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Hard Tech, Hard Power: Rebuilding Britain's Industrial Base for the Age of AI

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Executive Summary

In the age of AI, Britain must be able to build physical things. As frontier technologies like AI, quantum and robotics become widespread, the production of their physical inputs will become the key bottleneck. The real winners will therefore be the countries that not only adopt AI, but create the physical things that AI depends on and creates demand for: chips, robots, energy infrastructure, advanced manufacturing, defence equipment. This is "hard tech": technology you have to build, not just code. And it is in these hard-tech areas where much of the economic and geopolitical value will accrue. Far from making the physical world obsolete, therefore, the digital revolution is making it more important than ever.

This is compounded by an altered geopolitical backdrop. The assumptions that underpinned the UK's growth model after the Cold War – frictionless globalisation, comparative advantage and efficiency at all costs, and dependence solely on a services-driven economy – no longer hold. The UK can no longer outsource its economic and national security, and must stake a claim in critical technology supply chains in order to have a seat at the table. This does not mean having to compete with other countries on frontier AI models themselves, but it does mean building strategic leverage by developing capabilities in physical components that will underpin the next phases of the technological revolution.

But the UK is structurally disadvantaged when it comes to building and scaling in the physical world. Its tech sector and investment ecosystem are heavily skewed towards services and software. UK venture capital ranks third globally by value, but only tenth in deep-tech intensity – meaning the UK is attracting capital, but not for many of the deep-tech sectors that matter most.[1] This is visible in the AI ecosystem itself: of the UK's world-leading AI firms, 968 are software companies and just 74 are hardware firms, with a funding ratio of 10:1 (£18.7 billion in software compared to £1.84 billion in hardware).[2] Beyond the investment skew, the UK's manufacturing base has thinned significantly, and it has produced too few of the large, R&D-intensive anchor firms that are so key to building an industrial centre of

gravity: a dense ecosystem flywheel of talent, supply-chains and shared infrastructure. It is now a common refrain that the UK is good at inventing things but has become less good at scaling them.[3]

The challenge is likely to intensify as AI and autonomous discovery accelerate and commoditise invention. In that world, intellectual property (IP) alone will become a less durable form of strength, while the importance of scaling and manufacturing will increase.

The UK therefore needs a future-facing industrial policy to build strength in hard tech: capital-intensive deep technologies that require significant infrastructure investment, have long-term time horizons and are generally considered more risky for traditional investors. To do this, the UK's industrial policy must optimise for two things. The first is *competitiveness* – building genuine comparative advantage in a small number of strategic, "winnable" technologies and components. The second is *resilience*: creating a minimum viable industrial base so that companies do not have to relocate to scale, and so the UK maintains its economic and defence security. In other words, we must raise the industrial ceiling and the floor.

This agenda and the government's growth mission are natural allies. Growth needs to be felt in every part of the country, not just London and the South East. Focusing on hard tech is a big part of how that happens. The clusters of engineering and manufacturing strength that should be built upon already exist well beyond the capital: robotics in Liverpool, semiconductors in Wales, aerospace and defence engineering across the Midlands, chips in Bristol. Backing Britain's ability to build things is a whole-country effort.

Crucially, though, industrial policy is qualitatively different from the vital – but separate – goals of levelling up and regional growth. Regional growth is downstream of an industrial policy that takes bets on the right sectors and strengths. Indeed, industrial policy demands concentrated agglomeration – building globally rather than nationally competitive clusters and backing the UK hard-tech startups that can become global champions. Luckily, many of the UK's existing strengths are indeed diffused across the country; but taking bets requires being honest about where those existing strengths lie.

Rather than a comprehensive industrial policy blueprint – energy, planning and skills reform are addressed in other publications by the Tony Blair Institute for Global Change – this paper sets out two cross-cutting reforms to reset the ambition of UK industrial strategy and four practical, high-impact institutional levers that can be pulled within the next 12 to 36 months using largely existing institutions and capital.

Key Recommendations

RESET UK INDUSTRIAL STRATEGY AS A NATIONAL PRIORITY

- **Set a headline UK manufacturing target:** Government should commit to manufacturing reaching 10 per cent of UK gross value added (GVA) by 2031, with a subsequent target of 12 to 14 per cent – restoring, though not exceeding, Britain's 2002 position, and providing concrete benchmarks against which the success of the recommendations below can be judged.
- **Make the public financial institutions report directly to the chancellor:** The UK's public financial institutions – including the National Wealth Fund (NWF), British Business Bank (BBB), National Security Strategic Investment Fund (NSSIF), UK Export Finance (UKEF), Great British Energy and National Housing Bank – should start reporting, together, to the Chancellor of the Exchequer John Healey as chair of the Industrial Strategy Board, rather than being split across four departments. Their individual mandates and time horizons should be protected from relitigation at each change of government.

FUND STRATEGIC HARD-TECH INFRASTRUCTURE

Hard-tech infrastructure is precisely the kind of pre-commercial, long-horizon asset that the NWF mandate is trying to correct for. But the NWF is insufficiently focused on non-energy-related investments into enabling infrastructure for emerging technologies.

- **HM Treasury should require a minimum of 20 per cent of the NWF's remaining undeployed capital to be spent on non-energy enabling infrastructure for critical technologies** – including but not limited to infrastructure for AI hardware, AI for science, quantum, advanced manufacturing, robotics, biotech, photonics and space. Given the NWF has £19.4 billion left to deploy, this would amount to roughly £2.91 billion.

RESET THE DEFENCE INDUSTRIAL BASE

The UK's traditional defence companies are not built to deliver the fast innovation or play the ecosystem-anchoring role that the UK now requires from its defence-industrial base. Encouragingly, the UK already hosts a new pipeline of hard-tech and defence companies – from PhysicsX to Isembard, Cambridge Aerospace and Valarian – that policy can help scale into genuine neo-primes, but the government must now pivot to provide the demand-signalling needed to enable this growth.

- **Set a declining cap on the share of major-contract spend awarded to the UK's largest defence primes** and enforce – with published criteria and transparent reporting – the existing commitment that at least 10 per cent of the segmented procurement model's equipment budget be spent on novel technologies each year, giving these emerging companies a credible market to sell into.
- **Establish a £50 million to £100 million seed fund for employees leaving defence primes, aerospace and manufacturing to start hard-tech companies:** the BBB should be a limited partner (LP) to the fund, and it should be paired with framework agreements on IP licensing, non-compete waivers and expedited security-clearance transfer, negotiated by the Ministry of Defence (MOD).
- **Redirect £1 billion of R&D tax-credit spending into a dedicated annual machine-tool grant** targeted at companies and firms building components for defence and other strategic supply chains, doubling Britain's machine-tool purchasing capacity overnight.

REFORM THE CATAPULT NETWORK

The Catapult Network absorbs roughly £200 million of public money a year but is fragmented, spread across too many sectors and locations, and insufficiently aligned with the commercial engineering bottlenecks that actually block deployment – unlike Germany's Fraunhofer model, where 30 to 40 per cent of funding comes from industry paying to solve specific problems.

- **Review and refocus the Catapult Network, apart from the High Value Manufacturing Catapult, around priority translational engineering needs:** assess utilisation and strategic relevance across the network, determine which capabilities should be retained, consolidated or discontinued, and concentrate funding on a smaller number of clearly defined national engineering priorities. These should be commercially focused, embedded with industry and defence-procurement communities, and rebranded to attract top engineering talent.

BUILD PATIENT CAPITAL FOR UK HARD TECH

UK pension funds and institutional investors are natural sources of patient capital in principle, but venture capital – with its lack of liquidity, ten-year lock-ups and no interim income – is not necessarily the best vehicle to channel that capital into private markets. The Mansion House reforms have made progress but run into the same structural mismatch.

- **Establish a UK Hard-Tech Megafund:** a special-purpose vehicle, capitalised with government first-loss capital of £200 million to £500 million, and holding a diversified portfolio of between 50 and 100 late-seed to Series B companies across nuclear, AI hardware, quantum and defence tech. The fund should issue tranched instruments – rated senior bonds for pension funds and insurers, equity tranches for sovereign wealth funds – designed to be attractive to institutional capital.

