



Science and Technology Committee

Corrected oral evidence: Delivering a UK science and technology strategy

Tuesday 26 April 2022

10.15 am

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Members present: Baroness Brown of Cambridge (Chair); Baroness Blackwood of North Oxford; Viscount Hanworth; Lord Holmes of Richmond; Lord Krebs; Baroness Manningham-Buller; Lord Mitchell; Lord Rees of Ludlow; Baroness Rock; Baroness Walmsley; Baroness Warwick of Undercliffe; Lord Winston.

Evidence Session No. 14

Heard in Public

Questions 113 – 121

Witnesses

Professor Dame Ottoline Leyser, Chief Executive Officer, UK Research and Innovation; Lord Browne of Madingley, Co-Chair, Council for Science and Technology.

USE OF THE TRANSCRIPT

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

Examination of witnesses

Professor Dame Ottoline Leyser and Lord Browne of Madingley.

Q113 **The Chair:** Good morning to our witnesses, and thank you very much for joining us today. Before we start the questions, I would like to remind you that the session is being broadcast on the internet. A transcript of today's session will be sent to you in a few days' time for you to check and send in any minor corrections. If there is anything else that you would like us to know about or that you do not get a chance to say, we would be really pleased to receive any supplementary evidence in writing after the meeting.

We are clearly very interested in the impact of the new Office for Science and Technology Strategy and the new Cabinet committee on the working of the overall research ecosystem in the UK. Of course, the Council for Science and Technology, on which you both sit, made the recommendations that have resulted in these changes to the system.

I would like to get in three quick questions. How well do you think the Government are doing in terms of responding to your recommendations? Are they moving fast enough? What more would you like to see happening? I would also like to slip in a question that came up from one of our pieces of submitted evidence, which is suggesting that this new government science and technology strategy is going to be hugely important to the UK, obviously, and should have some kind of independent body. Just as the Committee on Climate Change monitors the Government's progress towards net zero, should there be some kind of independent body monitoring the Government's progress towards the delivery of their science and technology strategy? Might that be a role for a reformed Council for Science and Technology? If you are happy to pick up that one as a rider, let me start with you, Ottoline.

Professor Dame Ottoline Leyser: I very much welcome the establishment of the Office for Science and Technology Strategy and the National Science and Technology Council. The ambition to embed science at the heart of government is crucial for our future as a country, to build the knowledge economy that we are all seeking, with high-productivity jobs and all those kinds of things, as well as really world-leading public services. Both of those things depend on having science and technology right at the heart of everything that we do. That Cabinet-level anchor is crucial.

In the context of a science and technology strategy, that crucially covers not only, for example, the areas of technology where we might want to focus investment but the much wider set of interventions that are needed to deliver that, for example, the regulatory landscape and so on. That is not something that UKRI can do. We cannot change the regulations. We can advise and support that but we cannot oversee that, so that anchor in the Cabinet Office is absolutely critical. We have seen, with this set of allocations, the very welcome re-establishment of research and innovation budgets right across government in all government

departments to ensure that all departments have the research base they need to deliver their policies. Trying then to align all those things into high-quality delivery for research innovation in that wider policy context is absolutely critical.

I have taken to drawing this diamond structure, with OSTs and the National Science and Technology Council at the top. All those government departments need that overarching join-up, and then UKRI, as a delivery body, can potentially deliver for all those government departments. I am anxious not to see fragmentation but rather to see both of these things, the creation of UKRI and of the NSTC, as an integrative force delivering for the whole of government and the whole of the UK.

The Chair: Do the government departments recognise that UKRI can be the delivery body for them? Is that now an accepted approach?

Professor Dame Ottoline Leyser: We have long-standing and high-quality relationships with the departments that have traditionally had a substantial research budget, and we are very busy building those relationships right across as those wider research budgets are topped up. There are a lot of opportunities for that line-up, but the challenge with all of this, right across many of the things you are interested in, is the real need to ensure that every pound we spend delivers on multiple objectives.

There is a visceral desire to chunk things up into pots and put a label on top of them, saying, "This is for this purpose and this is for this purpose and we are going to deliver those things separately". We will not get that humming knowledge economy and public service support until we think about that stuff in a really integrated way, every pound does multiple things, we understand that and we are happy for that to happen rather than needing those chunked-up pots. That is an interesting element in the context of an external monitoring body. There could be something that is able to consider that activity in the round. Rather than ask, "Did this fund do its job?", it could ask, "Is the whole thing working?". That is an interesting idea that would be worth exploring.

The Chair: Lord Browne, can I turn to you and perhaps put to you this question about whether a slightly modified CST should have a role as a monitoring body similar to the Climate Change Committee on the Government's progress in delivering a science and technology strategy?

