HOUSE OF LORDS

Science and Technology Committee

Corrected oral evidence: Financing and Scaling UK science and technology: innovation, investment, industry

Tuesday 25 March 2025

10.25 am

Watch the meeting

Members present: Lord Mair (The Chair); Lord Borwick; Lord Drayson; Lord Lucas; Baroness Neuberger; Baroness Neville-Jones; Baroness Northover; Viscount Stansgate; Baroness Walmsley; Baroness Young of Old Scone.

Evidence Session No. 1 Heard in Public Questions 1 - 8

Witnesses

I: Professor Richard Jones, Professor of Materials Physics and Innovation Policy, University of Manchester; Dr Alicia Greated, Executive Director, Campaign for Science and Engineering (CaSE).

USE OF THE TRANSCRIPT

1. This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of Witnesses

Professor Richard Jones and Dr Alicia Greated.

Q1 **The Chair:** Good morning. Welcome to this House of Lords Select Committee on Science and Technology. We are undertaking our first evidence session for our new inquiry, "Financing and scaling UK science and technology". My name is Robert Mair. I am chairman of this committee, and I am going to declare some relevant interests. I am an emeritus professor of engineering at Cambridge University. I am a consultant to Laing O'Rourke, the construction company that has substantial research and development collaborations with Cambridge. I am also chairman of a spin-out company from Cambridge, Epsimon.

I start by asking you to introduce yourselves to help frame our session. Perhaps you could each set out some context for the UK's science and technology sector. What do you think are the most critical items that we should be looking at in our inquiry?

Professor Jones, perhaps you could focus on the UK economic and policy background on science and innovation policy for hard times, which I know is the subject of a very interesting publication[1] that you produced. Perhaps you could set out some of the strengths and weaknesses of the R&D ecosystem in the UK and how things have changed in recent years.

Dr Greated, perhaps you could tell us about some of the main issues that are currently concerning those in the sector that CaSE has identified.

Professor Jones, let us start with you.

Professor Richard Jones: I am professor of material physics and innovation policy at the University of Manchester, where I am also the vice-president for regional innovation and civic engagement, responsible for all the university's technology transfer and commercialisation activities.

I would start by setting the economic context that we are currently in, which is one of productivity growth having essentially stalled in the mid-2000s. That has had the direct consequence of flatlining wages ever since and the difficult fiscal situation that successive Governments have found themselves in. Essentially, everything

[1] **R. A. L. Jones** (2022) Science and innovation policy for hard times: an overview of the UK's Research and Development landscape Productivity Insights Paper No. 014, The Productivity Institute.
https://www.productivity.ac.uk/research/science-and-innovation-policy-for-hard-times-an-overview-of-the-uks-research-and-development-landscape/

that is wrong about economics and politics in this country can be traced back to that problem of productivity growth. We are really going into a second lost decade when it comes to economic growth. That is one big problem.

The other context of particular interest to me, being based in Manchester, is the profound regional inequality that we have in the country, where most of the country outside the prosperous south-east is essentially comparable to southern Europe in its economic performance. In particular, our great second cities—West Midlands, Greater Manchester, Glasgow—all have productivity that is lower than the UK average. That is very surprising for a European country. In most other European countries, we would expect second cities to drive the economy rather than to be drags on them.

We know that productivity growth comes from innovation, defined in the broadest sense. Research and development, particularly in the private sector, is very important as a part of innovation. It is not the only source of innovation but it is a very major one. Economists tell us that the private sector will always underinvest in R&D because of the difficulties of capturing all its benefits. If one leaves R&D entirely to the market, you will end up with a level of research that is too low for wider societal benefit. That is the importance of public sector R&D and support for private sector R&D. Whatever we are doing, it is not working. That is the way I would summarise things. At this point we should confront the fact that the UK economy really is not working, and the bit of it that is not working is the innovation part that should be driving productivity growth.

If I turn to the strengths and weaknesses of our science system, an absolute strength is that we have internationally competitive discovery science. That is unquestionable. We have centres of public sector R&D that are genuinely internationally competitive in Cambridge, London and perhaps even Oxford. In those places, there are very effective spin-out and start-up ecosystems that work, but those places are quite small and geographically focused.

One weakness of our science system is that it is too geographically unbalanced. Public sector R&D support is focused on those places that are both already quite prosperous and find it quite difficult to grow, for all the reasons that we know about: planning, transport, water and all the things that make growth in Oxford and Cambridge very difficult.

Also, our huge success at discovery science comes at the expense of some neglect of translational research. There has not been enough focus on translational research.

I would highlight that there is not enough private sector R&D being done by large UK-domiciled companies. If we look at the R&D scoreboard that the EU publishes, we see that, in the top 100 of R&D spending companies in the world, only two are British and both are pharmaceutical companies: AstraZeneca and GSK. Our private sector R&D base has a very large component from overseas-owned companies. That is both a strength and a weakness. It is a strength in the sense that it indicates the attractiveness of the UK for inward investment for science, but it is a weakness in that those investments are necessarily more footloose than if they were owned by domestic companies.