01

Turning Britain's Industrial Legacy Into Future Advantage

Britain must be able to compete in the hard technologies that will underpin the most critical supply chains of this century. To do this, it needs an industrial strategy for the future that neither falls into past assumptions about frictionless globalisation – which no longer hold in today's hard power world – nor offers a nostalgic version of "reindustrialisation" that props up uncompetitive jobs and industries of the past.

This requires building competitiveness – global comparative advantage in at least some hard-tech sectors – and resilience: minimum viable industrial capability for economic security and scaling national champions.

Yet to do this the UK government needs to rally behind a unifying political narrative on industrial and tech policy, not just settle a policy debate. Currently, there are two failures of political narrative evident in the UK's discourse around industrial policy and technology. The first is that most British people do not feel that technology or building the UK's "national winners" of the future matter to them. They see it as a problem for the founders in Oxford and Cambridge, or the investors in London – not something they have a stake in. This is not the reality; it reflects a failure of storytelling.

The UK technology story is too often one about software, universities and the South East. While this skew has elements of truth it is far from the whole picture. To truly capture the value of these technologies – and to revive the UK's defence-industrial base in a new age of conflict – the UK also needs to be able to build physical things. Robotics strengths in Liverpool,[4] semiconductor capabilities in Wales[5] and defence primes like BAE Systems and Rolls-Royce in the Midlands – to name a few – are a critical part of the story. As with the Industrial Revolution, which the UK led, this is a challenge and an opportunity for the whole country.

There is a second potential narrative failure at the other end of the extreme. Frequently, in a well-intentioned attempt to make UK technology a national story, we conflate industrial strategy with redistribution or "levelling up". Both are rightly political priorities, but they must be treated as different policy areas. The ambition to be globally competitive *and* to have equal growth should both be pursued, but levelling up is downstream from industrial policy, not synonymous. This is because the economics of industrial strategy requires making concentrated bets, focused on agglomeration and building globally competitive companies and clusters. Sprinkled too thinly, or focused on maintaining jobs and industries of the past rather than building the future, industrial strategy becomes unstrategic.

Moreover, concentrating bets does not mean hoarding their benefits: scaling competitive anchor firms pulls supply chains, startups and skilled employment across the country with them as they grow. A case in point: three in four employees at Silicon Valley's largest tech firms now work outside California – and over the past five years, these companies have grown their national workforce at more than double the rate of their local workforce.[6] In other words, by doubling down on Silicon Valley the United States has produced companies that drive jobs and economic growth across the country.

Technological disruption is inevitable, but the UK's prosperity is not. A future-facing hard-tech strategy is necessary to ensure the UK captures the value of the coming wave.

02

Why Hard Technologies Matter – and Why the UK Struggles

Hard technologies are capital-intensive, technically sophisticated forms of manufacturing and R&D.[7] These technologies are "sticky" in that they come with infrastructure, tacit knowledge and supply chains that make it difficult for value to leak out of the UK. That durability makes them a structural source of long-term prosperity as well as economic and geopolitical leverage.

Capabilities in hard technologies have always been critical to a serious economy, but they have become even more so in today's age of zero-sum geoeconomics. This is because:

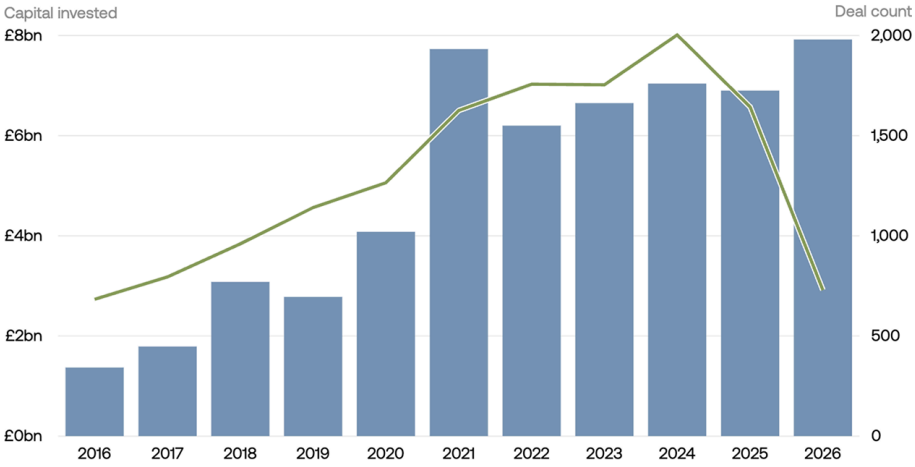
1. Much of the value of technologies like AI will be captured in the physical world, because the physical world is where the bottlenecks lie. For example, it is the supply of chips and energy systems – not code – that currently caps how much AI can be built. Conversely, AI is far more likely to cannibalise "soft" tech and service sectors. Indeed, the companies profiting most from the AI revolution are those building physical technologies: from Nvidia to Taiwan Semiconductor Manufacturing Company (TSMC) and Dutch semiconductor-industry supplier ASML.
2. Frontier technologies like physical AI and quantum require continual iteration, which means there must be a feedback loop between R&D and production. Achieving this feedback loop demands a minimum physical capacity to build. For example, a robotics team refining a gripper design needs to build and test 20 prototypes in a month – which requires physical production and R&D happening in close proximity.
3. Manufacturing has disproportionate spillover effects. In the UK, manufacturing contributes indirectly to 20 per cent of GDP despite delivering just under half as much in direct GDP.[8]
4. Firms are far more likely to remain or retain critical mass of operations in the UK in hard-tech sectors, where it is more difficult to relocate due to tacit knowledge and supply chains.

5. The ability to build and scale things is increasingly essential to protect economic security in crises – as demonstrated by the need for vaccine manufacturing during Covid-19 – and to have an adequate defence industrial base.
6. Investment into asset-light and asset-heavy technologies tends to oscillate cyclically. Currently, analysis shows that markets are shifting away from capital-light, consumer-oriented sectors (for example, software-as-a-service) towards heavy capital and the "real" economy (Figure 1).[9]

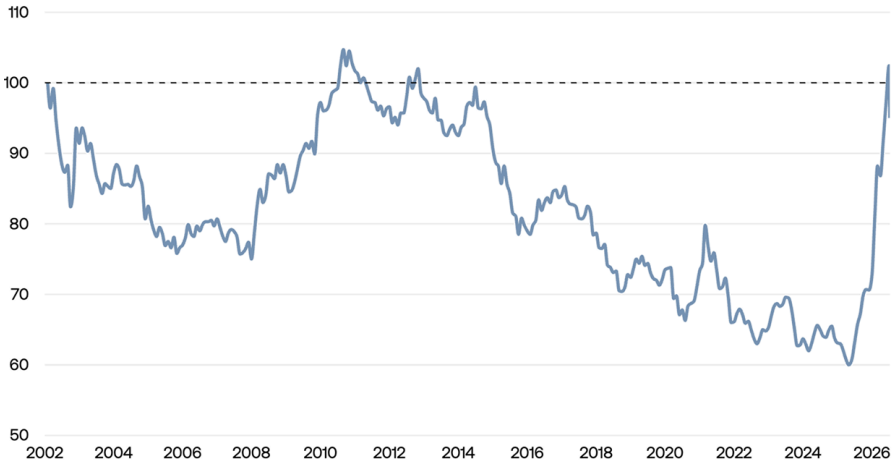
FIGURE 1

Hard-tech investment is increasing across private and public markets, with record venture-capital funding and renewed interest in asset-heavy firms

Venture-capital investment in asset-heavy hard technologies has reached record levels across the UK, with similar trends in Europe and the United States, and has remained resilient despite the broader slowdown in venture funding since 2021.



After more than two decades of underperformance, capital-intensive companies have begun to outperform as investors increasingly price in a more capital-intensive investment cycle.



