

# Science and Technology Committee

## Oral evidence: R&D statistics, HC 946

Wednesday 7 December 2022

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Members present: Greg Clark (Chair); Aaron Bell; Chris Clarkson; Tracey Crouch; Carol Monaghan.

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### Witnesses

**I:** Mike Keohan, Deputy National Statistician and Director General for Economic, Social and Environmental Statistics, Office for National Statistics; and Darren Morgan, Director of Economic Statistics Production and Analysis, Office for National Statistics.

**II:** Chris McDonald, Policy Chair for Innovation and Enterprise, Federation of Small Businesses; and Stian Westlake, Chief Executive, Royal Statistical Society.



## Examination of witnesses

Witnesses: Mike Keoghan and Darren Morgan.

**Q1 Chair:** The Science and Technology Committee is in session. This morning we are inquiring into two separate subjects. The first is the recent revision by the Office for National Statistics of estimates of research and development expenditure in the UK. Later this morning we will continue our inquiry into new nuclear power generation by considering some questions of the financing of new nuclear power investments.

We will start with official statistics. I am very pleased to welcome to the Committee our first two witnesses. They are Mike Keoghan, who is the deputy national statistician and director general for economic, social and environmental statistics at the Office for National Statistics; and Darren Morgan, who is the director of economic statistics production and analysis at the Office for National Statistics. Welcome. Thank you for coming today.

The reason for our discussions this morning is that one of the key measures in public policy in which this Committee and its predecessors have taken a very close interest is the level of research and development spending in the UK. For some years, the Government have had a commitment to reach 2.4% of national income invested in research and development, up from about 1.7% a few years ago. Yet just recently, in September, the Office for National Statistics revised upwards by an extraordinary amount the estimates of R&D that is thought to take place in the economy. For the purposes of illustration for those watching these proceedings, the estimate of R&D spend has gone up from £25 billion to around £40 billion in 2018, from £26 billion to £42 billion in 2019, and from £27 billion to £43 billion in 2020. These are massive changes. What are the reasons for this extraordinary change?

**Mike Keoghan:** It may be helpful if I give a bit of context. First, we welcome the opportunity to come and talk about what we have done and why we have done it. We completely recognise the public interest in this particular change. To help the Committee, we thought that it might be useful to begin by explaining why it has happened now. Darren will then pick up the methodological changes underpinning that.

This really begins in 2016, when Professor Sir Charles Bean, who was then the deputy governor of the Bank of England and a professor at LSE, was asked by the Government to review the output of the ONS's economic statistics. There had been concern from users, in government and outside, that some of the methods, data sources and approaches were a bit tired and out of date, and that we were failing to capture the reality of today's economy. Essentially, Bean found that there was some truth to that and recommended a series of investments that the Government should make in the ONS to transform the statistical landscape.



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The first wave of that, from around 2016 to 2019, focused predominantly on the really big outputs: GDP, prices and the labour market. Some quite important changes around measurement of intangibles and the digital economy were then incorporated into some of our main outputs. In 2019, when Ian Diamond was appointed national statistician, he wanted the focus, correctly, to move on to the structural economic statistics, things like R&D. Then the pandemic hit, and the office pivoted to covid response and the covid infection survey. In its economic stats, it focused on real-time indicators, to help the Government manage the pandemic response.

At the turn of this year, two things happened. First, the pandemic abated and we had more capability within the office to revert to the Bean reform programme. Sir Ian was very keen that we refocused on research and development. At the same time, in the spending review the Treasury authorised further investment in economic statistics modernisation. At the turn of this year, that left us with renewed resourcing for and focus on the core economic stats. The first one we looked at was research and development. That is why it happened this year. It was always planned that we would do it. It is just that other things happened to get in the way.

We published our first bulletin saying that we were going to do some changes in March this year. That set out the direction of travel, what we hoped to achieve and the review of the existing sources and methods. Darren, do you want to pick up the story?

**Q2 Chair:** What is the reason for the change statistically? I understand some aspects of the timing.

**Darren Morgan:** To go back to the reason why we made the change, when we looked at the challenges to the measurement of R&D, one of the things people were talking about was the difference between our estimates of R&D and HMRC's R&D tax credits. That is where we began. We did a microdata analysis between the two datasets. We saw that the coherence between the big companies was pretty good. They were telling us the same things, but when we saw the HMRC tax credit data, it was very starkly apparent that far more small and medium-sized businesses were doing R&D than our survey indicated.

We said, "Okay. Let's have a look at this a bit more." We then looked at how we sample into our survey. You may know that we have a large business register. Everybody who is registered for VAT or PAYE is on our business register. We use that to sample for all of our business surveys. That makes sense for nearly all surveys, because if you are a business you will have sales. If you want to measure economic growth and are collecting product data or labour market data, they have that.

To minimise the burden on businesses, to reduce costs and to make sure that we collected the right data, we used to take a slightly different approach to R&D, because not everybody does R&D. We could sample 5,000 businesses, send the forms out and have five businesses tell us



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that they do R&D, so we do not sample from the business register. Instead, we use our other economic surveys. When businesses complete their balance sheet information, we say, "Do you do R&D?" If they say yes, we say, "Great. Come into the R&D survey." That creates our R&D population and means that, basically, they are selected for the R&D survey.

That works really well for the big businesses, because they are automatically selected for our other surveys as well. When we looked at it, we found that it did not work so well for the small and medium-sized businesses, because we might never pick up a small and medium-sized business that was doing R&D if it was not selected for another survey, and there was quite a small chance of its being selected for another survey. The approach through our sampling meant that we were not capturing sufficient small and medium-sized businesses in our sample population.