The overall picture is that there are great strengths, and we should be able to build on those, but it is somehow not working. Private sector R&D, converting discoveries into commercial opportunities, is where we are weak.

The Chair: Thank you. There will obviously be many more questions where you can expand on those points.

Dr Greated, would you like to tell us the things that are of most concern to you as the Campaign for Science and Engineering at the moment?

Dr Alicia Greated: Thank you for having me here today. As you said, I am executive director of CaSE. I have only been there for a year—a year in two weeks' time, so I am not even a year old in that job. Previously, I was chief executive of something called KTN, which is an innovation agency. I worked a bit in government, a bit in university, and I spent many years working for versions of the research councils, both in the UK and overseas.

I have a tiny introduction to CaSE for those of you who do not know us. We are the UK's leading independent voice for R&D. We are a charity and we have members spanning the whole R&D sector, from the basic science that Richard has just talked about right the way to application and innovation. Our members represent universities, charities, innovation agencies, businesses and individuals who are working in R&D, so we cover both public and private sector.

Richard's points were all very good; I want to add to those by highlighting three areas that we are working on as CaSE. We work

on an expanse of topics, but I am going to pick out three for you that are in the forefront of our minds.

The first and most pressing of those is around the long-term sustainability of the R&D system, particularly universities. As the committee will be well aware, and as Richard has just described, the UK R&D system is extremely complex. We cover basic research right the way up to innovation with businesses, universities and charities. Universities are a vital component of that system, conducting 25% of the R&D that happens in the UK.

While our members cover lots of organisations that are not universities, they are completely dependent on the work that universities do. As you will have seen in the media, universities are facing quite worrying and significant financial pressures at the moment. We are seeing potential staff cuts, redundancies and a possible loss of departments across the UK. A concern for CaSE, and to our members, is that this could have a significant impact on R&D long term. As Richard has just said, that could affect the UK's longer-term ambitions for growth.

Our biggest concern about this is that individual universities are making their decisions relating to these cuts in isolation, as they should—they are independent organisations—but that means that, as the UK, we do not have oversight of these decisions and how they will impact us when we aggregate them across the UK. If we take that to an extreme, that could mean that we have complete loss of certain R&D fields in the UK, which therefore would have an impact on university R&D itself and capability in the UK, but also on the business R&D and innovation we have just talked about, as well as skills provision, which is extremely important.

Building on what Richard said, there is the impact regionally and on communities. We all know that universities can act as a focal point for the innovation system. I hope we can cover this a bit more later on because it is really the most pressing issue facing us.

I will describe the second point as unintended consequences, just to get you interested. What I mean by that is that we, as CaSE, and our members are concerned that sometimes decisions are made in parts of government that have an unintended consequence on research, development and innovation in the UK. A very clear example of this, which I know you are aware of but I definitely want to highlight, is around visa and immigration policy. As we are also very aware, we are reliant in the UK on our own domestic researchers and skills, but also international skills. That is partly to fill skills gaps but, fundamentally, research and development innovation in the UK is absolutely dependent on collaborations

internationally. We have lots of evidence to support that. It is critical that decisions made in the Home Office about immigration or visa systems do not act as a barrier to skilled researchers coming to the UK.

I have an example to give you a feel for the impact of this. In some work that the Royal Society has done, it has looked at the visa cost for the UK in relation to other research-intensive countries. Imagine you are a family of four. You are a researcher with your partner and two children, which would be a common family set-up. You have been invited to come to the UK to do some ground-breaking research and want to come. You would have to pay over £20,000 up front, which is totally unacceptable. That still exists, despite us talking about this for a long time. Our costs, the Royal Society has said, are 17 times higher than other research-intensive countries that we have compared them to.

That is the second point. We as CaSE have called, for some time now, for a reduction in upfront costs of UK visas. Again, I know the Committee is aware of that but it is really important that we highlight that and tackle it.

The third is a longer-term point about something that CaSE has been working on very hard. It is around the public opinion of research. This is about positioning R&D in the future and making more people aware of its importance and value. I will not go into massive detail but I want to highlight that, in CaSE, we have now polled around 35,000 people. We have talked to dozens of focus groups about the public opinion of research. The good thing is that—very broad brush—the public believe that R&D is important. They think it is important to invest in R&D. However, they do not think it is urgent. They think it is a luxury. Parts of society—around 30%—cannot see, or find it difficult to see, how that investment in R&D would impact on their own lives or the lives of their loved ones. I would like to talk more about this work, but this is a really important long-term element of our work, which we are embedding in our policy work at CaSE.

Q2 **Baroness Walmsley:** I have two questions, the first for Professor Jones and then the second for both of our witnesses.

Professor Jones, in your paper on hard times, you referred to the cliché that we are very good at basic research in this country but not so good at commercialisation. From your introductory remarks, I take it that you think that it is not just a cliché but absolutely true and is a major problem. That is right at the heart of the inquiry that we are doing at the moment. Could you say some more about the historical and policy reasons for why we are where we are and

what you think should be done to remedy that?

Moving to the second question, so that Dr Greated can think about that as well, you referred to the regional context. As far as we understand it, the Government like clusters but do not like concentration. We wonder whether you think that is true. Is it a problem? You referred particularly to the universities and their role in working with businesses in clusters and so on. Would you like to explore that a little further?