Source: UK hard-tech venture capital data: PitchBook (to 2 August 2026). Indexed performance of asset-heavy versus asset-light US stocks: Goldman Sachs Research (to 8 July 2026)

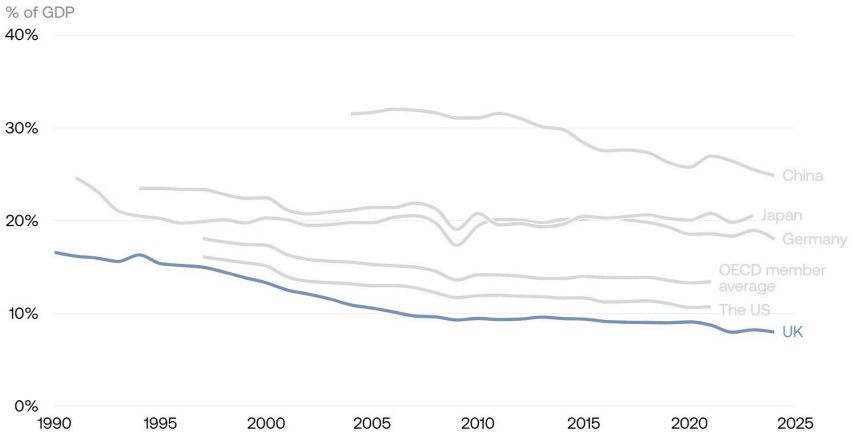
The semiconductor industry usefully illustrates why hard technologies matter. The most irreplaceable nodes in the most important supply chain in the world are physical technologies. The Dutch firm ASML is the world's sole producer of extreme ultraviolet (EUV) lithography machines – the machines required to fabricate chips with extreme precision. ASML holds exactly the kind of "moat" described above: three decades of R&D have yielded not just the product itself but tacit knowledge, supplier relationships that drive an R&D feedback loop, and co-development with Taiwan's TSMC, which cannot be imitated. China, despite spending tens of billions to build its own EUV capacity, remains decades behind.[10] This particular firm is not only Europe's most valuable company, with a market cap of $670 billion; it also confers geopolitical heft to the Netherlands, giving it a stake at the table in a critical value chain.[11]

However, the UK is structurally disadvantaged in building world-leading hard technologies – and therefore misses out on many of the positive second-order effects described. Over the past two decades, the UK's share of global manufacturing exports and manufacturing value added has more than halved (Figure 2), despite its indirect contribution to 20 per cent of GDP because of R&D spillovers.[12,13] More broadly, the UK's R&D spending has suffered dramatically. Over the decade up to 2023 the number of UK firms in the top 100 global R&D spenders dropped by half. Just 26 UK-owned companies – comprising 15 pharmaceutical firms, four banks, and seven software and computer-services firms – account for 70.1 per cent of the UK's total business R&D performed globally.[14]

However, even where R&D-intensive "anchor" firms do exist in the UK, they are largely not in hard-tech sectors (Figure 3). The wider picture reinforces the concern: R&D by UK-headquartered companies stood at £33.5 billion, far below the United States (£590.4 billion) and Germany (£99.4 billion), and somewhat below France (£40.2 billion).[15] This is particularly worrisome as large companies, especially in hard-tech sectors, tend to contribute highly on business R&D spending (Figure 4). Overall, this suggests that other countries with stronger manufacturing and R&D will be in a stronger position compared to their peers.

FIGURE 2

Manufacturing's share of UK GDP has declined, lagging behind international competitors and the OECD average



Source: Our World in Data

And the same goes for R&D in basic research, which is skewed away from engineering in the UK. Around 39 per cent of UK government R&D funding goes to basic research – well above the OECD average – while only 20 per cent goes to experimental development, significantly below peers. Higher-education R&D is similarly skewed: just 15 per cent is spent on engineering and technology, far lower than in other major industrial economies.[16] Indeed, the UK lacks large-scale applied-research institutions equivalent to Germany's Fraunhofer Society or Singapore's Agency for Science, Technology and Research (A*STAR).

FIGURE 3

The UK's top 10 companies by R&D spending include only two hard-technology companies, and two pharmaceutical companies

Name	Sector	World rank by R&D spend	R&D
ASTRAZENECA PLC	Pharmaceuticals & biotechnology	14	
GSK PLC	Pharmaceuticals & biotechnology	34	
HSBC HOLDINGS PLC	Banks	107	
LLOYDS BANKING GROUP PLC	Banks	168	
BARCLAYS PLC	Banks	176	
SHELL PLC	Oil & gas producers	229	
UNILEVER PLC	Food producers	245	
ROLLS-ROYCE HOLDINGS PLC	Aerospace & defence	253	
CNH INDUSTRIAL N.V.	Automobiles & parts	265	
NATWEST GROUP PLC	Banks	320	

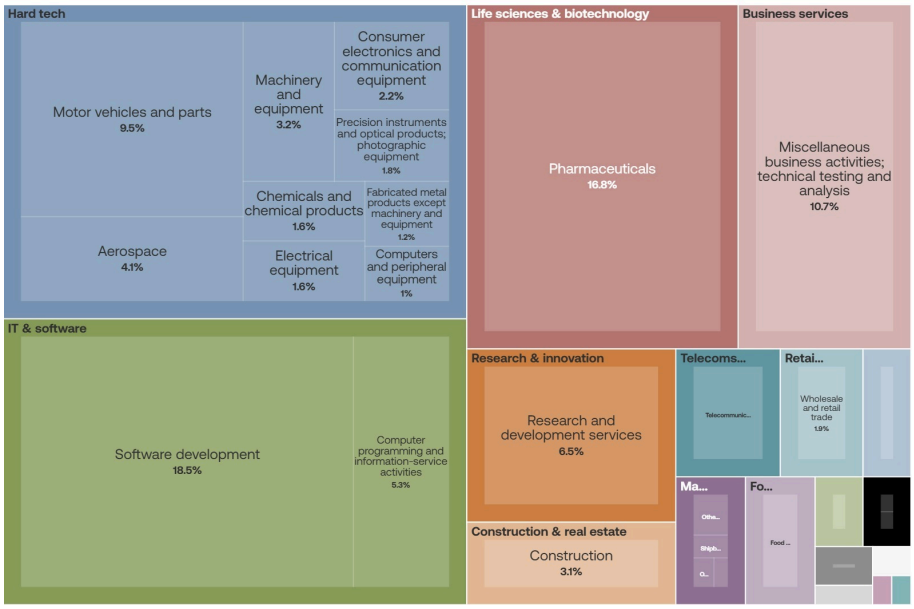
Source: 2025 EU Industrial R&D Investment Scoreboard, IRI.

Note: data was converted from euros to GBP

FIGURE 4

Hard-technology sectors account for the largest share of business R&D spending, exceeding all other sectors, including IT and software

Hard tech has the highest spending by R&D. This is slightly higher than IT & software and much higher than other sectors.



Source: Office for National Statistics

Supply chains, too, have increasingly been offshored to the detriment of the UK's economic security. For example, in life sciences, the EU strengthened its onshore vaccine-manufacturing supply chains following Brexit. Meanwhile, the rapid-response capacity the UK built during 2021 to 2022 has not been maintained, with successive governments declining to invest at a comparable rate to sustain it.[17]

Moreover, while services sectors represent huge strengths, the UK can no longer hedge its entire economic model on them. These are the sectors most exposed to AI-driven cannibalisation. As AI becomes capable of performing routine coding, analysis, content production and service functions, activities that previously supported entire layers of external suppliers may increasingly be brought in-house or automated altogether, compressing demand for many software and service businesses. The labour-market implications point in the same direction: as it stands now, around 67 per cent of workers' occupations involve tasks that AI could perform or augment, while approximately 32 per cent are in roles that could potentially be performed largely by AI alone[18] – especially those in IT, telecommunications and service businesses.[19] Of course, AI may simply augment worker effectiveness in these sectors, or even increase demand for such services, but it does still stand that the areas most likely to be imminently affected by technological adoption are in these sectors.

Despite this, UK policy tends to bias towards capital-light industry – although it is capital-intensive technologies that tend to be underpriced and underinvested in by the market – with "knowledge-intensive" companies making up just 14 per cent (525 of 3,735) of the firms supported under schemes like the Enterprise Investment Scheme.[20]

Together, this paints a challenging picture for UK hard tech: very few anchor firms, historically low corporate R&D spending, sectoral and investment makeup skewed away from precisely the capital-intensive technologies the country needs, and government policy that at times entrenches rather than corrects those biases. And that is before the most fundamental obstacles to UK hard tech are even considered: high energy costs, poor planning regulation and a dearth of infrastructure.