Lord Browne of Madingley: Good morning. Let me answer the question with a bit of background. When you look at the science and technology strategy, you are really looking at a science superpower strategy, which is all about economic growth of the nation. That is the ultimate test. It is not just about science and technology. It is about the relevance of it, the benchmarking of it and whether it can be focused into growing the nation. These wider issues are very important. The Government have done some interesting work here. I will come back to what the CST can do.

The Government have provided financial resources of £20 billion. OSTs and NSTC have been set up. That is very important because it integrates

it into the wider issues of economic growth. UKRI is now highly effective as a grant-making organisation. What is missing is any real connection with business and industry, which is so essential to get the future of the nation up and running. Secondly, there is something really missing in people and the integration of people into government and business. Thirdly, we are missing focus on what we do.

What is the role of CST, therefore? CST has been focused on catalysing and gingering up the response to these various things. It is quite independent. It is not an assessor, but we advise on things we think are missing. We have been advising on things such as the strategic areas for research, on people—how to integrate people between business, industry and government—and on how to understand how to catalyse business investment in R&D and innovation for the future. That is lagging on a benchmark basis, and we have been looking at how to provide money both for innovation and, principally, for growth. What can we do with emerging growth? There is very little point in innovating when the innovations go elsewhere, frankly, so CST has a role here.

Whether CST can be expanded is really quite a delicate matter because, in the end, this strategy is run by the Cabinet committee, NSTC, and that is the place where it surely should be integrated into both the global and local economies.

- Q114 **Baroness Blackwood of North Oxford:** I would like to ask a little bit about the 2.4% commitment. We are obviously facing significant economic headwinds, so I would like to understand your view on whether there is any risk to that 2.4%. We have a commitment in this spending review period, but it is a longer period than that. I would also like to understand what more action needs to be taken in order to fully realise that commitment, because it is not just public sector investment that is necessary; it is also private sector investment.

Professor Dame Ottoline Leyser: The commitment is important. Ideally, one would like a more ambitious goal. The 2.4% figure is the OECD average; we are at 1.7%. It is extraordinary how well we perform given the low level of investment. That target is important.

You are absolutely right: at least two-thirds of it must come from the private sector, so we need to think very carefully about how we build that joined-up ecosystem that we have talked about already, which catalyses the feedback between the public sector and private sector investment.

One of the things I have always been struck by is that if you look at the OECD charts, there is a relatively small number of countries where, when you break through some kind of percentage in the high twos, you seem to drive things up in a non-linear way with positive feedback. That is where we need to get to in the UK, and we have a huge opportunity to do that. That is fundamentally about two of the four principles for change in the new UKRI strategy. One is diversity. We have to think really carefully about the portfolio of public sector investment. It is absolutely critical to have the fundamental science base that fuels the whole thing and attracts investment and people from around the world, but as part of a

portfolio that invests right across the TRLs, the sectors and the disciplines.

People are critical, as Lord Browne mentioned. We think much too much about the money that spreads across that system and not nearly enough about the people. Our current incentive structures keep people in their silos. They keep the basic researchers in universities doing the basic research and the industrial scientists in industry. We need to think much harder about how we catalyse the movement of people through the system and get it properly joined up. That is the kind of thing that will drive those positive feedbacks that allows us to break through the 2.4% number and beyond.

It is about long-term, strategic investment with money but, critically, shifting the incentives to make that join-up possible in a way that does not undermine the basic fundamental research that we are so good at but allows a much wider range of things to be viewed in the light that they should be, as excellent, successful and world leading.

Baroness Blackwood of North Oxford: Just to be clear, you do not perceive any political risk at the moment?

Professor Dame Ottoline Leyser: There is a clear ambition to get to that target. It is absolutely central to the policy and rebuilding our economy after the pandemic.

Lord Browne of Madingley: First of all, the 2.4% is a very important international benchmark number. That is all it is. It is the only thing we can actually measure, and we need to be higher than that. What is really very important is the mix of investment below the benchmark number, in particular the mix between the public and private sectors. We are a little obsessed with the public sector activity, and the private sector is far more important, far bigger and far more broad reaching globally.

The question is: what is to be done? The CST has been very focused on this indeed. Certainly, during my co-chairmanship, we have been very focused on this, thinking about what the incentives are that we need to put in place for business to invest here in R&D, innovation and the follow-through. It is not just an R&D credit. That takes you only so far.

Secondly, how do we get scale-up finance into the system here? This is the financing needed to take an idea that is a prototype and really check that there is a product-market fit and that you can actually create a real business with this. We tend to lose companies at that stage to elsewhere in the world because others are more ready to finance the growth.