Professor Richard Jones: It is a cliché. I might say it is also something many other countries say about themselves too. It is really important to stress that this is not some strange cultural characteristic of the British nation. It is just a function of the priorities and policy choices we have made. There is nothing fundamental about the fact that we focus on discovery science more than commercialisation.

I think it is truer now than it was 50 years ago. In the long history of science policy, there were significant changes that took place in the late 1980s. Jon Agar's book, *Science Policy Under Thatcher*, is very illuminating about this; it is exceptionally well researched and documented. Essentially, the policy change that happened in the late 1980s was a conviction that the Government should not be involved in near-market research, but should focus entirely on curiosity-driven research, and that the market would then step in to fill that gap.

What we saw, as a matter of empirical fact, is that there was a substantial decrease in government applied research. That is absolutely true. A lot of that is to do with the rundown of the nuclear industry but, looking at the figures overall, there is that clear reduction in applied research. Then what one saw in private sector R&D was not, as the theorists had it at the time, that the private sector expanded to fill the gap; the private sector R&D fell too. This illustrates a point that economists talk about where, unlike in other areas of public spending, public sector spending on research crowds in further private sector spending rather than crowding it out. That was the empirical result that we saw.

There was a gradual change in policy starting in the mid-1990s with the Waldegrave White Paper, *Realising Our Potential*. There was quite a lot of continuity in the Blair Governments with Lord Sainsbury and the 10-year science and investment framework. But it was still fundamentally a kind of supply-side policy where the view was that, if you had a stock of discovery research and produced trained people, applications would automatically flow. And, as we have seen, that did not really happen.

Baroness Walmsley: I think it was you who mentioned that the pharmaceutical industry has succeeded where others have not. Can you perhaps unpick why that is and whether lessons can be learned from the way it has succeeded with innovation, then turning it into a really profitable business?

Professor Richard Jones: The pharmaceutical industry is an interesting case because it was enormously productive in the late 1990s and early 2000s but has suffered quite a loss of productivity since then. In fact, in the current productivity slowdown, quite a lot of it can be ascribed to a fall in productivity in the pharmaceutical industry. The reasons for that are quite complicated. Jack Scannell, a fantastic analyst, coined the term "Eroom's law", because it turned out that the amount of R&D you needed to produce a new drug increased exponentially through much of the 1990s and 2000s.

The pharmaceutical industry is an area that the UK has doubled down on. That is where our two greatest R&D spenders are. There is evidence that the industry has managed to halt that decline in R&D productivity, but I would not say it was an unalloyed success.

When we talk about scaling, there is an interesting contrast. There was a scientific revolution in the form of the biotechnology revolution, which, in the USA, led to entirely new companies emerging such as Gilead, Amgen, Moderna, Regeneron and Vertex. They are all really big companies that emerged in the last 20 years out of the biotech revolution. That has not really happened in the UK. We do not have that middle tier of big pharma companies. We have AstraZeneca and GSK, which are both great companies, then a kind of gap, and then a lot of promising start-ups that have not yet achieved scale. It is an interesting question about why we did not manage to get a company of the scale of an Amgen or Gilead out of that revolution.

Baroness Walmsley: Dr Greated, can you move on to the regional aspect of things and particularly the role of the universities?

Dr Alicia Greated: I will give you some general points to start with. I have lots of comments about universities to make through this.

Baroness Walmsley: We are not forgetting the devolved countries of the UK as well.

Dr Alicia Greated: Yes, you can hear the Scottish accent. To reiterate, we all know that investing in regional R&D is critical to

create new jobs and industries, and to drive economic growth, right across the UK. As CaSE, we have spoken to our members—universities, businesses, all of them—and we believe that the UK Government need an overarching national strategy for R&D. I think we all agree with that, but CaSE feels that that strategy must not be constraining. It has to have enough freedom within it to provide regions to make their own decisions, so that they can enact policies at a local level. We have heard clearly from our members that local leaders often know the needs of their area much better than a national policy or strategy might do. That is outlined in our report, *The Power of Place*, which we can share with you.

The other point that I thought would be interesting to raise is about regional capability. This is not talked about very much, but for any region to receive the benefits of R&D investment, whatever those are, it has to have the capability there in the first place. That could be having infrastructure, skills or facilities to carry out R&D. We know that those capabilities vary across the UK, and that different types of funding and support are required based on those differences.

I want to give a couple of examples of people and places I have visited recently. The first is Aberdeen. You will know that in Aberdeen there are skills and extensive knowledge around the oil industry, but we are going through this energy transition. The big issue around capability is how we adapt those skills for the energy transition. How do we ensure that people do not leave Aberdeen, or leave those universities and businesses? Then we have almost the opposite situation in the east Midlands. I recently visited Lincoln, where they are desperate to build up innovation and R&D, but they do not have the public services and the transport links to attract people into that region.