- Q3 **Chair:** How many businesses were in the sample for this R&D survey?  
**Darren Morgan:** It sounds quite big. There were about 5,500 businesses in our R&D sample.
- Q4 **Chair:** That is 4,000 in GB and 1,500 in Northern Ireland.  
**Darren Morgan:** Exactly.
- Q5 **Chair:** Four thousand in Great Britain.  
**Darren Morgan:** Yes.
- Q6 **Chair:** That is 4,000 businesses, out of about 2.5 million or 3 million businesses in total.  
**Darren Morgan:** Exactly.
- Q7 **Chair:** Given that one could expect that small businesses will be a bit lumpier in terms of whether they engage in it, or not at all, doesn't that strike you as an extraordinarily small sample to generate such a very important statistic, on which billions of pounds of public expenditure are based?  
**Darren Morgan:** We can do estimation approaches. I will come on to the improvement that we made. We want to balance minimising burden on businesses and making sure that we get correct estimates. A sample size of around 5,000 businesses to produce an estimate for the UK, if your sample is—
- Q8 **Chair:** Before we get into that, you say 5,000, but it is 4,000 for Great Britain and 1,500 for Northern Ireland. Given how small Northern Ireland is, that is a huge over-representation of Northern Ireland. It may be an appropriate representation, but to put it the other way, it is a huge under-representation of Great Britain. In my view, it is not right to elide Northern Ireland and GB. There is a very different sampling approach taken there, is there not?



**Darren Morgan:** Yes, there is. You are right that 4,000 is a small sample. When we looked at this and at what other countries did, it was clear that, although the sample size may have been appropriate previously and historically, when not so much R&D was being done by small and medium-sized businesses, it is too small now. That is why we made the improvements that we made this year.

Q9 **Chair:** Do we know whether it was ever appropriate to sample 4,000 businesses out of the nearly 3 million in the country?

**Darren Morgan:** If you go back and compare our data against the R&D tax credit data for HMRC, there are good reasons why they are different. There are good reasons for the different coverage and reasons why businesses might claim different tax credits and so on. When the differences between the two surveys grew from about 2015, that was the first warning sign that the sample size might not be quite big enough.

**Mike Keoghan:** Methodologically, it was a late 1980s and 1990s structure, so it reflects a British economy that has R&D being done largely in industrial labs by BT, GEC and ICI. That is the economy the survey was designed for. It replicated forms for too long. That is why, when the team came to look at it at the turn of the year, it became clear that it was untenable.

**Chair:** I understand that. It is clear that it needed to be looked at. Looking back, what seems astonishing, especially with the weight being placed on these figures, is that before Charles Bean looked into it, it was not thought that the rigour of the assessment should be questioned. Aaron Bell has a question on this. I will then go to Carol Monaghan.

Q10 **Aaron Bell:** Obviously, there are lots of different sorts of R&D. Are we picking up a different type of R&D from these smaller firms? Is it surveying their customers? Is it software development? Mr Keoghan, you spoke about how things used to be. Is it a different kind of R&D that we were missing?

**Darren Morgan:** The big picture was that the R&D that we were missing was from small and medium-sized businesses. If you look at the results we had previously and the results we have now, the biggest uplift between the two and the revision are for the small and medium-sized businesses.

You are quite right, actually. If you look at the breakdown by product and the type of R&D that they do, it is largely in services. That makes sense, as the economy has moved to a more services-oriented economy. You are absolutely right again that, within services, the areas that had the biggest changes were in software development, computer programming and so on. The areas that we are now capturing better are small and medium-sized businesses and within that, services, and within that, software development and computer programming.

Q11 **Aaron Bell:** Would customer surveys and things like that be covered as



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part of research? It has been suggested that the increasing generosity of the tax credit scheme is encouraging businesses to define more things as R&D. Is that a problem, potentially?

**Darren Morgan:** That did not come out specifically in the product group, but we could be capturing that in the returns, in some of the breakdowns.

There is another thing we are working very hard on. R&D is really complicated. It is not like asking someone what their sales are or what number of employees they have. Working with partners such as the British Academy and others, we are trying to make sure that the guidance on our questionnaires helps businesses as much as it can, to make sure that they know what to include within the R&D. When we go out next year, we may see further coverage of the topic you have just talked about.

Q12 **Carol Monaghan:** I was going to ask similar questions to Aaron, so I will just follow on. You said that next year you may get a better idea. Does that mean that this year you are not entirely confident that everything has been captured?

**Darren Morgan:** I will move on to the improvements that we have made. Based on the work that we had done and the challenge with the sample sizes that Greg quite rightly mentioned, we said, "We can't go back in time and collect data from other businesses, can we? What we can do is look at what we can do this year, with the data we do have."

What we did was treat R&D like we do our other business services. Even when businesses were selected for our R&D survey, they only represented themselves. The population was around 40,000. We selected 4,000, but they just represented themselves. As Greg said, there are nearly 3 million businesses in the country. What we do in our other surveys is let those businesses represent other businesses and use them to estimate. That is what we did for R&D this year. We said, "Look, we've got the data. Let these represent businesses with similar characteristics, within the same industry and with a similar size of employment. Let's uplift." That is what we did this year.

We were very lucky. Although that was done retrospectively, to check whether the new results were credible, we could triangulate with the HMRC data at a detailed level. We have looked at that, and they seemed credible in that sense. We think that the estimates that we have produced this year are good, that they are reliable and much better, but of course we have plans to improve them further. I can talk to you a little about the plans that we have, if you want.

**Carol Monaghan:** Some of my other colleagues may come on to that.

**Darren Morgan:** Okay. From the work that we have done to make this improvement and from triangulating with other data sources, we have confidence that this is a much better estimate.



- Q13 **Carol Monaghan:** You are happier with the situation that has been developed. Is there any attempt to capture the type of R&D that is going on? It is all very well to tick a box and say, "Yes, we're doing it. Here's our expenditure."
- Darren Morgan:** Exactly that. In our R&D survey, we break it down by what we call product group. I talked a bit to Aaron about different types of R&D. We also break it down by region, so we can tell where that R&D is taking place.
- Mike Keoghan:** It is also the case that with the changes for next year, we have the opportunity for the first time in a generation to change the questions and ask better, more detailed, more relevant questions around type of R&D.
- Q14 **Carol Monaghan:** I think that people would like that granular detail, rather than just, "There is R&D taking place." That would be good.
- Mike, you have explained a bit about why it has taken so long to get a comparison of the business expenditure and the tax credit statistics. How long has the ONS been aware that there are discrepancies between those two sets of figures?
- Mike Keoghan:** It is at least five or six years. Every country that has an R&D survey and a tax credit system has a discrepancy. You would not necessarily expect them to be the same because they are doing different things. Some discrepancy is inevitable. What began to generate concerns, both in the ONS and in Departments that care about R&D, was when they started to diverge quite substantially, around the middle of the last decade.
- Q15 **Carol Monaghan:** We are talking 2015.
- Mike Keoghan:** It was 2015 or 2016.
- Q16 **Carol Monaghan:** Okay. Then it went on to the ONS's work plan, which was hit by covid.
- Mike Keoghan:** Yes.
- Q17 **Carol Monaghan:** Covid was five years—
- Mike Keoghan:** It was within the work plan. The Bean review simply set out that the ONS needed to overhaul its statistics, and unlocked resources to enable that to happen. In the prioritisation of that work plan, areas such as GDP, the labour market and inflation were prioritised over R&D.
- Q18 **Carol Monaghan:** There were five years when the ONS was aware of this massive discrepancy before covid hit.
- Mike Keoghan:** Probably three.
- Q19 **Carol Monaghan:** You said 2015. Covid was in 2020.