If the UK is to succeed in the technological revolution, the barriers to building world-leading hard-tech companies must be removed.

03

The Role of the British State in a New Age of Industrial Strategy

We are in a new age of hard power where technology will determine the economic and military primacy of nations. This creates a new imperative to reimagine the state as an enabler of innovation – creating a revived impetus for industrial policy. But this also creates a risk: that the urgency of the moment leads to an overcorrection into protectionism – propping up uncompetitive industries and disincentivising the very competitiveness we need to instil.

Before setting out the immediate policy priorities for the UK's hard-tech strategy, it is important to step back and lay out the first principles of wider industrial strategy. We must be precise about what exactly has changed, what good industrial strategy requires and where the failure modes of industrial policy lie.

What Has Changed?

The 1980s and 1990s settlement – variously characterised as globalism, neoliberalism or laissez-faire economics – was not wrong for its time. It was correct for a world in which openness reliably generated mutual benefit, the United States underwrote the global security architecture, and the UK could rely on its services economy and outsource supply chains from elsewhere.

Yet that world has changed in several fundamental ways.

- **Efficiency and comparative advantage can no longer be the only objectives.** The late 20th-century settlement assumed that markets would self-correct and that countries specialising according to their comparative advantages was the fundamental goal. This assumption has changed twofold. First, firms on their own fail to account for national security questions, such as concentrated supply chains and critical technology dependencies. Second, hyper-specialisation makes sense in a broadly peaceful geopolitical context – but in an age of conflict and

volatility, comparative advantage can curdle into dependence. This in turn reduces a country's agency and sovereignty. This does not mean that the UK needs to on-shore everything, but it does mean that not being able to build physical things comes at the cost of economic prosperity and national security. That cost now needs to be factored in.

- **Services and last-mile value no longer insulate advanced economies from material constraints.** Britain deindustrialised partly on the assumption that IP and services captured value while production could safely be outsourced. AI and other technologies have complicated this in both directions: the technologies that will define the coming decades are dependent on physical infrastructure (compute, energy, hardware) and, in addition, their impact threatens the very white-collar service jobs that were supposed to be the UK's high-value core. This is not to say that traditional services sectors like finance – in which the UK excels – no longer matter, but rather that they are no longer sufficient in ensuring a country's wealth.
- **The UK must take more ownership over its own national security.** The UK and Europe's growth model has implicitly relied – since the end of the Cold War – on the United States underwriting international security. For decades, the US has urged both the UK and Europe to take more responsibility for its security; and this pressure has become more explicit in recent years. The UK must have industrial capability to defend itself if it is to be a serious nation.
- **Digital technology ended up concentrating power rather than diffusing it.** The internet was supposed to flatten markets and lower barriers to entry. Instead, frontier technologies are increasingly capital-intensive and dominated by a small number of firms with strong states backing them. An outsized share of global growth – and increasingly geopolitical power – now flows through a handful of companies. For the UK, this means that, while competitiveness is still the essential ingredient, taking a purist laissez-faire approach to the economy is an act of self-harm. The UK needs some globally leading technology companies, not only for prosperity but also to have a stake at the table in a geopolitical order where firms – not just states – are increasingly important geopolitical actors.

- **Value creation and value capture no longer align.** The old model assumed innovation would translate naturally into domestic prosperity. Today, value accrues downstream – to those who control scale, infrastructure, platforms and standards – not to those who generate the original idea. An economy that invents things but cannot build and scale them ends up essentially exporting its own growth.
- A reimagined, strategic state **matters more than ever.** The late 20th-century UK model, especially under Margaret Thatcher, assumed that markets could largely substitute for state capacity. Today, rapid technological change makes that untenable for two reasons. First, states must govern technologies like AI: not as managers of the economy, but as governors of the transition – for example, in simultaneously enabling labour-market dynamism whilst providing a safety net and re-skilling to those whose jobs are displaced. Second, with the limits of old growth levers such as taxing, borrowing, or population growth, science and technology are now more than ever the key sources of economic growth and power. However, science and technology require public investment and backing.[21] This does not necessitate a bigger state but a more dynamic one.

Global conditions today demand a revised version of liberalism with targeted industrial strategy, the government occasionally picking winners and a lean reimagined state that can do both of these things without ballooning.

However, much of today's debate on political economy collapses into binaries – both of which we should refuse. The first is "nostalgic reindustrialisation", which seeks to revive uncompetitive industries, take aggressive stakes in companies,[22] justify protectionism and pursue growth by creating jobs first – rather than creating jobs by first producing the necessary incentives for risk-taking and dynamism. The second is a form of naive globalism: the belief that openness is always benign, that markets will self-correct and that economic or national security concerns are exceptional rather than structural. Today, this is no longer the case.

What Is UK Industrial Strategy For?

Against this altered geopolitical backdrop, a question that British industrial strategy often fails to answer is: what is it actually for? Too often – because industrial strategy means the government spending money – it becomes distorted and stretched into areas that should not fall under its umbrella. Indeed, for all its strengths, the government's Invest 2035 industrial strategy is so broad (covering eight sectors, of which "digital and technology" is only one) that it captures a third of the UK economy.

Specifically, industrial strategy should be optimising for two things. First, the UK needs *genuine comparative advantage* in at least some of the technologies of the future – the kind of specialisation that creates leverage in global supply chains and gives the UK a seat at the table. Second, the UK also needs *resilience*, meaning the minimum viable scale of industrial capacity: enough infrastructure, engineering depth and physical capacity for leading hard-tech companies to grow here rather than relocate, and for the UK to retain baseline economic security and defence-production capability in a world where supply chains are increasingly weaponised. In other words, industrial strategy should raise both the ceiling (comparative advantage) and the floor (resilience).

To give an example: quantum – especially in computing hardware and software – is an area of UK comparative advantage, with companies like Oxford Quantum Circuits, Phasecraft and Riverlane all world-leading. Meanwhile, UK Steel is far from a globally competitive steel company but maintaining some baseline steel-making capacity in the UK is critical for economic and national security. Quantum is comparative advantage; UK Steel is minimum-viable industrial resilience.

However, downstream of industrial strategy, other phrases are too often ill-defined: in particular what we mean by a "UK national winner". The instinct when some people talk about national winners is to reach for ownership: keeping companies British-listed, British-capitalised, British-owned. This is the wrong framing and if taken too literally, it produces bad policy that conflates the superficial form of retention with the substance of capturing value. Worse, it tends to generate a policy response that uses sticks rather

than carrots and builds protectionist walls rather than curating the foundations that reward scaling in the UK. Companies leave, or sell, because the conditions for scaling here are worse than the conditions elsewhere. The answer is to change those conditions, not to make exit harder.

Put differently, in sport we do not want athletes who are simply British champions at home. We want athletes who compete globally, and who have a stake in and represent Britain in doing so. This is not about protectionism; it is about capturing the economic value of technological change in the UK.

What the UK should actually be trying to retain, in building "national champions", is value: headquarters, R&D, high-value employment, infrastructure, IP and tax base. A company can be foreign-owned and foreign-listed and still be a national asset. Equally, a company can be British-listed and UK-headquartered on paper while its productive capacity, talent and strategic capability have effectively migrated elsewhere. The question is not who owns the equity. Two examples help make the distinction:

- **DeepMind** was acquired by Google in 2014. While many lament the "loss" of one of the foremost AI labs in the world, it is headquartered in London, attracts and generates exceptional talent, and anchors one of the world's most concentrated AI clusters in King's Cross. Without Google's capital, DeepMind would likely not be what it is today. Yet despite foreign ownership, much of the value has stayed – largely because of its founder Demis Hassabis's own choices to prioritise the company remaining in the UK. While the UK could have created better conditions for DeepMind in 2014, this is broadly a success story of British value capture.
- **Universal Quantum**, though still a UK company, is an example of value leakage. When Germany's defence ministry sought a large-scale quantum computer it awarded Universal Quantum a €67 million contract and secured the end-product IP in the process.[23] Value from a UK-founded firm, built on UK research, accrued to Germany – not through acquisition, but because the German government at the time was a more purposeful customer.