Another angle on this is around structural funds. The committee will be aware that, following Brexit, the UK no longer receives the EU structural funds that supported R&D, universities and regions significantly across the UK. The issue I want to raise here is that those benefits varied significantly. If we take Wales as an example, its benefit from ERDF for its R&D funds at €125 per capita. That was five times the UK average, which was €23 per capita. Wales has been impacted massively by that funding transition. That is the second point: we absolutely need to build capacity regionally. Before we start pumping investment in, we need to make sure that they have the capability to use it.

The third point I want to mention is about public opinion. I just highlight that, based on our research and speaking to the public,

bearing in mind that these are voters and taxpayers, the public see R&D as an asset to their region and their communities. They feel it is important that we are carrying out R&D locally. That is motivated by the production of local jobs but also inward investment. We see that particularly highly in areas such as the north-east. Two-thirds of people would support a local lab being built in their region or their high street. The need and the desire from the research community, but also from the public and voters, to have that regional investment is critical. I will come on some more about universities in a moment. I have not forgotten that.

The Chair: Before we move on to the next question, can I ask you about one point that Baroness Walmsley mentioned? What is your view on the Government's position where they are said to like clusters but not concentration?

Dr Alicia Greated: I was going to throw that back to ask whether we actually knew what that meant. I feel that that is probably a bit unfair but it would be good to explore what that means.

The Chair: Yes. Professor Jones, do you want to comment on that?

Baroness Neville-Jones: It means the golden triangle has enough.

The Chair: It is really about the golden triangle, yes.

Professor Richard Jones: The evidence is that R&D spending is very concentrated. In that sense, there is a great concentration and I think the focus on clusters is broadly sensible. The industrial structure of places really reflects their very long history. It is a kind of classic chestnut: if you shove a biotechnology lab in a former mining town, you are probably unlikely to get much traction from that. On the other hand, to take Manchester as an example, it has a very strong AI cluster, which, in a strange way, does come from its history as a textile town because you can see the transition from people selling textiles to a bunch of firms doing catalogue or remote selling, and that turning into e-commerce and then into AI. History reflects itself in quite unusual ways, but it is always important, in trying to boost the innovation capacity of regions, that you work with the grain of that history. That is the logic of the cluster argument.

Dr Alicia Greated: What we see—and you will recognise this—is that, when you have investment, it attracts more investment. It builds up that concentrated investment, which we have seen in the golden triangle. That can be very positive, but it goes back to that capacity building point. You will never be able to really build up

investment without focusing on that capability and capacity, so that you can get that positive vicious cycle happening.

Q3 **Viscount Stansgate:** I have to declare some interests for the record. I am the president of the Parliamentary and Scientific Committee, which is Parliament's oldest all-party group. I am a trustee of the Foundation for Science and Technology. I am a trustee of something called the Parliamentary Science and Technology Information Foundation, one of the world's least useful acronyms. I am a fellow of the Royal Society of Biology, and, in my past life, before joining the House, I worked extensively with organisations including CaSE, so I have known CaSE very well over decades.

The Government have been in office now for nine months. What have you learned so far about what the Government's science, information, innovation and technology policy is? Which areas do you feel are as yet unresolved? That is before I go on to a couple of follow-ups.

Dr Alicia Greated: I can kick off there. This is a very big question, so I will start off with some headline points. First, thank you for the endorsement of CaSE, and we look forward to working with you more.

Generally, we feel that the Government have shown positive support for R&D investment, starting with the Chancellor's statement in the autumn Budget. That was very welcome, as was the protection of the R&D allocation and budget, which is positive. Our worry is that there is a tight fiscal context at the moment in the UK, but we are also facing a globally competitive environment. Our worry is that there is a risk of the UK losing our competitive edge. The spending review is going to be really important. We recognise there are really difficult decisions to be made and there is lots of competition for limited finances.

Our first recommendation as CaSE is to be thinking long term, and to commit to that ambitious long-term investment into R&D to ensure that the UK is a leader in the G7 in terms of R&D investment. That is a very general point, but it is our first point as CaSE.

The second point is about strategy and direction. From all our members, whether in business, charities or universities, there is a real need to have clarity, direction and consistency in policy and priorities. We feel there has been some really good progress on that, for example, with the missions, the industrial strategy and the science and technology framework, but what we need is high-level

co-ordination. What we do not need is more strategies or more and more priorities coming out. We need leadership from the very top of Government. A key component of that will be the Science and Technology Cabinet Committee, but also the mission boards. That co-ordination is fundamental, and we very much hope you will be pushing to drive that.

The other point is around the 10-year budgets. Again, the philosophy of this is really welcome. I worked in funding, as you know, for a long time. Having long-term investment is a positive statement from Government. As part of CaSE's work, we have talked with our members but also with the Treasury, with DSIT, with funders and with people receiving funding about this. We feel that there needs to be some careful consideration with the sector about how you actually deliver those 10-year budgets. I can definitely share our report on that.

There are a couple more points to highlight. The first is around that balance between the stability of the long-term funding and flexibility. We obviously need stability to support long-term collaborations, to support skills and the progression of those skills, but we need some flexibility within that to stop activities if they are not working or have achieved their goals, but also to reprioritise programmes in light of political or other developments that are facing us.