Thirdly, that means we need to look at our own markets and stock markets. Do they actually work here? Is it really working properly?

Fourthly, I want to come back to this big point. We cannot get all this working unless we have a proper interchange between business, industry and government, not just at the highest levels but right through all levels of activity. Many people say, "All we need to do is get a few CEOs together and we can fix it". That is not true. Having been a CEO over many years, I can tell you that we need integrated interaction right through the levels, so that people know who to speak to, how to speak to

them and how to get things done. That is the important thing, and that requires real open doors here, which we do not really have. We are trying to do some things at CST by putting in fellowships. That will take us so far, but I think we need something much bigger than that to make this really work, if we really want to be a superpower, which I hope we do.

Baroness Blackwood of North Oxford: I just have a tiny question to follow up with. The funding needs to be responsive to innovation and industry if we are to achieve superpower status, as Lord Browne has stated. Is the funding over the spending review period already fully allocated, or is there room for manoeuvre?

Professor Dame Ottoline Leyser: There is certainly room for manoeuvre. The way the UKRI portfolio works is that there is a continuous churn of investment. Although in the early years of the spending review there are significant commitment tails from previous years, every year projects finish and new projects start, so there is continuous opportunity to tune that portfolio. That is how we need to operate as UKRI. We are a portfolio investor, and we have to retune that continuously. The balance that we have to put in place is going to be different for different sectors and disciplines at different points in their cycles. There is no one size fits all.

As I said before, it is so critical that we have the flexibility within that portfolio to retune it actively and for every pound to be doing multiple things, driving towards the 2.4%, supporting our research base for the future, driving the levelling-up agenda and all those things. We have to think about every pound in those multiple contexts.

Q115 **Baroness Walmsley:** Good morning, Dame Ottoline and Lord Browne. Perhaps I can come to you with this question first, Lord Browne. The Council for Science and Technology has called on the Government to set out their ambitions for science and technology. Government witnesses who have come before us have talked to us about identifying a few key areas of strategic advantage. Do you think the Government have been specific enough about the objectives for science and technology strategy? Which areas do you think we should focus on?

Lord Browne of Madingley: CST has, over its tenure, been looking at all these areas and saying, "What are the strategic areas we need to invest in?". Very early on, for example, it said that it is time for us to invest in quantum technologies, based on what was going on at the National Physical Laboratory a very long time ago. That is one example, but we have been looking across the board. If I go from the past to today, today we are very focused on whether we are taking the right approach to engineering biology. It is a very important thing for the future. Are we still taking the right approach on quantum? Are we taking the right approach on AI? Are we still continuing to invest in the whole area of bioinformatics and genomics?

I think we are making the right choices. You are never sure, of course, because we need to scan and listen carefully to people who tell us about the future where they are not quite sure about the future. Prediction is a

terrible thing, but we need to figure out how to invest in things we do not fully understand today. That is the role of UKRI in the pure discovery research that is conducted in so many institutions in the nation, but we are focused. Every year, we pick two or three topics to discuss, to focus on and to have a task force report on, which I hope pushes the scientific and technological organisations forward in a better way.

Baroness Walmsley: Thank you very much. That is a very tricky challenge for you, Dame Ottoline, as I hand over to you.

Professor Dame Ottoline Leyser: Yes, absolutely. Fundamentally, as I said, the job of UKRI is portfolio management, and that is always going to be a balance between bottom up, having no idea what is going to turn up when you lift the next stone, and top down to make sure that we capture the benefits of the extraordinary creativity we have right across our research and innovation landscape.

I agree with you that there is a need to think strategically as a nation. We are a relatively small nation. We will never match the total amount of investment in our competitors such as the United States or China, but we are relatively small geographically, which is actually a benefit because, although we have learnt a lot through Covid about what you can do online, in fact, people talking to each other and learning from each other physically is very important.

We have this long, strong history of excellence right across the disciplines and sectors, so we are poised. We have seen huge successes during the pandemic from long-term investment, from incredibly blue-skies ideas about how you might make new vaccines through to our ability to pivot to deliver. We have the makings of a system that can really deliver if we have that bubbling crucible of creativity pointed at key national objectives such as net zero, for example.

A key focus for the National Science and Technology Council is technology, because those technologies are a platform. They reach right across our economy and can deliver for multiple sectors. Trying to prioritise within the opportunities in platform technologies such as engineering biology is a really important goal, and it requires one to make decisions and say, "We are going to do this and we are not going to do this". That is a very difficult thing for anyone to do, because as soon as you say, "We are not going to do this", all the people doing that jump up and down. None the less, we need to do it to maintain our advantage.