**Mike Keoghan:** It was in roughly 2015. It was due to be processed in 2019.

Q20 **Tracey Crouch:** You have updated the BERD figures for 2018, 2019, 2020 and 2021. Are you going to update the figures any earlier than that? You are nodding. That's great. When can we see them?

**Darren Morgan:** The reason I nodded is that a lot of users, quite rightly, have said how important a continuous time series is going back. What we have done so far is take the UK figures back to 2014. We have taken them back that far at a high level. In our most recent release, we took the more detailed breakdowns back to 2018, but we know that we need to do more. We plan to do that as part of our phase 2 development next year.

When we collect information in real time, it allows us to take the data back even further with more confidence. We are talking to colleagues at the Bank of England and other partners to see whether we can do something in between a bit more quickly—something that is a bit less robust but that, nevertheless, will be helpful to our users. Watch this space. We will definitely do it next year. We will definitely do it properly when we publish next November, but we hope to do something in advance of that, with help from our partners.

Q21 **Tracey Crouch:** That is really helpful. In response to Carol, you alluded to plans for the future. Do you want to outline some of those plans, particularly around the methodologies used to calculate R&D stats more generally?

**Darren Morgan:** We will be doing a root and branch transformation next year. It is from the start. If you look at our statistical value chain, we will start in the sampling. We have talked a little about the sample size and how we sample. We will completely improve our sample design. We will look at the sample size to see what size gives us reliable results.

With Aaron, we talked a bit about the questionnaire and making it as easy as possible for businesses to know what to include so that it is easier for them to complete. As I said, we are working with partners—the British Academy and so on—to get the guidance to businesses in the right way. We are talking to businesses as well to see what would be helpful to them. We are moving our survey online, so hopefully the user experience will be better, which will encourage them to complete it.

We will have much better sample design and much better questionnaire design. We then look to have better estimation. We are looking to minimise the burden on the businesses that we select and, at the same time, to make sure that we estimate the population in the best possible way. In parallel, we are working with international partners in other countries, looking at what they do and what we do to see whether there are any other improvements that we can make, alongside the ones I have just mentioned.



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I think Mike talked about it. We hope that this is a once in a generation opportunity to improve the measurement of R&D. We hope that next year will deliver that.

Q22 **Tracey Crouch:** Is that your whole timeframe? Is it at some point in the next year?

**Darren Morgan:** Yes, between now and November 2023.

Q23 **Chair:** You have changes to come, but you have already made some pretty huge changes. As we have seen, you have completely transformed our understanding of R&D in the economy. Did you consult the statistics community before making these changes?

**Mike Keoghan:** Yes. In March, we published our article setting out that we would be looking at the R&D stats. That began a user engagement process that ran to the summer of 2022. We published a series of articles and blogs on the ONS website. We had a series of user group meetings with Government, R&D users, the Government Office for Science, and R&D expert groups. The team's own estimate is that they were talking to stakeholders and users, both Government and academic, pretty much every other week from March through to publication. There was quite an extensive process.

What we learned subsequent to publication was that the user group community is even bigger than we anticipated. That has been really good, because it means that as part of round 2 we are able to consult a much wider user base. Even yesterday, we were outlining some of our plans and what we have done to a webinar of around 80 users, many of whom had not previously been part of our world. It has been a great opportunity to work out where our user base is and not to be completely narrow to traditional user bases. We recognise the importance of the consultation and being out there.

Q24 **Chair:** Given how big these changes were, did you consult specifically on the changes that you announced and say, "This is what we are thinking of announcing"? Did you consult users or, indeed, experts in the external statistical community?

**Darren Morgan:** We certainly did. There is a real challenge over the statistical code of practice as regards pre-releasing the numbers. We consulted some users, and some users knew the size of the changes.

Q25 **Chair:** Which users, for example?

**Darren Morgan:** The Treasury, the Bank of England, BEIS and GO-Science. They knew about it.

Q26 **Chair:** Those are internal to Government. Obviously, the Bank of England is independent, but you know what I mean.

**Darren Morgan:** The reason why we could share the outcomes with them was that that was part of the quality assurance process. We could



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share the numbers with them for that reason. We are allowed to do that under the code of practice, to make sure that we get proper peer review of those numbers.

Q27 **Chair:** Why couldn't you share the proposed change in methodology, even if it was not populated with the actual numbers?

**Darren Morgan:** We did that. We absolutely shared the improved methodology and the approach that we were taking in a series of—

Q28 **Chair:** When was the specific proposed methodology shared?

**Darren Morgan:** In early September. I think that was the first time. I can have a quick look.

Q29 **Chair:** In early September. They were announced in mid-September, were they not?

**Darren Morgan:** Yes. The blog was on 21 September. We announced it in September.

**Mike Keoghan:** There were also engagements about the problems that we had identified. There was peer review with some of the ONS fellows well in advance of that.

Q30 **Chair:** You announced the new changes on 21 September. When did you share the proposed methodology with the statistical community for comment?

**Darren Morgan:** Mike spoke earlier about the user engagement. We shared the user engagement back in March. We said, "We were doing this. This is—"

Q31 **Chair:** No. I am talking about the specific proposed methodology. When, if at all, did you share that with the community beyond those public sector—if I can put it that way—partners?

**Darren Morgan:** We would have been talking about what we were thinking of in meetings and forums all through the summer. We did that publicly, to the wider audience, on 21 September, as I said, and again in detail on 29 September.

Q32 **Chair:** On 21 September, they became live. They are now our official R&D figures.