The other point is about the variation between sectors. Different sectors need different approaches. If we look, for example, at AI or digital, their timescales tend to be shorter. We have talked about pharmaceuticals. If we look at the pharmaceutical industry, or nuclear or aerospace, they have much longer-term R&D cycles. We cannot have a one-size-fits-all approach. When we look at those budgets, we need to be thinking about the different sectors and how we adapt that funding depending on the needs of each sector, as well as talking to the community about that. They are our top-line points.

Professor Richard Jones: I also start by welcoming the autumn Budget. It had a framework for growth, which laid the correct amount of emphasis on innovation as part of that. There is a good understanding in the Treasury of the importance of innovation. Obviously, the finances will be tight, so it is going to be tough. What I sense emerging from DSIT, particularly from Lord Vallance, the Science Minister, is quite a focused view. It is saying, "We've got to have discovery science, so we're going to ring-fence it and make sure that it genuinely is unconstrained", but then part of the

Budget is going to be about needing to support the missions, particularly the economic growth mission.

There are some interesting developments, with a little more of a focus on translation and diffusion. You see that in the Government Chief Scientific Adviser's tech adoption review. I look forward to seeing what that says. As I say, it is needed to put more of a spotlight on that.

What is not yet clear is what we could call industrial strategy. There are a couple of points to make about that. First, one should stress the need for continuity. It was a real failing of the previous Governments that there was so much change. On the back of my envelope, I calculated that the average lifespan of an industrial policy was 18 months. That is really no way to prioritise, because it takes a long time to set programmes up and for research and development programmes to go forward. So the first requirement is that we really need consistency and preferably over more than one Parliament, let alone within a Parliament.

There is a tension in industrial strategy about supporting the things that we already have, as it were. We have existing sectors with potential for productivity growth. Look at what the record is on the economy: ICT, manufacturing and knowledge-intensive business services have essentially been the drivers of productivity growth over the last few decades. Within that, we have talked about pharma already, which is an area of specialism for the UK, and aerospace is always important. I always like to take the opportunity to stress how important the chemical industry is, because it often gets neglected, but it is particularly important regionally in the north of England. You have those existing sectors, so work is needed to hone down. It is not enough just to refer to advanced manufacturing or, indeed, life sciences; you need to say what bits of those you are talking about.

Then there is the focus on new things, as it were. AI has had lots of attention, obviously, as has quantum computing. Fusion still gets funded. Getting the balance right between those bets, which may or may not work, and the kind of solid industries that generate continuing wealth and productivity growth across the country is going to be a crucial thing that the Government need to get right.

Viscount Stansgate: As you have referred to the industrial strategy, can I follow up by asking what, in your view, the UK should concentrate on in that strategy? We are told it will now come out in June, and I hope it will last longer than 18 months. Do you think the Government are showing signs of making the necessary trade-offs and prioritisation required to make it a

strategy that will be successful? What is your feeling so far?

Professor Richard Jones: I could slightly evade that question by saying it is a little too early to say. The Green Paper was a good framework. It is right to consider what the existing strengths are and what the historical record of productivity growth is, and to make some assessment of the speed of technological change in those areas. There will be some predictable outcomes and life sciences will undoubtedly continue to be a priority, as they must, given the fact that that is where the strength is. That is the framework for looking at what we have and seeing where the potential is.

There will be changes. The changed general global environment dictates that we might need to do some things differently, given the need for defence and security, and the importance of energy security. I have long been an advocate for getting on with new nuclear build, which has been painfully stalled for the last decade. There are things that will come as we understand what the priorities of the nation need to be in this changing world. We need to see some different things as well.

Dr Alicia Greated: I have a quick comment to reinforce what Professor Jones has just said. From our members, what we have seen so far is that the industrial strategy has gone down very positively but, to reinforce that first point, the consistent message that comes from across our whole membership, whether as a business or university, is that there needs to be that strategic continuity. If we can get you to reinforce one point, that is it. I do not mean you can just have any strategy, but if it is changing then it does not matter how good the strategy is. If it changes in a year, or even two years, that creates a problem.

Q4 **Baroness Northover:** Professor Jones has just mentioned a changing world, and we are indeed in a changing world. Can I probe this a bit further? Obviously, there are huge economic, political and technological changes, particularly the global challenges that we face with the changes in the United States. How should the science and technology sector advocate for itself in Government in this situation where you have tight finances, as you have mentioned? There is also a renewed commitment to defence and security. In the light of that and the rise of AI, how would you advise the Government to adapt their strategy in a changing world?

Professor Richard Jones: Yes, it is obvious that we are going to need to spend more money on defence R&D. I am not a historian but, generally, this is not a country that has run its defence by fielding mass armies. It is a country that has run its defence by

deploying technology on the sea and in the air, predominantly. That needs to continue.

It is really important to understand how much the balance of R&D spending in the UK has changed since the end of the Cold War. The historian David Edgerton referred to the "warfare state" as being the state that we had in the post-war period. As recently as 2004, pretty much 30% of the Government's R&D spending was actually on defence. That has now dropped to about 13%. So we have seen, in the last 20 years, a huge shift away from defence R&D into other sectors, with life sciences being one of the main beneficiaries. It is inevitable that that will be reversed. In an overall environment where we are not expecting big increases in the total sum, that will necessarily mean some quite tough choices about what will need to be deprioritised to accommodate that.