As Lord Browne said, it is that embedding of voices from across industry as to what is needed and what the exciting opportunities are. That is not just the big primes but the new, growing sectors that did not even exist before. That is where we can really capture advantage as a country: yes, building on our strong prime sector but also really supporting, through our national infrastructures and skills and so on, the up-and-coming sectors of the future.

Baroness Walmsley: Could it be that the breadth of excellence is actually a bit of a problem in a way, because you are perhaps spoilt for choice? Do you think the National Science and Technology Council has yet

been specific enough about these strategic objectives?

Professor Dame Ottoline Leyser: It is very early days for the council. It is working through that, for sure. It is too early to say whether it is going to be able to make those decisions clearly.

Lord Browne of Madingley: OSTs has identified four clusters that are pretty good: sustainable development, health, national security and digital. It is by force of what we can do that there have been subsets now generated with each one of these things. Some are the continuations of great expertise, certainly in health. Other areas are being developed, and it is no bad thing to have the umbrella and to force people to pick a few things underneath it. That is happening bit by bit.

Professor Dame Ottoline Leyser: My comment was in the context of the technologies.

Baroness Walmsley: Can I ask you about public procurement? The Government want to use public procurement to pull through innovation, and we have had this ambition for quite a long time. Do you think anything needs to change in the way of regulation or practice in order to make that succeed, Lord Browne?

Lord Browne of Madingley: First of all, public procurement is not one magic bullet. The Government spend around £300 billion per annum on procurement, about half of which is the NHS. Some of that can be used for what I think is a way of reducing risk and producing finance for companies. It can reduce risk by the Government being the first buyer, the innovative buyer and, occasionally, the product identifier, with a company being the product market identifier. Governments are pretty good at identifying products but not so good at identifying markets, but the two together would be very good.

There is a lot of work that could be done here, and we are capable of doing that, as indeed are other nations. We can make regulations here. I do not think it is something that we can assume will work in all circumstances, but there is nothing like having a company that starts where you have guaranteed, annual, repeating revenue from a high-quality source such as a government. It really sets the company up for the future, and the Government will have to take some risks in this area to make this work. We are looking at it at the moment as a CST project.

Baroness Walmsley: Governments do not like taking risks usually, do they? What do you think, Dame Ottoline?

Professor Dame Ottoline Leyser: I agree very much that risk is at the core of this, and that is in the context of both the procurement and the place of innovation in public services more generally. One of the reasons for re-embedding R&D budgets right across departments is to try to embed that approach in policy formation in the first place. It is always a portfolio.

There are well-understood ways of managing portfolios in investment. You absolutely need the solid, surefire investments to make sure you can move forward, but you also need to put some of your budget into that

high-risk activity. Across your high-risk investments, they need to be orthogonal so that they are not dependent on one another. It can be done. And I agree with you, a lot of it comes down to shifting the perception of risk and the way risk is managed in policy formation, in public procurement and in research investment. Being explicit about that risk portfolio is key.

Q116 Lord Rees of Ludlow: I would like to follow up a bit on the proliferation of extra committees. Dame Ottoline said earlier that she welcomed the setting up of the OSTs and the NSTC. It was very good news to hear that, but I would like to ask a bit more about this. Perhaps I could ask Dame Ottoline in particular how the operation of UKRI is affected by this proliferation, because you have your own board chaired by Sir Andrew Mackenzie and presumably you get advice or directives from the OSTs, et cetera. I just wonder whether there are crossed wires or whether you think there is a good complementarity between these different bodies that, to an outsider, look very complicated.

Professor Dame Ottoline Leyser: Maybe one way to frame this is in the context of Haldane. It is absolutely legitimate, and indeed the role of government, to set high-level strategic objectives such as the four areas that have been identified by the NSTC to date and, as we move forward, prioritisation within the technologies in the context of the integrated review, for example. How you deliver those is the job of UKRI. That distinct role is there and that is how the system is currently operating. Beyond that, the OSTs and the NSTC have roles that extend well beyond how you invest in research and innovation—to these areas of regulation, for example—on which we do not have any traction.

Lord Rees of Ludlow: The Haldane principle operates at the micro level, which is the individual councils below you, so I just wonder what is left for your advisory board.

Professor Dame Ottoline Leyser: The Haldane principle operates at the level of UKRI. It is across the board. It is not just that. The board is playing a critical role both in how the overall government policy is fed into the UKRI set of strategies and objectives and that dynamic portfolio management that I talked about, and in really driving forward the extraordinary opportunities there are from the creation of UKRI, precisely to navigate these kinds of issues. UKRI is a critical body in delivering all these objectives, precisely because it brings together all the disciplines and sectors under one roof and creates the opportunity to build that connectivity that our system so desperately needs. The board is critical in doing that.