Good industrial strategy must remove that trade-off between staying and scaling, not by erecting walls to block exit but by making the UK a better place to build. Indeed, a common pathology of UK technology strategy is that it consistently looks backward – to the companies and industries the UK "lost" – rather than forward to the waves of technologies the UK can still build a stake in.

Industrial Strategy Is Not About Levelling Up

Equal growth across the country is an inadvertent effect of good industrial policy, but it should not be its primary focus. Of course, regional growth and industrial strategy both matter. But treating them as interchangeable policy areas is to mistake cause for effect.

This is because industrial strategy requires concentrated bets and geographic agglomeration if the UK is to be truly globally competitive in key areas. Meanwhile, levelling up is downstream from this in three senses. First, organically: by building UK national champions in hard tech – which demands components and infrastructure – this creates demand for UK SMEs across the country, which in turn scale and generate wealth. More obviously, when UK companies scale they generate jobs across the UK, not simply in the clusters where they first originated from. Second, by design: the proceeds of getting bets right and generating growth can and should be used to invest across the UK. Finally, many of the UK's hard-tech strengths are already spread across the country, meaning that a well-disciplined industrial strategy will inevitably be a country-wide effort. But identifying and doubling down on those areas requires honesty and rigour rather than opting for what is politically convenient.

A National Technology Story

There are already world-leading hard-tech ecosystems across the UK, and they should be a bigger part of our national technology story.

Wales is home to CSconnected,[24] the world's first dedicated compound-semiconductor cluster. The University of Liverpool's Materials Innovation Factory[25] houses one of the highest global concentrations of materials-science robotics infrastructure[26] anywhere in the world. Oxfordshire's Harwell campus[27] anchors the UK's quantum sector around the National Quantum Computing Centre. The North East has built a successful defence and space technology cluster around Newcastle,[28] hosting research-and-engineering facility Leonardo, manufacturer Lockheed Martin and the Ministry of Defence's own Defence Science and Technology Laboratory. Numerous defence primes are already anchored in the Midlands.

This is why industrial strategy and regional growth, while both critical, cannot be conflated: doubling down on Newport's semiconductor cluster or Harwell's quantum ecosystem is not an act of "levelling up", but a bet on global competitiveness. The jobs, supply chains and prosperity that follow across the rest of the country are the downstream reward of getting that bet right, not the initial rationale for making it.

What this means in practice is that the UK must maintain some central government capacity for bet-taking and industrial policy. This is because the judgement about which sectors are genuinely strategic cannot be fully devolved without risking fragmentation and stakeholderism.

But in some instances, taken for the right reasons, a regional approach can strengthen rather than dilute central judgement. For example, the newly established Number 10 North could strengthen the information symmetry between central government and the UK's key clusters. France's approach is instructive here: a single national agency, Business France, runs foreign direct investment (FDI) attraction centrally while its regional directors connect investors directly to the specialisms of each region – aerospace in the South West, life sciences around Lyon – combining national strategic direction with genuine local expertise.[29] The French approach therefore strikes the right balance: central bet-picking enhanced by devolved power and strong regional talent.

Principles for UK Industrial Strategy

Taking the above together, the principles the UK must therefore prioritise in its approach to industrial strategy are:

- **Being future-facing, not backward-looking.** The goal is not nostalgic reindustrialisation nor lament of those companies that have already been lost – it is about giving the UK a stake in the next wave of technologies.
- **Making concentrated bets, not sprinkling or levelling up.** A small number of genuine bets on sectors and clusters where the UK has or can build comparative advantage. Industrial strategy and levelling up are both essential, but they are different policy questions.
- **Fixing the foundations.** Energy pricing, grid connection and planning reform must be addressed in parallel with targeted bets.
- **Using carrots, not sticks.** Stickiness of headquarters, R&D and high-value employment is achieved by making the UK the better place to build – not by making it harder to leave. In the long term, protectionism will simply disincentivise the founders and competitiveness the UK needs.
- **Maintaining central bet-taking capacity, but also pursuing regional devolution.** The UK cannot have an effective industrial strategy if its key levers – be they procurement, advanced market commitments or rapid grid connections – are entirely devolved. Having said this, there is a serious role for devolved powers and better regional linking between the government's central industrial strategy and key regions with their own comparative advantages, especially when it comes to bringing in foreign direct investment.

Yet while these principles set out what good industrial strategy looks like, this paper does not attempt to provide a comprehensive national blueprint across the policy recommendations that follow. A full hard-tech industrial strategy for the UK would span energy-market reform, planning overhaul, engineering skills and capital markets reform – all of which TBI has addressed or is addressing elsewhere, including on planning reform, competitive industrial energy, and scaleup infrastructure and capital.

Instead, the rest of this paper addresses a more specific, immediately practical and deliberately bounded question: given existing institutions, existing capital and a 12- to 36-month implementation horizon, in which areas can the UK make the most meaningful progress right now?

These areas are:

- **Cross-cutting reforms.** As a baseline, UK industrial policy needs a headline target and a single accountable minister.
- **The National Wealth Fund.** The NWF already has a mandate to invest in strategic technology infrastructure.[30] It needs the institutional design – a ring-fenced allocation for strategic technology infrastructure.
- **The defence-industrial base.** The government needs procurement and capital policies that enable a new generation of defence startups to emerge, innovate at pace and become ecosystem anchors.
- **The Catapult Network.** This collection of science and tech centres absorbs significant public resource and should be reformed to become more mission-focused and attractive to top-tier talent.
- **Patient capital for hard tech.** The UK – across its venture-capital, pensions and other institutional investors – has the patient capital necessary. But it does not yet have the financial vehicle to channel that capital into UK hard tech.

04 Reimagining British Industrial Strategy: Cross-Cutting Reforms

UK industrial strategy is in danger of failing from a lack of definition. The Invest 2035 strategy already spans eight sectors, covering roughly 35 per cent of total UK employment.[31] Left undefined, with no metrics for success, industrial policy may become a diffuse soundbite rather than a targeted plan for the economy.

This new government has an opportunity to reset the ambition of the UK's industrial strategy and ensure it is truly optimised for pragmatic reindustrialisation, with success measurable against clear metrics.

Recommendation: *The government should, as a high-level target, commit to manufacturing's share of UK gross value added (GVA) reaching 10 per cent by 2031 – with a subsequent target of 12 to 14 per cent.*

This would represent roughly a 25 per cent increase from today's level (roughly 8 per cent) – restoring, though not exceeding, Britain's 2002 position.[32] Without some kind of measurable anchor, "reindustrialisation" could remain a political slogan rather than an actual economic programme against which the UK's sectoral makeup can be tracked. The correlation between advanced manufacturing and higher productivity is clear: advanced manufacturing (defined as chemicals, transport, aerospace, machinery, and electrical equipment in the Invest 2035 strategy) accounts for just 2 per cent of UK jobs but 6 per cent of GVA (£80 billion). The case for industrial strategy is therefore, fundamentally, a national productivity argument. A headline GVA target will keep the government on track.

Recommendation: *The UK's public financing institutions – the NWF, BBB, NSSIF, UKEF and Sovereign AI – should all report to the chancellor rather than being split across departments. The chancellor should sit as the chair of the Industrial Strategy Board.*

Britain's public financing institutions, which are the key machinery executing its industrial strategy, currently answer to at least four different departments: HM Treasury, the Department for Business, Innovation, Science and Trade, the Department for Energy Security & Net Zero, and the Ministry of Housing, Communities & Local Government. While coordination is facilitated through forums like the Strategic Public Investment Forum, there is a real danger of overlapping mandates – or "PuFin soup".[33] To ensure a top-down industrial strategy rather than conflicting departmental interests, these institutions now require singular oversight. However, each institution's own investment criteria and time horizons should stay fixed for their respective terms to avoid politicisation and chancellors relitigating mandates at each change of government.

These two reforms address the conditions that could otherwise undermine the UK's industrial-policy ambitions: no overarching target to aim at, and no single senior government personnel to ensure consistency across the various public organisations. A government that implemented these two recommendations would immediately indicate serious policy intentions for hard tech and reindustrialisation.