**Darren Morgan:** No. Our official publication was in November. This is an important point, Chair. What we tried to do at the end of September is exactly what you are alluding to—to warm people up. We said, "Look, our official release is in November. We've been looking at all this improved methodology over the summer. We've been talking to you about it. This is what we have concluded. If we had used this methodology for our previous estimates, these would have been the results." Two months later, we published our estimates.



Q33 **Chair:** It was to warm people up to what you were doing, rather than to consult them on whether it was the right thing to do.

**Darren Morgan:** No. In that article, we sought comments as well. We said, "This is where we are. Please let us know what you think."

**Mike Keoghan:** There had been peer review in the summer, in July/August.

Q34 **Chair:** This Committee is a huge fan of the ONS. You have been incredibly important to everything from the pandemic to other aspects of our work. Given what an important institution the ONS is, it seems a little opaque, paradoxically, for an institution that is there to bring clarity and transparency that this came as a surprise to the statistics community. We know that from the reaction.

**Mike Keoghan:** That is a really fair point, if I reflect on what we could have done better. We did a lot of engagement and consultation. What we failed to convey, and where we were probably a bit coy, was the likely size of the change. There are lessons learned for us on that. We had talked about its being a significant and substantial change. We thought that meant something, but clearly it did not resonate. We have to reflect on that, not just for R&D, but as we do reform of economic stats across the board.

Q35 **Chair:** In fact, I want to come on to some aspects of that. That is very clear.

**Mike Keoghan:** It is an important lesson for us.

Q36 **Aaron Bell:** Thank you both for coming in, by the way. This Committee has been going around the United Kingdom for the last year and a half conducting an inquiry into the role of R&D in recovery from covid. We have spoken to lots of academics and businesses and have been gently berating them, bluntly, about the failure to get up to 2.4%. Have we been operating under completely false pretences this whole time?

**Mike Keoghan:** The estimate we produced was our best estimate from the information we had been given. We have produced a better estimate. What this has highlighted is that, from the changes, the economy appears to be technologically richer. That raises quite a lot of interesting policy questions, which we are not able to talk to, about the role of R&D in productivity performance and what that now means. If the R&D performance is as it is, that raises some questions, which we have explored a little with GO-Science, around what that means for how technology diffuses, and businesses adopt it and for management practices. Again, that raises some quite important policy questions. All I can say is that that was our best estimate. We have improved the method, and this is the number we now have.

Q37 **Aaron Bell:** I accept that there is value in being consistent and that, if you have to make a change, you have to make a change. It strikes me



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that not only this Committee, but the Government, have been working on the assumption that we were a long way behind a number of our closest international comparators and, indeed, competitors. You mentioned productivity, Mr Keoghan. What are the implications of what we have done to the BERD figures for national accounts and for productivity, in particular?

**Mike Keoghan:** I shall ask Darren to answer that.

**Aaron Bell:** Okay. Mr Morgan?

**Darren Morgan:** We will be taking the numbers into our national accounts next year, so it remains to be seen exactly what it means for productivity. Obviously, there are lots of moving parts, but if you look at the pure numbers for where we are, productivity is probably slightly worse than we previously thought, based on these numbers. We need to work them through next year. I think there will be a lot of attention when we do that in terms of what it shows, purely number-wise.

**Mike Keoghan:** In terms of what it means on GDP and how it ticks through, we will take it through next year's Blue Book into the national accounts. We won't make any particular comment around what it means there, but I appreciate that there is a hunger for understanding around that. We would probably point you to some work that Josh Martin at the Bank of England has done to try to take it through and work out what the impact is for the targets and for GDP. It is a very plausible methodology, so in the interim we would probably point statistical users to the work that Josh has done.

Q38 **Aaron Bell:** Of course, R&D is not just for its own sake. From the Government's perspective, it is about productivity. We have consistently had issues with the so-called productivity puzzle as well. Do you think that there are likely to be any further statistical changes that might offset the headline reduction in productivity that you might expect to see from a higher R&D number? Are you looking at productivity more widely in the context of the Bean review?

**Darren Morgan:** There are developments on the productivity level, on GDP and on the labour market. It is an interesting time, isn't it? All the different dimensions of productivity are being looked at in terms of improving the methods. If you are asking me whether there are other factors that could impact on productivity over the next year: absolutely. Do I know what those impacts will be yet? I don't, but we will make sure that people will be sighted on them as they evolve.

Q39 **Aaron Bell:** Returning to my first question, about our international comparisons, obviously these measures have brought us more into line with a number of competitors, but there is still the league table with Singapore at the top, and South Korea, and all the rest of it. Do you think that the numbers we keep looking at in these league tables are now broadly comparable between all countries, or are there some countries whose methodologies are sufficiently different from ours that they



deserve an asterisk in the tables?

**Darren Morgan:** We have been working really hard with the OECD to try to understand what other countries do. That has helped to inform our development programmes as well. The key things that, I think, other countries do—it is quite consistent—compared with what we did, are that they used a business register to sample from, and perhaps other administrative sources as well. Their sample sizes are much bigger, going back to your first question, than the UK's. In Italy, it is nearly 40,000; Spain is over 30,000 and Germany is nearly 20,000. Across Europe and across the world, countries have different sample sizes, but it looks as if broadly the changes that we have made this year, and the changes that we have planned, bring the UK into line with what other countries are doing; but we are continuing to get into more precision.

**Mike Keoghan:** We were much more of an outlier with the old method.

Q40 **Aaron Bell:** Are there any outliers on the other side? We see some countries up at 4% plus, and so on. Is that a genuine reflection, as best we can tell?

**Darren Morgan:** It would not be right for me to comment. I don't know, but if you look at the broad methods that they use, that we have been able to glean from other countries, they look broadly comparable; but, as I said, we continue to work with the OECD to get into more detail.

**Mike Keoghan:** They are all running off the Frascati definitions that the OECD produces, and they all seem to be using business register-based survey methods, supplemented to varying degrees by tax credit arrangements, where they have them. Our current position today is that we are much more in line with the average methodology across the OECD than we were before September.

Q41 **Chair:** Thank you very much. There are just a couple of final questions. On those international comparisons, one of the things that this Committee was advised during covid was that it was quite difficult to make international comparisons of the performance during covid—deaths, and suchlike. To what extent is that true in R&D? Are the league tables meaningful in your view as statisticians?

**Darren Morgan:** The Frascati international standards for R&D are given for every country to follow, but if you look at the detail within those guidelines there is quite a lot of flexibility.

