Government's support for the new South East Wales enterprise zone where compound semiconductors will be a central element (Welsh Government, 2023c).

Furthermore, and prior to the UK's departure from the EU, the Welsh Government led British participation in the European Commission's *Important Project of Common European Interest in Microelectronics* programme that was the forerunner to the European Chips Act (Huggins et al., 2023). This had approved plans by the UK, France, Germany and Italy to provide up to €1.75 billion in state aid for electronics production, of which UK companies would have received €48 million. The Welsh Government argues that this would have '*...unlocked private sector investment in the UK of up to €337m (£306m)*', but the UK Government did not honour this funding (BEIS, 2022, p. 3). In 2023, the Welsh Government became a signatory of the European Semiconductor Regional Alliance, but the work of the Alliance appears very much on the context of EU policy, and it is difficult to yet see what direct benefit this might bring to the South Wales cluster (Welsh Government, 2023e).

4.3 Good Governance of Industrial Strategy?

As indicated above, the semiconductor industry is highly vulnerable to geopolitical tensions, most notably resulting from growing tensions between the US and China, which have reverberated across the whole semiconductor ecosystem. In the context of the compound semiconductor cluster, these tensions were clearly witnessed in the case of Chinese-owned Nexperia's purchase, and subsequent forced sale, of Newport Wafer Fab. This experience exposed the weaknesses of the previous UK Government's decision-making processes in relation to the semiconductor industry, but there were also parallels with experiences in other industries and critical national infrastructure, such as the roll out of 5G. Moreover, the severely limited powers of the Welsh Government and other regional partners to engage with this process, clearly demonstrated the challenges of multilevel governance in the UK context (Hooghe and Marks, 2003).

The previous UK Government made much of its desire to develop the UK's semiconductor industry based on its existing strengths. But in the case of Nexperia it did not adequately demonstrate a commitment to the region, and its failure to act in a timely manner was a severe limitation. The Government's response to the Nexperia saga was largely reactive, rather than proactive, and may have been influenced by its experiences in other industries. The significant delay may have seriously affected the business of Nexperia and may have impacted upon the decision of the Rockley to depart the cluster and the UK, thereby losing important investment opportunities from Newport. Overall, it is clear that the decision made by the previous UK Government in this instance paid little or no regard to its likely impact on the South Wales cluster.

The UK national strategy aimed to build on the existing regional clusters of activity, especially South Wales, but there is little acknowledgement within the strategy of the need to learn from the evolution of these clusters. Moreover, it is far from clear whether the national strategy sought to understand the constraints that exist at a local or regional level. It did not consider whether local systems have the capacity to effectively engage with the national policy process (Sunley et al., 2022; 2023). Fundamentally, it is not clear whether the development of the national strategy was largely a reactive top-down process or whether there were genuine opportunities for bottom-up development based on the experiences of regional clusters and industry partners (Stoker, 1998).

A lack of technical knowledge and experience within government on particular policy areas, such as semiconductors, must also be noted. While much is made within the strategy of the existing highly regionalised clusters, there appeared to be only limited effort to understand the regional ecosystems within which the clusters are located, the locally grounded knowledge associated with them, or the importance of multilevel governance in this respect (Parsons et al., 2024).

Overall, it is not clear that the semiconductor strategy actually constitutes an industrial strategy given that it appears to have limited its integration with the expertise of regional partners, which is a key requirement in recent understandings of contemporary industrial policy (Bailey et al., 2023). This supports previous conclusions on the lack of clarity at the interface of industrial and regional policy in the UK (Tilley et al., 2023). Given the growing interest in investment zones in the UK this is potentially a significant shortcoming in the future governance of regional development.

The previous UK Government's strategic response to the semiconductor industry displayed a serious lack of understanding of the need for a reconfigured role for the state in the context of industrial policy and its governance. Instead, it was predicated on traditional notions of centralised government rather than broader notions of networked multilevel governance (Pierre and Peters, 2020). The new UK Government must address these issues if it is to successfully achieve its growth objectives.

5. Key Issues and Conclusions

This case study of the UK semiconductor industry has sought to identify some of the main governance challenges in formulating and implementing national industrial policies that aim to foster effective regional development in lagging regions. Ultimately this case has concluded that some of the main obstacles to developing a national industrial policy that supports effective regional development in lagging regions derives from the continuing predominance of the centralised national policy process.

Despite the clear evidence of a semiconductor industry that is highly regionalised and based on dispersed clusters, and a widely understood acknowledgement that such an industrial structure exists, a UK semiconductor industrial strategy emerged from a decision-making process that was too divorced from regional considerations.

This policymaking modus operandi appeared unwilling or unable to seriously contemplate a radically reconfigured role of the state and a wider reliance on the intelligence and engagement of non-state actors. With limited financial support available for the industry and a lack of technical capacity to adequately contemplate high tech industries such as semiconductors, this inability to share power or relinquish control was a major limiting weakness, both in terms of supporting the continuing development of the UK semiconductor industry and in maximising its potentially positive impacts in regional development strategies.

There is strong evidence of the important and contextualising role that can be played by non-state organisations, such as CSconnected and HEIs, in developing effective, well-informed, and regionally focused policy agendas. A dispersal of power away from London toward regional industrial clusters, which are complex ecosystems of state and non-state actors, may enable more effective and more responsive policymaking. The new UK Government's proposed 'mission boards', designed to transform Whitehall policymaking, must also seriously engage with multilevel governance as well as private sector expertise if such a policy approach is to be successful.

A closer empirical analysis of the implementation of the *National Semiconductor Strategy* over its initial years may provide further evidence of how to improve on industry involvement within multilevel governance configurations. This would inform the development and implementation of any revised strategy with the UK semiconductor industry, as well as the renewed interest in growth as the driving force behind the new Government's economic agenda.

It is therefore recommended that:

> *A review of the National Semiconductor Strategy should be undertaken, led by an industry, government, and wider policy community advisory group that is regionally representative of semiconductor and compound semiconductor clusters.*
>
> *The review group should be jointly chaired by a senior industry representative and appropriate UK Government minister. The review should be published in 2025 to coincide with the two-year anniversary of the introduction of the Strategy.*
>
> *The review should seek to evaluate the implementation of the strategy and consider potential improvements. Critical to such a review would be addressing the two core findings of this case: the need for a radically reconfigured role for the state in semiconductor industrial policy, and the need for a significantly increased role for non-state actors within this policy process.*

The review group might also consider whether the establishment of a specific semiconductor mission board would be beneficial to support growth within the industry, so as to contribute to the UK Government's growth ambitions.

Finally, one of the major conditioning factors for industrial and regional policy development in recent years has been the significant degree of political and economic instability experienced in the UK. If the new UK Government is to achieve its growth ambitions over the coming years, and attract businesses investment, then stability must also be a central priority.

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