Lord Rees of Ludlow: Lord Browne, I wonder whether you have any comments from the perspective of CST on how this is working.

Lord Browne of Madingley: I have also been a founder director of UKRI. My frustration there was that there was no way to join up all the aspects of government so that we could actually see the impact of science and technology on the whole economy, how you can integrate business and industry and how you can change the attitudes and

behaviours of people. The invention of NSTC and OSTs allows us to do that. That is actually, in the end, the overarching government activity, and it puts fairly and squarely in the hands of the important decision-makers of the country the reality of science and technology as the key levers for growth for the future. It is really important for that reason.

Now, do we have to sort out some details of how all this is working? It has hardly started work. It looks pretty good to me. People have good intentions. Let us make sure we do not clutter it up with too much procedure. I am far keener on action.

Lord Rees of Ludlow: Also, of course, there is direct input from the Department for Business, Energy and Industrial Strategy into some of your decisions, so that must be an extra complication.

Professor Dame Ottoline Leyser: In principle, the key role for the NSTC is to co-ordinate across government and government departments. That is a major challenge. The Department for Business, Energy and Industrial Strategy is one of those, so I am not expecting to get any strategic input from NSTC that is in conflict with or differs from what we are getting through BEIS. They should all be aligned. That is the idea.

Q117 **Lord Krebs:** Ottoline, I would like to put my questions to you in the first place, although John may wish to come in as well. They are three questions about UKRI. The first is that one of the points of UKRI was to encourage more interdisciplinary research, particularly working across the different research councils. Has that happened? If so, how are you measuring it?

My second question is about the balance between applied and basic research. As I understand the numbers, quoting from you, 12% of your budget goes in responsive-mode funding. If you look at that as a percentage of the total government spend on science, it is therefore about 6% or 7%. Is that the right number, given that this is the seed corn of future innovation and exploitation?

My third question is about the feedback you get from researchers on the ground. Are they pleased with the way that UKRI is operating? Do they see problems with it, and what are you doing about that?

Professor Dame Ottoline Leyser: Those are three very important questions. On interdisciplinarity, this is a really interesting issue. People talk a lot about interdisciplinarity. It is really important. It is where a lot of the exciting work is going on, but it falls into several really distinct categories.

The first thing to say is that it is very hard to measure. I have looked at a whole variety of attempts to measure it and, because disciplines are difficult to define, interdisciplines are even worse to define because of the multiplier that goes with that. None the less, we sort of know what we mean in at least three categories, one of which would be research where the questions you are addressing are core in that particular discipline but

you are using all kinds of stuff from other disciplines to do it. While there can be challenges with that in the standard system, it is not badly served.

At what I would consider the other end of the spectrum is problem-driven or challenge-driven research, where you need to assemble an interdisciplinary team in order to address a particular challenge. UKRI has been extraordinarily good at that. There are lots of very good examples of things that have happened since the creation of UKRI that would have been much harder to do before that—not least our response to Covid, where we were able to pull together all kinds of activity very quickly to address questions coming out of SAGE.

The thing we have not yet delivered is what I would call research that is so interdisciplinary that it has no home. There has been a lot of bilateral collaboration between councils. That has historically also been the case but, again, that is targeted. What if you have a project and a really clear idea about what you want to do but just do not know where to send it because of the current panel structure across UKRI and you just cannot see where the home would be? I am very keen that we experiment with how we might address that.

We are hoping to set up at least a pilot of a fully open response-mode call that at least surfaces how many projects there are out there that fall into that category that currently have nowhere to go or are squeezing themselves as square pegs into round holes.

We have done very well in some areas of promoting interdisciplinary science but there are other areas where we still need to work, and I am quite excited about that through this next spending review period.

Regarding your question on basic research versus applied research, as you say, about 12% of our budget is currently on the fully open response mode. Other proportions are on more strategically focused response modes. That does not mean to say that it is applied, though. For example, they might be targeted at cutting-edge AI, but they are focused on AI rather than on any area of computer science.

Is that the right balance? The question becomes about what the other 80% is doing, if you add those two numbers together. That is, for example, 10% on PhD studentships that work right across the piece and do that thing I talked about—£1 doing multiple things—training the next generation in a variety of skills while also focusing on particular areas where we have a need to move forward and skills shortages. Those PhD students are contributing to basic research in the same way and, if you start trying to cut PhD numbers, to move on to your third question, goodness me, what a hullabaloo you would get. The idea that that 10% is not a core part of our research base is clearly not right.