Q42 **Chair:** It is broad, isn't it?

**Darren Morgan:** Yes, it is quite broad. Previously in the UK, our approach was that we could do that in line with Frascati. It was not wrong, but, as we have talked about, it was not optimal either. That is one thing to bear in mind. Yes, there are international standards, but there is lots of flexibility within those standards for countries to adopt and align to in the measurement of R&D. From the work that we have done, as I said, it looks as if countries take broadly the same approach about



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that. I do not think that I would say definitively that they are one way or the other, but it appears that the share of R&D to GDP is a reasonable league table to look at. Absolutely.

Q43 **Chair:** In ranking, if not in precise figures.

**Mike Keoghan:** Probably with ranking, like any international comparison of productivity, it is worth thinking about not over-interpreting too small movements in the league table. If you are moving from 7 to 8 there is probably not that big a deal going on; but there will be real economic differences between those at the top and those at the bottom, and within the middle groupings.

Q44 **Chair:** In the interaction or interface between the ONS and public policy development, you have obviously been worried about this since about 2015 or 2016, and since then you have heard multiple policymakers—myself included, during my period as Business Secretary—saying that we must increase R&D and that it is unconscionable that we can be at 1.7% of GDP compared with 2.4% as the OECD average. When Boris Johnson’s Government came in, much the same analysis drove a huge increase in R&D, from £9 billion to £22 billion a year of public investment. Given the worries that you had, did you have butterflies in your stomach, thinking, “They’re making these statements, and we think the statistics on which they’re based may not be reliable”?

**Mike Keoghan:** Maybe I could answer that as a former user, rather than as a producer.

Q45 **Chair:** For those who don’t know, you were a senior official in the Business Department.

**Mike Keoghan:** Yes. As a user I think there was an understanding that this was a tired survey. I think we always took comfort that it was consistent with other evidence. If I think about the R&D policymaking process in BEIS, we had the BERD survey, but we had other surveys. We had the innovation surveys of business; the microdata that was analysed; and other forms of evidence that collectively said innovation was important for productivity and we could be better at it.

Q46 **Chair:** Perhaps this is difficult because you were in the Business Department at the time, but in the ONS—this has wider application—if you are worried about the robustness of statistics on which sizeable public policy commitments are being made, should the ONS regard itself as having a responsibility to communicate those concerns?

**Darren Morgan:** I think in 2016 the Bean review said that. It set out at that time, which was a watershed moment in recent times, that these are the areas we should be looking to improve, and that could be done better. I think they were signalled at that point, to help users and policymakers: “These are things that you need to be considering when considering policy and thinking about things, and these are the things that ONS should look to improve in the near future.”



**Mike Keoghan:** Perhaps I could draw attention to the most recent publication. We think there is a lot of uncertainty around the sectoral and regional estimates, so we have done two things there. We have been clear in our own communication that users need to be quite careful on them. Secondly, we approached the Office for Statistics Regulation to ask it to de-designate that particular part of the publication from its national statistics status. We hear what you say on this, and we are determined to make sure that we help our customers understand better what we are doing.

Q47 **Chair:** Finally, we have been talking about the R&D statistics, but that has thrown up questions. When you look back, it seems quite strange that for so long we relied on such a small sample size, for example. The Bean review shone a light on that, but is there enough self-reflection in the ONS? You have a very important job in collecting the figures, and I understand that the mechanics of getting them is a big responsibility, but is there enough of a culture or a process to question whether the statistics that you collect and publish are good enough?

**Mike Keoghan:** Yes. Sir Ian Diamond takes this really seriously. He will be giving a speech on quality early in the new year. It is a big focus at the office to try go through a—

Q48 **Chair:** Which are the other ones that you are worried about?

**Mike Keoghan:** To provide some assurance we have gone through the current business statistical estate looking for things. There are, broadly speaking, four flags on R&D that individually looked plausible, but when you add them up there is a problem. There is the outcome figure. The UK was way off the international standards—plausible, but it was. There was a big gap on the admin data, and if you put those two together, there is clearly an issue on the outcome. There were differences of methodology internationally and there were differences of methodology within the ONS. Nothing else we have has those characteristics.

Q49 **Chair:** You do not think that for any other national statistics there is going to be as substantial a reboot as you have seen in R&D.

**Mike Keoghan:** There is nothing that has those characteristics, so that would give us some confidence. Is there something lurking in the bowels of some spreadsheet somewhere that gets reformed? To some extent, we have to recognise that as we go through the reform process our statistics are going to change. We have to approach that in a way that is scientifically rigorous. What that means for the way the ONS approaches it is to acknowledge that it may happen, but to be rigorous in our curiosity around the statistics we have; to be completely open-book with our users about what we are doing, to involve peer review, and to be fully consultative with the people we work with, so that when we do the next one people understand where we are coming from. That is the only way we are going to maintain trust in our stats.



**Chair:** Absolutely. Thank you very much for your evidence today, on matters where all the Committee wants the ONS to continue to succeed. Sometimes that involves asking some difficult questions so that its practice can be constantly updated and kept current. Thank you very much indeed for that.

## Examination of witnesses

Witnesses: Chris McDonald and Stian Westlake.

Q50 **Chair:** Our next pair of witnesses are Stian Westlake, the chief executive of the Royal Statistical Society, and Chris McDonald, the policy chair for innovation and enterprise at the Federation of Small Businesses.

Thank you very much indeed for joining us. You heard the evidence from the previous panel. Perhaps I could start with Stian Westlake. As the chief executive of the body that represents the statistical community, what is your assessment of what you have heard and what this incident has put under the spotlight?

**Stian Westlake:** This was a very tricky statistical situation for three reasons. First of all, the size of the change. It was a very big revision, as we have identified. Secondly, the way the change interacted with the Government's 2.4% target was particularly unfortunate. It was incredibly bad luck that the change happened to bring it up to the target. The third reason was the timing. As you recall, it was at a time when we were expecting a fiscal event very soon. There was feverish speculation about whether the Government might consider cutting public subventions to R&D. Certainly those of us in the science policy community were very worried that this would be used as a pretext to do that.

Obviously, that has not come to pass. In some senses everyone has dodged the bullet. The end outcome is fine, but I think it was a particularly tricky situation for ONS to be in. Nevertheless, I concur with what the ONS was saying. It would have been better had the consultation been clearer and had people in the science policy community been more aware of the size of the change, and that we were able to understand it and talk about it. That would have meant that nerves in that September to November period, which were very frayed, would have been a bit calmer and we would have been able to have a more sensible discussion.