The rest of the paper focuses on specific institutional levers the UK can pull across the NWF, primes, Catapult Network and pension capital.

05

Reimagining the National Wealth Fund for Next-Gen Technology Infrastructure

The UK has the institutional capacity, through the NWF, to invest in the infrastructure required to win across hard technologies. But the NWF is not yet built to entirely fulfil this mandate.

The NWF – formed in 2024 from the UK Infrastructure Bank – was originally focused solely on energy-transition infrastructure. But following the publication of Invest 2035, Rachel Reeves issued a Statement of Strategic Priorities in March 2025 that significantly expanded the NWF's remit: explicitly directing the fund towards "digital and technologies", "advanced manufacturing", and "dual-use technologies" in support of defence and security.[34]

However, while this new mandate now exists in theory, the NWF is not yet designed to deliver on it. The NWF's portfolio is still predominantly focused on energy, with little diversion towards enabling technology infrastructure. Of a sample of NWF deals publicly disclosed in the financial year 2025–2026, energy-sector commitments accounted for roughly four-fifths of committed capital – even before the £36.6 billion Sizewell C nuclear-facility loan, which alone dwarfs the rest of the portfolio combined.[35] Digital and technologies, advanced manufacturing, and dual-use investments – the sectors the March 2025 mandate was meant to prioritise – remain a marginal share of deployment to date. This shortfall is structural, for a number of reasons:

- **Financial returns versus strategic spillovers.** The NWF is structured around a crowding-in model with a requirement to recycle capital and deliver positive financial returns. The infrastructure with the highest strategic value – shared testbeds, pilot manufacturing lines, quantum facilities – will often generate returns slowly, diffusely and over long time horizons. These assets are precisely the ones that the NWF's return-seeking investment structure is least equipped to fund.

- **Mismatched technology-readiness thresholds.** The NWF's investment criteria focus its equity products on technology-readiness levels (TRLs) 7 to 9. Yet TRL 7 to 9 are so mature as to exclude some of the most important technology areas by default, be they quantum or space. In space and satellite technologies, for example, TRL 9 essentially requires a technology to already be operating in orbit.
- **Pressure to deploy capital quickly.** Compounding these issues, the NWF's strategic-priorities statement commits it to roughly doubling its investment activity relative to 2024–2025. That pressure to get money out of the door quickly creates a real risk of poor decision-making given the other constraints the NWF faces.

These are not reasons to abandon the NWF as the vehicle for infrastructure investment, as creating a new institution would be slow and costly. Nor should the NWF abandon energy infrastructure and Net Zero. Nor does this mean moving away from the NWF's existing financing model, predominantly focused on debt levers.

But the NWF's portfolio is currently not sufficiently focused on enabling technology infrastructure, as set out in the 2035 industrial strategy.

Recommendation: *HM Treasury should set a 20 per cent minimum of the NWF's remaining undeployed capital be spent on non-energy enabling infrastructure for critical technologies – including but not limited to infrastructure for AI hardware, AI for science, quantum, advanced manufacturing, robotics, biotech, photonics and space. Given the NWF has £19.4 billion left to deploy, this would amount to roughly £2.91 billion.*

For this 20 per cent carve-out, the NWF should also operate within some different parameters:

- **A targeted environmental-mandate carve-out** should apply to enabling technology investments. The NWF carries a statutory obligation to optimise for net zero and environmental sustainability. Some strategically critical hard-tech infrastructure – energy-intensive compute facilities, advanced-manufacturing pilot lines, certain semiconductor processes –

will not satisfy climate-related investment criteria. HM Treasury should issue a direction clarifying that tech-focused investments are assessed primarily against strategic-value criteria, with environmental impact de-prioritised. The environmental mandate would continue to apply to the rest of the NWF capital.

- **Lower TRL bands for critical technologies** (for instance, TRLs 4 to 9) should be permitted to ensure that important sectors are not excluded because of earlier maturity.
- **Returns should be targeted at capital preservation, not guaranteed profit**. The financial tools the NWF uses would continue to be **debt, guarantee and equity finance – not grant funding**. However, rather than the NWF's blanket requirement to deliver a positive financial return for the Exchequer, the technology infrastructure carve-out should adopt a softer bar: a reasonable prospect of returning capital over time, recycled at portfolio level, rather than a guaranteed positive return on each individual investment. This is closer to the approach taken by Canada's Growth Fund,[36] which targets a "reasonable prospect of a return of capital or better" across its portfolio rather than positive returns on every deal – reflecting the reality that infrastructure investments in strategic sectors often earn their return through economy-wide spillovers rather than direct financial performance.
- **A critical-technology infrastructure audit** would be needed initially to prioritise which infrastructure and what sectors to prioritise. This would require working with other organisations including the Sovereign AI Unit – to ensure the critical-technology focus is aligned – as well as ARIA, NSSIF, HVM Catapult and the Royal Academy of Engineering.

Infrastructure Priorities

As part of auditing and prioritising the enabling infrastructure that the UK will need to capture the value of AI and other technologies in the next decade, three questions should shape decision-making:

- **Is this a binding constraint on domestic scaling?** Does this infrastructure need to exist in the UK for hard-tech companies to build and grow here, or can firms access equivalent capacity abroad without meaningful disadvantage?
- **Are the sectors the infrastructure enables strategic?** Either because they are dual use, are fundamental to having any UK capacity in a given technology or enable the UK to double down on a specific technological comparative advantage.
- **Is a UK build-out of this infrastructure feasible?** Is there existing nascent capacity to accelerate or anchor clusters and institutions that make it viable with available capital?

The types of enabling infrastructure the NWF should be investing in could include:

- **Inference compute testbeds.** UK AI-hardware firms need domestic facilities to validate chips and systems at scale before production. Without them, the R&D-to-deployment pipeline breaks and firms relocate testing (and eventually manufacturing) abroad. Financing here would target the facility itself – the compute, the physical site – rather than equity in any single operator; firms including Fractile, Callosum, and OLIX form part of the emerging cluster this would serve.
- **Advanced packaging and photonic integration.** Advanced packaging is a binding constraint shared by quantum, AI-chip, photonics and defence-electronics firms, all currently forced to rely on overseas facilities. A shared domestic facility – usable across multiple firms and sectors, rather than built for one company – is the kind of asset NWF-style debt or guarantee financing is suited to in a way company-level equity is not.
- **Self-driving laboratories.** Self-driving labs compress scientific-discovery timelines from years to weeks and are already being treated as a national strategic asset elsewhere (the US Genesis Mission). The UK has early commercial momentum to build on – Automata's £45 million raise in February 2026 signals real demand in this space, and Prima Mente is a similarly interesting UK startup – but no shared, at-scale facility yet exists.

The relevant NWF role would be financing that facility, distinct from any equity stake in Automata or similar operators, which sits with investors like the BBB.

The hard part is done, in that the vehicle and the capital are already there. Now they just need directing.

06

Reimagining the Defence-Industrial Base for a New Generation of National Winners

In a new age of hard power and conflict, the UK needs two things from its defence-industrial base. First, it requires a more dynamic hard-tech and defence ecosystem that can innovate and iterate fast – and government procurement cycles that enable rather than undermine this. Second, it requires a new generation of hard- and defence-tech "anchor firms": that is, companies that not only supply technology and equipment but also more broadly contribute to the UK's hard-tech ecosystem with infrastructure, a pipeline of talent and capital reinvestment – creating new clusters of startups and pulling in demand from supply-chain SMEs.

The UK has these "anchor firms" in other sectors – DeepMind has played such a role by creating an AI ecosystem in King's Cross, and pharmaceutical companies have made Oxford and Cambridge leaders in life sciences. The UK's defence-industrial base needs its own version of this dynamic – and that anchor role is more likely to be filled by a new generation of companies than by the traditional primes themselves.

Despite their technical strengths, the UK's traditional defence primes (BAE Systems and Rolls-Royce, for example) are built neither for fast innovation and iteration nor to act as anchors for the hard-tech ecosystem. They remain the main beneficiaries of a slow, overspecified procurement system that rewards scale and incumbency over speed, and their talent, IP and capital tend to stay locked inside the firm rather than flowing out to seed the wider ecosystem.[37] This is not a case for bypassing the primes, who will continue to build the platforms only they can build. But it is a case for reforming procurement and de-risking capital-intensive innovation to make it easier for new startups to join the race.