It is going to be a really difficult and painful discussion, but one that we should address head on. If you do not plan for that sort of thing, you probably will end up with unintended consequences that are worse than you think. So yes, we will see more on defence—not just submarines and aircraft, important though those are, but the kind of AI and digital technologies that underpin what the security services do.

The Chair: Dr Greated, you mentioned unintended consequences earlier.

Dr Alicia Greated: Yes. I am really glad you have asked this question because it is very salient and important. As we all know here—just looking at the news this morning and the last week—support for R&D in the US has been impacted significantly by political changes. The reason I mention that is that, in the UK, we cannot take support for R&D for granted. It can change quickly. We absolutely need support for R&D from the public. They are the voters; they are the taxpayers, as we are. We need to be able to make a compelling case for the public and for policymakers. At the moment, that is absolutely critical. It is at the heart of a lot of the work that we are doing at CaSE.

As I said, we have been spending time looking at public opinion. Most people—70%—feel it is important for the Government to invest in R&D. But when we look at the parts of society that are more sceptical about investing in R&D, the biggest sceptic group is the young. It is the under-44s. Personally, and as CaSE, that is really worrying. All our data is public, by the way, so we can share any of that. When you look at the different cohorts, women are more sceptical, as are lower socioeconomic groups.

We really need to care about this, so we have been looking as well at how to make those messages more compelling. How do we do that and who carries those messages? The way to make them more compelling is around place, which we have talked about. People want to hear more about research, development and innovation, and how it impacts on their environment, their local jobs and the local economy, but there is also purpose. We can all identify with how it affects our lives. For example, how does investment into the NHS support your family or your loved ones? That is really critical. It is also about who carries that message. You might not be surprised to hear that people trust scientists to carry that message more than they trust politicians. We have quite a lot of evidence about how you talk about R&D, and who should be giving those messages and talking to the public.

My main message is that we cannot take the support for granted, whether from the public or policymakers. We have an absolute need, as a sector, to make a more compelling narrative about why R&D matters to the missions—the priorities of the Government—but also to the benefit of lives and livelihoods of the people who are voting and paying for a lot of this.

Q5 **Baroness Neville-Jones:** I do not have any current interests to declare in relation to this investigation.

I am struck by the fact that, in your last set of answers, neither of you seems to regard defence as an opportunity. Professor Jones, you talked about awkward choices. Do you not see it as an opportunity? Is it not an area where we can grow?

Professor Richard Jones: That is a very fair point. Historically, many great advances in technology have been driven by the defence industry.

Baroness Neville-Jones: Exactly, yes.

Professor Richard Jones: If we look at the way that the semiconductor industry emerged in Silicon Valley, that was largely driven by the demands of the US defence industry. So, yes, there are opportunities. It does not sound quite right to say that I welcome the fact that the world suddenly got more dangerous, but, yes, perhaps one could say there is a silver lining: it potentially gives us a way of rebuilding some of our industries that have lagged a little bit. As I say, electronics and semiconductors is a very important example and will remain important.

There will be a regional dimension. Yes, it is absolutely true that many places that will benefit from an increased focus on defence are in those parts of the country whose industrial base has

withered away and, with it, their manufacturing and innovation capacity. If one lives in Barrow-in-Furness in Cumbria or many other centres—Bolton is another one—those are places where it is not just a question of there being jobs in the defence industry. Investment in R&D-intensive innovation-driven industries will have spillover benefits that will benefit the civilian industry too.

Baroness Neville-Jones: Make UK certainly seems to view it as an opportunity, which seems to me a welcome attitude, at any rate.

Dr Alicia Greated: I have a short comment, which aligns with the other things I have said. From the CaSE perspective, it is more about ensuring that we look at the whole sector. With any investment that moves into defence, we need to make sure that we are not losing capability for the future in other areas. It is those unintended consequences. Whenever we make decisions about moving money or on policy, it is about ensuring that, at the same time, we are looking at the whole sector. There is also an underpinning research base that feeds into those big issues.

Baroness Neville-Jones: That is an ideal world, I have to say.

Professor Jones, I want to bring you back to something you said. In talking about what happened earlier on and the decline in applied research, you said that when the Government removed or greatly reduced their role in that sector, the private sector acted similarly. Can you say more about that and why? What is your understanding? On the face of it, that is an extraordinary thing for industry to do—not to see its own interest in innovation. What was going on and is there a road back there? It is striking that in all our conversations, it is all about government policy after government policy. Where is the private sector in this? Why is it not feeding its own future?

Professor Richard Jones: It is a complicated and difficult issue. You could point to various things. You can look at the decline of the big companies that were very R&D intensive.

Baroness Neville-Jones: Why?

Professor Richard Jones: ICI and GEC are two great examples: ICI as a great chemicals combine and GEC as an electronics company. There is a report that John Kay did for the business department in about 2013 on long-term financing. His argument was that, in those companies, the view seemed to become that the way to create value was by buying and selling little bits of the company. So ICI demerged; bits of it were sold off and bits of it

were bought. The market was mistimed, essentially, and they pretty much ended up destroying the company in that way. It was a change in corporate governance and in the way that people thought about long-term value in companies. You can blame the demise of both GEC and ICI on those trends.