We invest about 10% in institutes and research centres, which are absolutely critical to everybody, both applied and basic scientists, in what they do. Some of them are, of course, themselves driving forward extraordinary basic science, such as the Crick Institute. Then 20% of our budget goes in QR into block grants in English universities, which have complete freedom as to how they invest that, including in that basic

science. It is that portfolio that I have been talking about. We need the opportunity to have the flexibility in our budgets to balance that portfolio correctly for different disciplines as they roll forward and new ideas and opportunities emerge. The answer to the question is going to be different for different disciplines at different times. What is crucial to me is that we have the flexibility in our budgets to tune for those disciplines in different ways.

There is always a lot of feedback from the community that there is not enough funding in that discovery science and that UKRI has shifted the focus away from it. Demonstrably, in our statistics, that is not true. A lot of the additional money that came in with the creation of UKRI was in the national productivity investment fund, so the percentage of research we are funding that is more directed at particular problems—not research, in fact, but innovation—has gone up, but the total amount invested in completely pure discovery science has gone up year on year through UKRI.

We are funding a portfolio, and our success rates are low. Some 80% of what we do is reject people's grants; that is just how it is. There is a 20% success rate and 80% not, so there will be a lot of people with fantastic ideas that are currently unfunded. That is always a challenge, but it also means that people are always going to be asking, "Why did my grant not get funded?". They see very high-quality, excellent applied science being funded, and one answer then is, "My grant wasn't applied". It is easy to see how that narrative embeds itself in the system but, if you look at the data, we are funding more completely open discovery science than we have ever funded before.

Q118 Lord Mitchell: Good morning, Dame Ottoline and Lord Browne. John, I would like to direct much of this question towards you. Meeting the 2.4% target relies on increased investment from the public sector, and I think you mentioned that we need more than 2.4%. The Chancellor noted in the Spring Statement that the UK spends more on R&D tax credits than almost any other country, but the private sector lags behind in investment. The problem of scaling up start-ups is also long standing. What can the Government do to boost private sector R&D spending?

Lord Browne of Madingley: Successive Governments have tried many things, and many of these initiatives, such as the British Business Bank and all these sorts of things, are in process at the moment. Some would say, "You shouldn't do anything else. Just wait and see how that all works". We are not sure we agree with that. I do not agree with that.

We also observe that we have quite a few start-ups under way and working. We are number three in unicorn generation in the world.¹ But when you actually look at them, most of them—almost three-quarters—are in fintech and e-commerce, which relies on having good mathematical

¹ Lord Browne of Madingley clarified after the session that the UK is fourth in the world, after being overtaken by India: <https://www.statista.com/chart/27266/unicorns-by-country-world-map/>

strengths. An awful lot of what we do is not associated with that. The question then is what we do.

We have looked at evidence, and we look at pairs of companies that are similar—start-ups here and in the US—and how they get funding and what they do with this funding. This work is still in process, but it is very clear that we do not provide the incentive for people to build a company here. If you do not have that scale-up incentive, you do not do the R&D and innovation as well as you could and, indeed, the fruits of it go elsewhere. We need to figure out how to get the activity pulled through. That is what we are focused on at the moment.

How do you do that? What incentives, in addition to tax credits, do you need? What markets are needed? The stock markets here are particular. They have been heavily influenced by defined benefit plans. They take a slightly different and lower-risk approach to activity than markets elsewhere. I come back to the key point of people. Understanding of where the government-to-business interaction takes place needs to be much more fully developed, ideally with people interchanging the whole time. We need to get rid of the barriers that stop that interchange taking place, as has been done elsewhere in the world.

Finally, we require rather specific tax considerations. Clearly, the tax considerations to get net zero off the ground are different from the tax considerations to get some different form of activity in bioinformatics off the ground. They are simply different and need to be tailored appropriately. We discuss all that with the Chancellor at CST. We have some action in place, but I feel that, over the next year, we will be able to see whether we are doing enough. I like to think that if we are not, we will do more. It is absolutely essential.

Of all the important things, I want to focus on getting the people right. We cannot have success in this area if the Government are of one nature and business and industry are of the other. They have to be integrated. That is the only way to get this done, because the vast majority of that 2.4% is from business and industry.

Lord Mitchell: Issues around the relationship between academia and industry have been going on for a long time. How do you see that going?

Lord Browne of Madingley: It is not really going very fast. We have a very limited number of fellowships. We are trying to generate schemes at the moment to add a few more in, but there are structural things such as pensions, promotions and who values what. We need to attack all these things. What limited work is going on at the moment will produce an example of what needs to be done, but we need to crack this.