Q51 **Chair:** They should have published their intention for consultation during the summer, before the autumn, or they should have published for consultation in the autumn for adoption, say, in the spring.

**Stian Westlake:** They faced a dilemma. One of the things that I often lobby the ONS on, with my Royal Statistical Society hat on, is the importance of avoiding pre-release access. Obviously, what we do not want is a situation where the ONS, effectively, selectively gives economically sensitive data to people. We know that causes all sorts of problems in terms of insider trading and so forth. On the whole, it is good to keep these things internal until they are published.



This is a particularly hard case because of when it happened and because it was such a policy-sensitive number. It is a very hard thing to do. The challenge was that they should have published, but privately briefed the numbers earlier. That would be a bad precedent to set for most ONS statistics, but had it worked this time it probably would have made things easier.

**Q52 Chair:** You are well connected in the world of those who use these statistics. You have written extensively on R&D and science policy. Do you think that there is currently any talk, any suggestion, perhaps in the Treasury, that since we may have achieved our targets, we can row back on some of this?

**Stian Westlake:** Less than I had feared. When the numbers first came out, I was speaking quite a lot to BEIS about whether this was being brought up in their negotiations with the Treasury. The BEIS SPADs at the time said, no, that was not happening, which was really reassuring to me. That was the first thing I was worried about.

Obviously, the Treasury, rightly, will always demand value for money. They always question a situation like this, if it arises. One thing that is worth being clear about, though, is that right from the time of the "Industrial Strategy" White Paper that you published, through to the Johnson Government's claims and subsequent claims, it has always been clear that the Government's goal is not just to reach the OECD average—not to reach 2.4% and now 2.5% of GDP on R&D—but to do better than that. The actual target in the White Paper that you set out was 3%. The aspiration in the White Paper was to be in the top quartile of OECD countries, which requires a lot more than the 2.4% or 2.5% we are on.

There is consistent messaging, both from the Government and, to their credit, the Opposition, that, actually, we should be doing much better. The fact that the stats may have shown we got to 2.4% does not mean we should quit now.

**Q53 Aaron Bell:** Mr McDonald, you are here representing the Federation of Small Businesses. Do you think that the figures, as they are now, better reflect the amount of R&D that small businesses are doing in this country?

**Chris McDonald:** First of all, I apologise for my voice; I am recovering from a cold. It is perhaps worth pointing out that I represent the Federation of Small Businesses but, like all policy leads in the FSB, I am a lay member. My regular job is running a small business. I run a research institute based in Teesside that develops new technology, primarily for the steel and metal sector. That is what I do day to day.

With FSB colleagues, particularly those involved in the innovation field, we were unsurprised and relieved, I would say, by the revision of the ONS data. We too had found puzzling the difference between the ONS and the HMRC data. That was something we discussed over the summer.



It did not tally with our anecdotal understanding of the sector. As a scientist and an engineer, it is never good to be in a position where I feel that the hard data does not tally with what we sense by anecdote.

Yes, we think that the statistics are in a much better place in not correlating. When you look at international comparisons between tax data and survey data, certainly our gap was the wrong way round. We look more in line internationally as well. It is interesting to think why we have ended up in this position. The ONS have been using a methodology that they have deployed since the 1980s and, for much of that time, with reasonable success. Ultimately, it relied on an implicit understanding that there was a correlation between business size and innovation intensity, or innovation capability. Maybe that held true in the 1980s, but it is not the case now.

There is something that we need to address in our assumptions as well, which I think came through in the autumn statement in the changes that were proposed around R&D tax credits. I sense that in HMRC there is an assumption that innovation is something that is done in big businesses when, in reality, it is also done very much in small businesses. In fact, in the life sciences sector we have seen a big shift over many years in the business model, allowing innovation to flourish in small businesses and to promote entrepreneurial activity in that way. In fact, in the Federation of Small Businesses our members report to us that entrepreneurs' business plans are very much assisted by R&D tax credits, and that if the R&D tax credits were not there, some businesses would not go ahead. They simply would not start.

**Q54 Aaron Bell:** Do you also recognise the sectoral issues? I don't know if you were listening to that section with Mr Morgan; I am not sure when you arrived. Your company and the life science companies are classic relatively R&D-intensive industries. It seems that some businesses were doing things that were R&D and were not being captured. Do you recognise that with your FSB hat on?

**Chris McDonald:** Yes. There are small businesses that are doing R&D and they are not captured either by the survey or by the HMRC data. ONS said themselves—I think in the blog that was referred to earlier—that there are a number of R&D-intensive small businesses that they had spotted in the HMRC data that have never been subject to the ONS survey. I think that was one of the triggers that caused ONS to look at this in more detail.

It is also the case that there are a number of small businesses that do not engage with the R&D tax credits either. When we talk to small businesses about that, some businesses are concerned about their relationship with HMRC. They see HMRC as quite a scary organisation and maybe they do not want to engage with it. Some businesses simply do not know about it. Some businesses find the R&D tax credit system complex, and they are unwilling or unable to engage with a third party on it. There are issues about accessibility to R&D tax credits, just as there



have been issues around picking up R&D-intensive small businesses in the ONS data.

**Q55 Aaron Bell:** As we said towards the end of the first session, one of the implications of the revisions that the ONS have made is that, actually, our productivity problem looks even worse. Commentators have long pointed to small businesses as the long tail of companies that are not particularly productive, growth oriented or doing much research as part of the productivity puzzle. Do you think that is a fair criticism in general? Do you recognise that these figures add some more validity to that criticism?

**Chris McDonald:** I do not know if you are referring to it, but Andy Haldane did a very good piece of work around that. He showed that within place and by sector there was that quite long tail. It is one of the things we looked at from a Federation of Small Businesses' perspective. There was some discussion towards the end of the evidence session about the Frascati definition of R&D. You were asking, Chair, about how comparable we are with other countries. I think you heard that there is some room for manoeuvre.