Encouragingly, a new pipeline of British hard-tech and defence companies already exists that, with the help of effective policy, can be successfully scaled. PhysicsX,[38] a London-based physics-AI company spun out of Formula 1, has rocketed to a $2.4 billion valuation on the back of tools that compress industrial-engineering simulation from days to seconds across aerospace, defence and semiconductors. Isembard has raised $50 million to build a network of AI-powered factories tackling the manufacturing "valley of death". [39] Valarian, a London startup building sovereign-AI infrastructure for government and defence, has raised £52 million to date.[40] Nuclear Turbines, a recent spinout from BAE Systems, shows the primes themselves can help to seed this pipeline.[41]

The government now needs to double down on these potential emerging champions and aim to help scale at least two genuine British "neo-primes" (emerging defence prime startups) – in the mould of Germany's Helsing or Portugal's Tekever. To make this shift real, the government needs to start radically reshaping incentives within defence procurement and the broader industrial base.

Recommendation: *The MOD should set a declining cap on the share of major-contract spend awarded to the UK's largest defence primes, and reinforce – with published criteria and transparent reporting – the existing commitment that at least 10 per cent of the procurement model's equipment budget be spent on novel technologies each year.*

This would act as a bold signal that the government is serious about both British rearmament and leveraging defence spending as a lever for growth and reindustrialisation.

Today, the top ten defence suppliers still receive 38.7 per cent of MOD expenditure – a figure that has barely moved in a decade – while BAE Systems' spend is only 10 per cent competitively tendered and Rolls-Royce's just 1 per cent, reflecting how much of their business still flows through single-source, direct-award contracts.[42] A declining cap need not exclude primes from the platforms only they can build, but it forces MOD to actively cultivate alternative suppliers rather than defaulting to familiar ones. Government has, in principle, already legislated a complementary tool: the

2025 segmented procurement model formally commits 10 per cent of its equipment budget to "novel technologies" annually. In practice, this exists on paper only: the criteria for "novel" have never been published, and the ringfence is reportedly being used to fund legacy programmes, including the production of the decade-old F-35 aircraft, rather than genuinely novel technologies. Publishing binding criteria and enforcing the ringfence would turn this into a legitimate, durable demand signal for the neo-primes described above.

A shrinking prime share and an enforced ringfence only work, however, if there is a pipeline of companies ready to absorb that demand – which means giving the UK's engineering talent more reason to build new startups.

Recommendation: *Establish a £50–100 million seed fund for employees leaving defence primes and aerospace and advanced-manufacturing companies to set up hard-tech startups, with the BBB as LP.*

British primes have exceptional scientific and engineering talent. But the UK hard-tech ecosystem would also benefit from a stronger flywheel effect: more engineers who spend formative years at a prime before leaving to found their own companies, in the same way DeepMind alumni have gone on to seed London's wider AI ecosystem. Primes also sit on IP and domain expertise that could, with the right incentives, be licensed out to fuel new startups rather than sitting unused. Alongside capital, the fund should offer security-clearance transition support, regulatory navigation and introductions to MOD procurement teams, with the MOD negotiating framework agreements on IP licensing, non-compete waivers and expedited clearance transfer.

However, seed capital and contract wins only go so far if the underlying cost of building hardware remains prohibitive.

Recommendation: *HM Treasury should redirect £1 billion of R&D tax credit spending into a dedicated annual machine-tool grant, doubling Britain's machine-tool purchasing capacity overnight.*

The current approach is a generic R&D tax-credit regime, which assumes relief will eventually find its way to genuinely hard-tech, capital-intensive firms. In many cases it does not: nearly three times more R&D relief is currently claimed for "business support" and office-administration activities than by machinery and equipment manufacturing.[43] For a defence-tech startup or SME trying to build hardware, that credit does little to offset the upfront cost of the equipment needed to manufacture at scale.

A dedicated machine-tool grant, targeted specifically at defence firms and their supply chains, would be a far more precise instrument: it converts diffuse tax relief into direct support for the concrete capital stock – lathes, precision-milling machines, forming equipment – that determines whether a company can turn a contract win into physical output. This matters more for defence than most sectors, given Britain's capital stock of machine tools is just 15 per cent the size of Germany's, 61 per cent of France's and 63 per cent of Canada's.[44]

Together, these three levers are designed to work in sync. A shrinking share of guaranteed prime spend, backed by an enforced innovation ringfence, gives Britain's emerging neo-primes a growing market to sell into. A seed fund then turns the primes' own talent and IP – currently locked inside the firm – into the new entrants capable of meeting that demand. And a machine-tool grant ensures those entrants can rapidly build the factories and output required at speed.

The aim is not to displace the primes, who will remain essential to programmes only they can deliver. It is about deliberately pushing the wider ecosystem – talent, capital, demand and capacity – in a new direction, so that the UK's future national defence champions have a genuine path to scale, rather than remaining dependent on the incumbents of the last generation.

07

Reimagining the Catapult Network

The UK consistently produces frontier research but repeatedly fails to convert it into scalable technology. Part of this is a capital problem, part an infrastructure problem. But there is a third dimension that receives less attention: the absence of engineering-focused, industry-facing research institutions of the kind that underpin hard-tech success in Germany, Finland and the United States. Germany's Fraunhofer institutes are the most cited example: 76 institutes, 30,000 researchers, focused not on basic science but on solving the specific engineering problems that prevent good science from becoming competitive industry.

The Catapult network was the British attempt to replicate this. It was established as a network of 65 physical technology-translation centres bringing together academia, businesses and technical expertise to help turn research and ideas into commercially viable products across nine defined areas, including energy systems, medicines discovery and high-value manufacturing (HVM). Yet with the exception of the HVM Catapult and some successes from the Cell and Gene Therapy Catapult, it has not worked as intended. This is because they are:

- **Fragmented.** The Catapults lack coordinated governance, clearly differentiated remits and a shared strategic focus.
- **Spread too thinly.** Nine centres operate across 65 locations and often cover multiple technologies and sectors, reflecting a generalist model designed to be useful to everyone, rather than to solve a limited number of priority engineering problems. The Compound Semiconductor Applications Catapult, for example, works across aerospace, defence, energy, telecommunications, transport and space, while the Digital Catapult serves deep-tech sectors broadly. By contrast, Fraunhofer institutes are organised around specific technical capabilities, such as photonics, materials and manufacturing processes.

- **Too far from their customers.** Lab spaces and Catapults tend to be located near supply side rather than demand side, meaning that startups are too far away from their customers and users, making it harder for Catapult users to work with clients and problem-solve together in future.
- **Insufficiently focused on the bottlenecks that block commercial deployment.** A large proportion of Fraunhofer funding comes from industry purchasing solutions to specific technical problems. Most Catapults attract a much smaller share of private funding, suggesting that their work is less closely aligned with the problems industry is willing to pay to solve. They tend to provide supply-side support, such as facilities and infrastructure, rather than addressing the hard-engineering bottlenecks that actually block adoption, integration and scale.

The core government grant across the non-HVM Catapults runs to approximately £200 million per year (around £1 billion over five years). This is a meaningful sum of money that could make a difference – and achieve a satisfactory return on investment – if deployed in a few key areas of focus.

Recommendation: *Review and refocus the non-HVM Catapult network around priority national engineering needs. The government should undertake a rigorous review of the non-HVM Catapults to assess utilisation, additionality, industry demand and strategic relevance. The purpose should be to determine which capabilities should be retained, consolidated or discontinued. Funding should then be concentrated on a smaller number of clearly defined national engineering priorities that are updated annually.*

Priorities should be selected on the basis of evidenced need from industry, university spinouts and researchers; the UK's comparative advantage in each capability; and the presence of specific engineering bottlenecks constraining commercial deployment. Each Catapult should have a tightly defined mission and be accountable for solving a limited set of high-value technical problems.