There were other factors. Many people in the manufacturing industry will tell you that those sectors suffered from a long period of rather high overvaluation of the pound, which came about from the pound being a petrocurrency at that stage. Something that economists talk about is the Dutch disease where, if you have a resource-rich economy, it tends to squeeze out other bits of the economy. Our oil production peaked around 2000 and there is a bit of a coincidence where maybe that coincided with the erosion, particularly, of capacity in the manufacturing industry.

To come back to the Kay report, there was just a general climate with that idea that a company's management job was to maximise shareholder value over the short term. That militates against long-term investments in R&D. You can see that in this country but the United States suffered from this too. American GE was a fantastic R&D powerhouse that did not survive having some management that focused on maximising quarterly results and share prices.

The Chair: We are running slightly late now. Can you make your question brief, if possible?

Baroness Neville-Jones: If you move forward in the story, do we still have such a level of unenlightenment in corporate management or is there a new attitude? It still does not seem to me that the corporate world, if you compare it with Germany, displays the same interest in R&D, skills management, training and all those things which should ensure a good future for the company. Is something lacking in our private sector culture or is this an unfair judgment?

Professor Richard Jones: I feel a long way away from my comfort zone in talking about this. When I visit companies in the north-west, I often get quite a few family-owned companies with quite long-term horizons. They look pretty similar to the German companies that we always look to. If I look at AstraZeneca, it seems to be managed with quite a long-term focus. I suppose that is inevitable in the pharma industry, because the timescale of developing a drug makes it absolutely clear you have to be long-term about it.

Baroness Neville-Jones: What about government policy?

Professor Richard Jones: There are fewer of the publicly listed companies on the London Stock Exchange that, in the past, you would have thought of as well-established companies that were managed for the long term. I suspect that there are issues about the relationship between ownership, control and long-term time horizons that somebody with more understanding of the business landscape than I have would be better qualified to talk about.

The Chair: Dr Greated, I know that Lord Lucas has a question specifically for you about universities, and I am sure Professor Jones may also want to comment.

Q6 **Lord Lucas:** What needs to change with the set-up of university R&D? Am I wrong in thinking that a well-run industry-related research programme in a university should generate a substantial financial surplus over time?

Dr Alicia Greated: Sorry, could you say the last point again?

Lord Lucas: Universities should be making a lot of money out of research. Why are they not?

Dr Alicia Greated: Do you want me to go first? You go first, because I can hear that you are desperate to comment.

Professor Richard Jones: They just do not. It is clear that universities do not make a lot of money out of research. R&D in universities is essentially sustained by cross-subsidies, generally from overseas students. That is the system we have walked into over 15 to 20 years. It is uncomfortable in many ways.

Dr Alicia Greated: When we look at evidence on universities and what we have done at CaSE, it is important to think about the tangible benefits. I have evidence here saying that £1 of public funding into research in the higher education sector generates £9.90 through research and knowledge exchange, so those are tangible benefits.

Lord Lucas: Two of those pounds should end up with the universities, so that they are making money out of it.

Dr Alicia Greated: Can you say that again?

Lord Lucas: Two pounds out of that £9 should end up with the universities.

Dr Alicia Greated: Yes, that is true. We have to be looking at the intangible benefits as well and the benefits for business. It was said before that we talk a lot about universities, but universities are at the heart of the whole system of innovation. The other parts of the

sector, including business, have told us that they are dependent on the universities, not only for knowledge and expertise where they do not have in-house capability, but for reaching other sorts of knowledge that they would not usually have access to. Say that you are an AI expert or working on robotics: you might go into a university and meet somebody who works on ethics. You would never get that in a normal business structure.

We also have universities providing infrastructure facilities for businesses. I do not know how much you have discussed this as a group, but universities act as a neutral arbitrator where smaller and bigger businesses can come together and collaborate rather than compete. That is not a usual state of affairs and it often attracts money as well. They also act as a focal point or an anchor for innovation to happen in regions.

For CaSE, our big worry at the moment is that we recognise that we need to focus on scale-up and all these bigger issues of innovation and translation, but the financial pressure that universities are under is absolutely acute and significant. Whether we are talking about translation or innovation, they are an important part of that process and their finances definitely need to be relooked at. What we are saying as CaSE is: can we give short-term support for the universities to get through this period so that we can then plan a longer-term model and get long-term financial support for the sector that works? At the moment, we would agree it is not working as it should.

Professor Richard Jones: The UK is an international outlier in how much of its public sector research happens in universities. I think only Sweden is comparable. We have evolved the system where that happens. In a sense, it probably is one of those unintended consequences. We have ended up putting more and more research into universities because it is cheaper. It is cheaper because the universities are happy to cross-subsidise it, because they think that research is what they ought to do, and university researchers really like doing research and are very committed to it. It is a strange situation that we have ended up with but it is a deeply unstable one, and we ought to sort that problem.