Professor Dame Ottoline Leyser: I agree with that, and it maps back a little to the point I was making earlier about people. Interestingly, one of the reasons the academic community is always so anxious about that basic research funding, which is an absolutely critical part of the system, is partly that the incentive structures we have in universities are so narrowly focused now on a relatively small number of things—whether you have won a research grant and published papers in the right

journals. Those things are absolutely crushing to creativity and diversity, in my opinion.

We have to have a much broader incentive structure that values a much wider range of activities. Absolutely, those things are critical, but we also need to engage with diverse industrial sectors, with policymakers more generally and with society more broadly, so that we really take down some of these barriers. One of the worst things about the UK system and one of its greatest weaknesses is silos. We are very siloed in all kinds of ways. One of the enormous opportunities for UKRI is to take down those barriers, both between disciplines and sectors and, more generally, in society. I would like to see much greater career path diversity, for example, as a key element for that: when people move into and out of academia, how people move into and out of businesses and how we value the much wider range of skills and experiences that people have.

People who have left school at 16 and started a business in their bedroom who later decide they would like to do a PhD would be fantastic people to recruit into PhD programmes. At the moment, you fill out the form and it says, "Where did you get your undergraduate degree?" and all those kinds of things. Thinking hard about that diverse creative system that we need and ensuring that all the incentives we put in place and the things that we reward and value are really supporting that connected, diverse system are critical for this next phase in our development.

Q119 The Chair: Do you therefore think the REF needs radical restructuring, for example to pick up the extraordinarily positive collaboration we saw during Covid, which many universities would say the REF does not actually encourage?

Professor Dame Ottoline Leyser: Indeed, we have an ongoing review of the REF at the moment, and that is a key question. How can we ensure that the REF, and the way in which it is implemented by universities, supports that diversity of activity that we need and, critically, supports diversity with collaboration? Our system, at the moment, is very set up to drive competition against relatively narrow criteria with sharp elbows. That is partly what drives the silos. We need to think much more about whether we have the diversity across the university system with different universities with different specialisations and remits, for example. Are we rewarding all those things, so that we have diversity with the collaboration that you need to capture the benefits of those diversities?

One of the interesting models to look at is that the devolved nations have worked much harder on that than has been the case in England, for a whole variety of very good reasons. There are good examples of practices in Northern Ireland, Wales and Scotland that we can learn from more generally as to how you support diverse higher education institutions to engage deeply, both locally through the levelling-up agenda and nationally, to ensure that, across the whole nation, we have everything we need to deliver this knowledge-led economy and public service generator.

The Chair: We will look forward to seeing the outcome of that.

Q120 Baroness Manningham-Buller: Dame Ottoline, I would like to start by asking you a question. You have described to us how the funding of excellent science by UKRI is going. Looking at your list of priorities from the Government, I think you have 11—a substantial number, anyway—and you are being asked to do quite a lot of other things. A minute ago, you referred to breaking down barriers, but you are also being asked to level up and all these other things. How do you actually do that? You have quite a lot to do with the day job and you have a range of these other tasks to do across a whole range of government departments and beyond and in industry, as we have heard from Lord Browne. Do you have the capacity to do that?

Professor Dame Ottoline Leyser: That is a really key question because, at some level, it encapsulates what I think the opportunity is. As I have mentioned a few times, the opportunity is to ensure that every pound we spend delivers on multiple objectives. If we are funding a doctoral training centre in wind power in Newcastle, you are training and upskilling the workforce, supporting levelling up and supporting the net-zero ambition, for example.

To be able to deliver in that quite complex environment that you describe, what we need is budget flexibility so that we can do that, rather than having our budget chunked into multiple pots and being told to do net zero with this pot and levelling up with this pot. We need really high-quality analytics inside UKRI to allow us to understand the complexity of our investment portfolio, which will have that bottom-up, freely open response-mode activity as a key driver but also the opportunity to capture and steer that, and point that in particular directions through more targeted investments.

Do we have the capacity to do that now? At the moment, our data systems are in desperate need of upgrades. We are still working on legacy systems that need to be replaced. We are spending a lot of time creating that information resource, which is key to our investment strategy, and we need to be able to do that much more easily. It needs to be clear that it is a really tricky job we are doing, and the skills we need in UKRI are not about handle-cranking and processing grants. Those are really important, and we have to do them really well, efficiently and effectively, but we need those really high-quality analytical skills as well to be able to interface with government and our diverse communities to make sure we are able to deliver in that landscape.

Baroness Manningham-Buller: I did not quite understand whether you have enough budget flexibility now or whether it is something you are aspiring to.