Regardless of sectoral focus, the reformed Catapults should be governed by the following design principles:

- **Mission focus** on commercially oriented engineering research – not underlying physics or basic science, but the specific bottlenecks blocking deployment and scale in a defined technology domain.
- **Research focus** on two primary needs. First, technological enablers: engineering-oriented projects aimed at improving the infrastructure and key inputs on which the technology depends. Second, translational research: targeted work on short-term bottlenecks affecting specific devices or systems blocking deployment.
- **An operating model that works directly with industry** – both UK hard tech companies and corporate adopters – to identify specific chokepoints: barriers to adoption, integration and scale. Additionally, Catapults should locate research teams and infrastructure within or near major corporate customers, regional clusters and defence-procurement communities. This would allow them to identify deployment bottlenecks in real time, co-develop solutions with end users and stay close to the decision-makers responsible for adoption and scaling.
- **Responsibility for maintaining technical roadmaps.** Mapping the key engineering impediments facing deployment across the relevant technology domain, updating the roadmaps annually, and using them to guide both Catapult research priorities and other relevant government investment decisions.
- **Building the engineering commons.** Catapults should not only conduct research but actively build shared tools, data sets and software infrastructure that accelerate adoption and iteration across the sector. This would mean embedding research-software engineers alongside domain specialists, who would develop open-access simulation tools, hardware-validation frameworks and AI-assisted design environments that individual firms cannot justify building alone. In the same way that open-source software infrastructure has accelerated software development globally, shared engineering infrastructure – built and maintained by Catapults – could meaningfully compress the development timelines for UK hard-tech companies and lower the barrier to entry for the next generation of startups building on top of it.

- **Competitive, annual funding rounds based on capability requests.** Establish transparent competitive funding where academic researchers, companies and industry consortia can directly propose which engineering capabilities they need. Use models proven successful elsewhere, such as the Space Clusters Infrastructure Fund (users propose capabilities and co-invest), UKRI applicant-led infrastructure challenges and sector-specific capability bids. Catapult funding allocation should be published annually, with metrics showing: user requests received; which requests were funded; and speed of response to new requests.

Finally, it is important to note that institutional branding and signalling matters. One of the reasons why more recently established institutions like ARIA and the Sovereign AI Unit have attracted serious talent and international credit is because they carry a clear, distinctive mandate, signalling to the best engineers and researchers that this is somewhere worth working – and somewhere that will take risks and move fast. Part of the process of reforming the UK's Catapults should be about rebranding, not just institutional redesign: ensuring these are places that leading engineers and corporates want to work for or partner with.

08

Reimagining Patient Capital for UK Hard Tech

One of the defining features of the past three decades of capitalism has been the progressive decoupling of finance from productive investment.[45] Quantitative easing pumped liquidity into the financial system without directing it to the tangible economy; low interest rates made speculative financial activity more attractive than long-horizon investment; and venture capital, for all its strengths, has structural incentives that push capital towards capital-light industries and away from the physical world.[46]

There is no shortage of discussion about the "valley of death" that hard-tech companies face.[47] Yet often this falls into a debate between those who believe there is a genuine "equity gap" in the UK and those who argue otherwise.[48] Less discussed, but equally important, is whether the UK has the correct *vehicles* to channel capital from pension funds and other key sources.

The Mansion House reforms (2023 and 2025) have made genuine progress but they run into a problem. Venture capital alone is not a well-suited vehicle for funnelling pensions into private markets: the illiquidity, ten-year lock-up and absence of income during the fund's life sit awkwardly with the liability profiles of defined-benefit schemes and insurance books. The question is not how to make pension funds behave more like VC, but rather how to design instruments that make UK hard tech look more like the assets pension funds would want to hold.

The solution to this already exists in theory.[49] The core point is that hard-tech returns are highly asymmetric – most bets fail, but a small number of outlier successes more than cover the losses – and a single large vehicle holding 50 to 100 companies across multiple sectors can hold enough positions to make that logic work reliably, generating cash flows predictable enough to support something conventional VC cannot: the issuance of rated debt.

Rated debt opens the door to institutional investors. The bond market is more than 400 times the size of the global venture-capital industry.[50] Pension funds and sovereign-wealth funds cannot easily invest in VC funds, but they can invest in rated bonds. This structure can generate senior debt returns of 5 to 8 per cent and equity returns of 8 to 11 per cent – modest by VC standards, but compelling to institutions currently targeting 7 to 8 per cent across their whole book.[51]

Recommendation: *HM Treasury should establish a UK Hard-Tech Megafund: a special-purpose vehicle holding a diversified portfolio of 50 to 100 late-seed to Series B companies across nuclear, AI hardware, quantum, defence tech and more. The megafund would issue tranched instruments – rated senior bonds marketed to UK pension funds and insurers, equity tranches open to sovereign-wealth funds – with government first-loss capital of £200 million to £500 million guaranteeing the junior tranche.*

Another alternative worth considering is a two-layer structure, where the megafund acts as a strategic limited partner that tenders capital across several competing specialist VCs per sector rather than making direct investment decisions itself. This preserves founder optionality and reduces the risk of a single vehicle becoming a concentrated gatekeeper of who gets funded.

Either way, this is the next step that the Mansion House Accord needs to take: rather than making UK pension mobilisation into UK private markets mandatory, this offers institutional investors a carrot that is more suited to their structure.

Having said this, even a good instrument runs into a coordination problem. UK defined-contribution (DC) pension schemes compete largely on cost, not risk-adjusted return, and members and employers can switch schemes on that basis. A scheme that allocates to a megafund-style vehicle will show a higher cost ratio than one that does not, even if the underlying returns are better over time – because cost is visible and comparable now, while the return payoff only shows up years later. No individual scheme has an

incentive to be the one whose costs rise first. Government-backed coordination, rather than reliance on voluntary first movers, is therefore necessary to get this off the ground.

This is perhaps the highest "bang-for-buck" move the UK government can make within 12 months to mobilise institutional capital into the UK's hard-tech and defence-industrial base – and signal that it is taking long-term investment and economic security seriously.

09

Conclusion

There is an important irony at the heart of the AI revolution. The ultimate digital technology – the one that feels the most abstract and removed from the physical world – will make physical capital matter more than ever. As AI, robotics and other emerging technologies become increasingly widespread, the bottlenecks will be physical: chips, energy, manufacturing capacity, engineering R&D. And these bottlenecks are where economic and geostrategic value accrues. The result is that the UK cannot ideate its way into relevance in the AI era: it must physically *build* its stake.

Yet the UK is entering the age of physical imperative with systemic handicaps in its ability to scale and build hard technologies. The UK's manufacturing base has thinned, its financial ecosystem is not geared towards hard tech, its R&D is skewed away from engineering and it has very few large anchor firms – and the ones that do exist are not adequately fulfilling their role in the innovation ecosystem.

This paper has not tried to offer a comprehensive blueprint across the sweep of every possible industrial policy. The foundations – such as energy costs and the planning system – are major constraints that must be addressed by this government, and TBI has argued for their reform elsewhere. Instead, this paper has set out the high-level principles of industrial strategy and then focused on a more bounded question: where, within broadly existing institutions and capital, can the UK make the most meaningful progress in the next 12 to 36 months?

The cross-cutting reforms to industrial strategy – setting a national manufacturing target and a direct reporting line for public financing institutions to the chancellor – together with the four overarching institutional recommendations (concerning the National Wealth Fund, defence-industrial base, Catapult Network and the creation of a new megafund) will not solve all of the UK's industrial-strategy problems. But they will advance some of the most important elements of a successful hard-tech ecosystem: coherence and having something to tangibly measure industrial-policy success against; building and leveraging the value

of anchor firms; investing in enabling infrastructure; creating a talent and capital flywheel effect; ensuring patient capital exists for the most ambitious but capital-intensive areas; and ensuring the UK has translational-engineering R&D capability to turn science into commercial strength.

None of this requires Britain to abandon economic liberalism, or retreat into nostalgic reindustrialisation. Rather, it requires a state that is willing to make ruthlessly prioritised long-term bets. Countries are racing to build influence in this century's key technologies, and the next three years will be genuinely vital if the UK is to secure a seat at the table.

The future is not set, but the time for making bets is now.

10

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Mann Virdee, The Entrepreneurs Network

Cam Watson, independent

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