Universities are not, in fact, businesses. We have to meet the payroll at the end of the month, or whatever, but I think universities genuinely feel, collectively, that they have an important purpose in society. A really important part of that is to do research and development, and to use the benefits of that research to support their local economies and their cities. To speak for Manchester, like many of the great civic universities, Manchester

University was founded specifically to support the industries of its city and the well-being of its citizens. That motivation is still really important to our universities.

Q7 **Baroness Neuberger:** I have to declare some interests. I chair University College London Hospitals Foundation NHS Trust and Whittington Health NHS Trust, and I am a member of the North Central London Integrated Care Board and various of its committees. Sorry, but that is important because we have to get it on the record.

To the point that you just made, it is an unstable situation with research in the universities as it is, but is it not also the case that universities, unlike other companies or whatever, find it more difficult to do the translation bit of the model? You can do the basic research but it is getting from the research to translation into practice that is really hard for universities to do. I speak as somebody who chairs hospitals. We do a lot of it in hospitals but, unless you have that model, it does not work very well.

Professor Richard Jones: It is hard because academics have many virtues but they are not enormously close to markets. It can only work with partnership; it needs partnership with private sector businesses. Businesses can come with an understanding of market needs, so that is a big part of it. Partnership is also important on the commercialisation side, working with venture capitalists and having an ecosystem. To come back to Cambridge, it works exceptionally well as a commercialisation system because there is a huge population of financiers—people who have run companies and been through the mill—who are prepared to work with it.

It is not something that universities can do by themselves. They have to work in partnership and develop these systems. I shall be going to Cambridge next week precisely because, in Manchester, we think we have a huge amount to learn from the Cambridge system. It is not just the university. It is all the stuff that surrounds it: the venture capitalists and people who have management experience and understand the markets, who need to go in to support that.

Q8 **Lord Drayson:** I too have to declare my relevant interests to this inquiry. It is quite a list. I am director and executive chairman of Freevolt Technologies and director of Freevolt Group; director of Isovia Health; director and chairman of Appella AI. I am also an industry adviser to Advent International. I have a number of shareholdings in technology companies, including Cambridge Mechatronics, Freevolt, Arcturis Data and Appella AI. In terms of non-financial interests, I am recently a member of the advisory

board of Labour Together, advising on this very topic, and honorary fellow of St John's College, Oxford, which is developing a science park in the north of Oxford.

My question is: we have heard quite a lot about the failures of government policies over a number of years to address this well-recognised problem, recognised at the level of a cliché. Why has it not worked, Professor Jones? Why have these initiatives, particularly over the last 10 to 15 years, not worked?

Professor Richard Jones: I come back to the point I made earlier: because nobody has ever stuck to one for long enough to demonstrate that it is going to work. Looking back, the Greg Clark and Theresa May industrial policy of 2016 or so was actually a pretty good policy.

Lord Drayson: What is it about the culture of policy-making in the UK that leads us to do this? What is it that we need to change to stop doing it?

Professor Richard Jones: It is in this building, is it not?

Lord Drayson: Seriously, has anyone done any research into the characteristics of the cultural attitude within policy-making in the UK in comparison to other countries that you could direct us towards? To the point that Dr Greated made about the lack of recognition of the value of R&D, what work has been done to explain and understand the link to wealth creation?

Professor Richard Jones: I think you have an enormously distinguished career in this sector; I am not sure how many of your colleagues in the legislature could say that. There are maybe not enough people who have seen that from the inside. There is an ownership question. The increasing overseas ownership of many of our companies means that there are not distinguished industrialists and industrial scientists who are either part of the Government or close to the Government—advising them and that kind of thing. It probably also reflects a bit on the centralisation of the country. If I was in Manchester 50 years ago, there would be senior people from major industries who were very close to a powerful city government, as well as influential in national government. The centralisation that we have seen militates against that a bit.

Dr Alicia Greated: I will try to be brief, but your question is very good. I want to reinforce that first point. The absolutely critical point is having consistency in strategy and policy.

Secondly, last year we published a report called *Backing Business R&D*. It was all about business R&D, but what was fascinating in

that report was that a lot of our recommendations were about doing the recommendations in other reports. We have reports coming out of our ears. We know what the issues are: do the recommendations. I feel we know what the issues are, not all of them but a lot. They are published, so we do not need to do another review. We need to do the recommendations.

I was going to talk about funding gaps and scale-up, but the nub of the issue is that a lot of the interventions are not always fit for purpose. Part of that is to do with communication between business, policymakers, academia and the movement of people. That leads on to that point.

We were talking about the differences between countries. Culture is really hard to define. We do not talk about it because it is a bit soft and we cannot put numbers on it, but culture is really important. Risk aversion is a big difference between the UK and the US, for example. One of the points that came out from our members was about public procurement. This is where the Government can show an example. As a Government or as public departments, where are we using UK innovation? That requires leadership, boldness and a change of culture. We do not really talk about it because it is very hard to describe and measure, but it is a really important point.

The Chair: Dr Greated and Professor Jones, thank you very much for your really interesting evidence. We appreciate it very much. We will pause now before we have our witnesses for the next session.