In fact, the UK's definition of R&D for access to the R&D tax credit scheme is somewhat tighter than in many other OECD countries. Quite particularly, new-to-firm innovation, as we have styled it in the Federation of Small Businesses, is not included in that. We need to give some consideration to why we have such policies at all. Surely, their purpose is to promote economic and productivity growth, yet we are excluding the most important thing that a business can do immediately, which is to do some new-to-firm innovation to increase its productivity and its innovation capability. We have perhaps more of a focus on what might be termed "good science" than innovation that creates economic benefit.

I and the Federation of Small Businesses have long argued—we published a report on it, "Spotlight on Innovation," a couple of years ago—that it would be helpful to widen the definition so that it comes into line with OECD standards to include new-to-firm innovation as well. That is one thing that we can do that will really help to pick up that long tail.

**Q56 Aaron Bell:** Mr Westlake, you have said that the jury is still out on what the reported rise in figures represents. Particularly among small businesses, what is your view about the way they are using tax credits? Are the tax credits capturing genuine R&D? Are businesses that are doing genuine R&D not doing tax credits? What is your overall take, particularly with regard to this long tail in the small business world?

**Stian Westlake:** HMRC says that about 7% of tax credits are basically from fraud and error. The question is whether that is an underestimate, particularly when we are dealing with smaller businesses, because we know that there are very aggressively marketed schemes.



It is interesting to look at other countries and their use of tax credits. France is probably the main OECD country that uses tax credits on the same level as the UK, with about 0.3% of GDP going on them. In places like the US and Korea, very innovative countries, they spend about a third more than we do, relative to the size of the economy, on tax credits. Places like Germany and Israel spend nothing on them. They do not have an R&D tax credit scheme at all. It is definitely not a necessary component of a successful, innovative country.

Clearly, however, it is popular and a way of accessing, as we have seen, businesses that are not interacting with, say, Innovate UK or the grant-making bodies. It is a valuable initiative. The point that Chris makes about creating clear definitions is important as well. The one thing that we saw happen about 15 years ago in the life sciences industry, which is very good at this kind of organisation, is that they set out lots of guidance, working with HMRC, to say, "This is what it looks like to do R&D in biotech in the life sciences industry." That made it a lot easier for firms to work out what to claim. A lot of them, as Chris says, are quite small and cannot employ lots of professionals to advise them. That level of more specificity and saying, "Well, this is what R&D really looks like," might help more firms to take advantage of the credits that they are entitled to. That would be very helpful.

**Q57** **Aaron Bell:** Thank you. Going to the overall productivity puzzle problem and the implication that we are even less productive than we thought, to what extent do we need to rethink the relationship between R&D and productivity, and more specifically our exploitation of innovation? It looks like we are doing quite a lot of innovation in this country, yet somehow it is not coming through in the figures. Is this a statistical argument or is there something else going on?

**Stian Westlake:** We know that there are lots of different things that contribute to productivity. It is not just R&D and innovation, but infrastructure, skills, finance and all these other things. The fact that we are lagging, even though we are doing a little better at innovation, does not necessarily mean that there is a problem with wanting to do more on innovation. It might be that actually we need to take advantage of becoming a science superpower and doing that.

In one sense, there is something quite optimistic in the message to take away from these stats. What it shows is that, if you want to think about it as leverage, the leverage between the money that the Government spend on R&D and the money that businesses spend—that ratio—is much better than we thought now that these stats have been put out. Our previous worry had been that we spend all this taxpayers' money on innovation, but we seem to get less private sector innovation as a result than, say, Germany. That made us think, "Is it really worth spending the money on this?" The fact that that ratio, the leverage we get from the public money we put in, is better suggests that this policy move is a move in the right direction.



**Q58 Aaron Bell:** Finally, as I mentioned in the first panel, this Committee has been going round the country taking evidence about the role of science and technology in the economic recovery from covid. The implication from what you have just said is that perhaps all this R&D is all very well and a good thing, but there are some other levers that need to be pulled more firmly. You mentioned infrastructure and skills particularly.

**Stian Westlake:** That's right. To get productivity right, as has been clear in all the Government's writing on industrial strategy and productivity growth, you need to do multiple things. The question to answer is, do you want to just raise everything up to an average level? That is certainly one strategy, and then you say, "We are average on R&D, so let's take our foot off the gas there." Or do you want to say, "Let's work out what the UK can be distinctively good at?" I would argue that R&D innovation is something that we should be making the most of as a real national strength. We should work on the other things, but we should not quit now that we are in a good position on R&D.

**Q59 Tracey Crouch:** You referenced the changes in the autumn statement to the SME tax credit scheme. They were largely due to HMRC having concerns. To what extent would you agree with that assessment?

**Chris McDonald:** I disagree with the assessment. The policy would have made some sense back in the spring when it was initially mooted. At that time the ONS data had not been corrected, and HMRC was looking for an explanation for the gap between the HMRC and the ONS data. Once the ONS data was corrected in late September or early October, that rationale fell away. Quite a lot of work was done by me and others to try to point out to HMRC that there was then a flaw in the logic. However, perhaps the steamroller had started running and the proposal ran through to the Budget. I think that, now, the changes as proposed to the R&D tax credit scheme are not on a foundation of solid evidence, as a result of the massive change that we have heard about in the ONS data.

**Q60 Tracey Crouch:** Were you comfortable about the communication of those comments? Are you content at the moment that industry and SMEs are aware of the challenges in all the different places?

**Chris McDonald:** One thing we need to be aware of is that it is difficult to communicate with the UK's extensive number of small businesses. It takes quite a long time for messages to filter through. We are still finding new small businesses to work with that have not heard of the R&D tax credit scheme. In fact, one of the things that HMRC has not been particularly clear about is what happens at the extensive margin—essentially, each year how many new businesses are being drawn into the scheme? What we have seen is that larger businesses tend to use the R&D tax credit scheme year after year, as they have large programmes of R&D. I used to manage a large programme of R&D in a big business on that basis. Small businesses may engage in an R&D project and they may use the R&D tax credit scheme, but then they might not need to do that



for a year or so because they are commercialising a new product, or whatever.

The challenge that we constantly have is ensuring that small businesses are aware of the scheme so that they can engage in it. A change like this will cause a problem because there will be a flow-through of businesses presuming that the scheme has been withdrawn. If we can get some correction to that, we will have to go back and communicate that. I would expect this sort of cycle, in and of itself, to have a detrimental impact on small business innovation.

**Q61 Chris Clarkson:** Picking up on that theme, do you think any particular sectors will be more affected than others by the changes?