Professor Dame Ottoline Leyser: One of the things that I sincerely hope for, and I think we are moving in the right direction in this spending review period, is far fewer ring-fences, which is absolutely fantastic; I would like to keep that direction going. I talked before about the national productivity investment fund, which was a key part of our budget in the first phase of our development. That was very ring-fenced.

The overall investment going into UKRI is being maintained. We have the ongoing investments from the programmes that we invested in under things such as the industrial strategy challenge fund, but over the period of the spending review those will wind down. The money is still in the system, so we have much more freedom about how we invest, and that is critical to delivering every pound doing multiple things. It is a key shift in how we think about investment in R&D that we should be able to do that. That needs to be the case right across government.

Baroness Manningham-Buller: The way you are answering answers the question about the balance, or the integration, between working across government and across industry and actually funding the science - you are not seeing a conflict in those two forms, where you have to do more of one than you would like at the expense of the other?

Professor Dame Ottoline Leyser: This is a really important issue with framing the whole problem or question. Typically, because our system is so predicated on competition with sharp elbows, we always tend to think about zero-sum games: "If I'm doing this I'm not doing that, and that's a problem". Instead, collectively as a community, we need to think much less about, "Is my slice of the pie the right size?" and more about how we can collectively grow the pie. That requires that much more collaborative ethos and a much wider understanding of the interdependencies of the different parts of the system. As I have stressed multiple times, there is a need to invest in the join-up between them and to really understand those dynamics rather than to chunk the whole thing into pots and do things independently.

Baroness Manningham-Buller: Thank you very much. Can I just ask you, Lord Browne, how you think this balance is working?

Lord Browne of Madingley: It needs improvement. With the new Cabinet committee, I am hopeful that the remit for many government departments will change so that they can all contribute to what we are doing here. I was quite struck with a paper that I recently received at CST from FCDO and DCMS, where the question was what to do with international collaboration in science and technology. The paper answered a brilliant question, which is what to do with government-to-government collaboration. That is important and necessary, but wholly insufficient.

At CST, we have had very good conversations on levelling up with Michael Gove, we have had very good conversations with the Secretary of State for Education, and we have had a continuous discussion with DCMS, of course, on the digital side. All these things have to be integrated in a way that integrates all these components. That is not just the responsibility of UKRI, or of CST as a ginger group.

Baroness Manningham-Buller: You have seen "joined-up government" for many years. Is it really now properly joined up?

Lord Browne of Madingley: It is too early to tell.

Q121 **Lord Holmes of Richmond:** Dame Ottoline and Lord Browne, good morning and thank you for your time today. We have heard concerns that

a frequently changing science and technology policy has negative consequences for research. How can the Government and institutions such as UKRI ensure that you are embedding policy for the long term, Dame Ottoline?

Professor Dame Ottoline Leyser: With the move to put research and innovation right at the heart of the UK economy and embed it deeply across government, now is the time to think about a really stable, long-term strategy for research and innovation that includes long-term, stable investment. In the context of the ability to balance that portfolio dynamically, which I have talked about, it is a real issue that not having stable direction of travel and stable long-term funding makes it, not impossible, but much harder to create the investment portfolio I have described. That would be excellent if we were able to embed a truly multi-partisan policy that Government after Government would commit to.

Lord Holmes of Richmond: What is the percentage chance of that happening?

Professor Dame Ottoline Leyser: I am someone who operates from a base of optimism. Otherwise, it is difficult to get out of bed in the morning. I really think that UKRI is an opportunity to foster that, because we are one body that accounts for in the region of half of public sector investment. We cover all the disciplines and sectors. If we can demonstrate the extraordinary power of that to deliver for the UK, I hope that would create the enthusiasm among voters for the opportunity that we have. That is another reason why breaking down the barriers between the research and innovation system and wider society is so important. This has to be a shared national endeavour to build the kind of economy, high-quality jobs and high-quality public services that everybody wants.

Lord Browne of Madingley: We do not lose the plot here. We have to remember that the purpose here is to build a great nation for the future, and one of the biggest planks of building that is our brains, science and technology, and how we apply it all. As long as we keep that in mind and go for excellence and something that is sustainable, the shifts of policy, yes, will be annoying and, no, cannot be avoided. This is an important area for local distribution, patronage and all the sorts of things that we have seen again and again, but we must not lose the plot here. If there is one thing that produces the future of this country, it is all these things, whether on the security, sustainability or health side or for the future of markets. We must not forget that.

The Chair: Dame Ottoline and Lord Browne, thank you both so much for talking to us today. Lord Browne, we wish you a very speedy recovery from Covid. As I said at the start, if there is additional evidence you would like to submit, we would be very pleased to receive it after this session. For now, we will close the session and say goodbye to you. We are very grateful for your inputs.