**Chris McDonald:** It is difficult to say. We know that 70% of R&D is done in manufacturing. We would expect the biggest impact to be on manufacturing and the manufacturing supply chains. To come back to the point about the general lack of productivity, there are clearly big issues with productivity in the UK, but we cannot look away from the fact that, as an economy generally, we are structurally weak in manufacturing compared with our OECD competitors. As much as we will try hard to improve productivity, and we need to do more innovation to do that, if we really want to achieve higher levels of productivity, we also need to have policies in place that support more manufacturing. Manufacturing is more productive than services. It pays higher wages than services. It does the most R&D. As well as doing innovation, we need to find out how we can do policies that will create more manufacturing as well.

**Stian Westlake:** May I build on that, briefly? One plea that I would put out at this stage to Government, to HMRC and to the Treasury is to keep the data coming on the R&D tax credit. Until very recently there was very little data at all made available on claims for R&D tax credits, which is in stark comparison with Innovate UK grants, where lots of information is published. Recently, HMRC has been proposing getting rid of the statistical appendices that tell you into which sectors the money is going. We will be even less well positioned to answer that question quite soon unless HMRC makes sure that it publishes that information. I agree, it is a good question to ask, and it is important we have the data to know.

**Q62 Chris Clarkson:** We need that granular data if we are to understand what the long-term impacts are. Staying with the innovation piece, obviously spin-outs from university are very important. We have the Innovation Factory in my part of the world at Manchester University, which does some amazing things. How do you think the changes will affect spin-outs from universities, and how will they affect the relationship between spin-outs and SMEs?

**Chris McDonald:** If we are talking about entrepreneurialism and start-ups in general, the same impact will be felt by spin-outs from universities. The R&D tax credit is a crucial part of the business plan at that early stage. There are businesses for whom the make or break in



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being able to launch will be dependent on the level of R&D tax credit because, ultimately, it is a way of sharing the risk.

Stian mentioned earlier the difference between different countries and their use of R&D tax credits versus grants. The R&D tax credit is a great success story for the UK because if you are an entrepreneur—a start-up or a small and growing business—you are best placed to determine what innovation needs to be done in your business. You know precisely what your customers and markets require, and you will deliver on that.

If you are reliant on grant funding, perhaps Innovate UK ran a grant scheme 18 months ago or perhaps they are going to run one in 18 months' time. That is of no use to you now. The UK is good at innovation. We know we are good at start-ups as well. We are perhaps not as good as some others at scale-up and growth. The R&D tax credit scheme, as I see it, is a vital part of keeping us at the forefront of innovation in that way.

Q63 **Chris Clarkson:** Is there anything you would like to add, Mr Westlake?

**Stian Westlake:** Broadly, if anything reduces the public funding that can go into these businesses, on the whole you would expect there to be fewer companies arising. It would be a harder question if there were a choice between spending money on increasing R&D tax credits or on other schemes that might be useful to university spin-outs. That is a harder call to make. We know that the R&D tax credit scheme is a good scheme. We know that it works. If the question is to reduce the level or keep the level the same, keeping the level the same is the obvious choice.

Q64 **Chair:** Finally, Mr Westlake, although you pointed out that the Government have maintained their commitment to the overall target and, in any case, successive Governments have wanted to go beyond the narrow 2.4% target, nevertheless this change to the definition has big implications for whether in getting there—leveraging private sector investment—there is a bigger job to be done in bigger businesses or smaller businesses. Mr McDonald referred to the fact that we now have a lot of small businesses doing a lot of research and development. What would you say the implications for future policy are in terms of where the efforts are directed, even if the quantum is not really in doubt?

**Stian Westlake:** In the old world, when we were relying on the old numbers, we thought that there was a particular deficiency on the part of innovation among smaller businesses because there was this dark matter of small businesses that we were not seeing. We thought that there was specifically a problem around the idea of the leverage rate and the relationship between the amount of public money we were putting in and private money. Those two problems, to a certain extent, go away under the new figures. It shows that there are a lot more small businesses than we thought doing interesting innovation and that £1 of public money generates more private investment than we had thought.



What all of that means is that, rather than trying to focus very specifically on a perceived small business problem or a perceived tech transfer problem, we should go back to the broad palette of interventions. Some of that stuff is quite straightforward. It is about continuing to increase funding, whether that is through tax credits, UKRI or other public bodies, and making sure that there is access to finance so that businesses can grow. In some ways it makes our task simpler, because it means that we do not have the unusual and specific problem.

**Q65 Chair:** Do you think the changes to the tax credit system—Mr McDonald commented on this—that were included in the autumn statement made things better for bigger businesses relative to smaller businesses? I assume that policy thinking predated that change. It looks odd in the context of the discovery now of the statistical change.

**Stian Westlake:** Yes. I do not really follow the logic of the change that has been made to the R&D tax credits. It is important to continue to bear down on fraud and error. If you Google “R&D tax credits,” the number of consultancies coming up is a sign that there is a lot of sharp commercial practice going on there. It is not quite clear to me what the rationale for the changes was, in light of what we now know.

**Q66 Chair:** On your point about leverage, you said that what this shows is that we get more leverage from the private sector for every pound of Government spending. Are we sure about that? Could it not be the opposite? I think you said in your evidence that sometimes the smaller businesses find it harder to access Innovate UK grants and all the rest of the things. Does that not demonstrate that actually businesses are getting on with R&D themselves to a greater extent than we knew, not because they are connected with public sector R&D spending?

**Stian Westlake:** This is an interesting one. Leverage is obviously a simplistic concept. It is not that you spend £1 of Government money and then someone decides to invest. For example, in the work that Richard Jones and Tom Forth did in Manchester, looking at small businesses there, which was one of the things that gave them some confidence that there was some dark matter going on, they showed that there were quite a lot of interesting, complex interactions between those small businesses and the things that Government did. They were not necessarily big UKRI programmes or things that the universities were doing, but the skills that are supplied, the skilled workers and the tax credit scheme. All of those are quite important. We certainly must not narrowly focus just on UKRI. It is important that we continue to support the innovation system through policy.

**Q67 Chair:** Mr McDonald, it is very helpful that you are both a practitioner and someone who understands the system more widely for small businesses. In your experience as a practitioner, you said you have managed research programmes for a big business. You now run an SME. What is your experience of engaging with Government-funded R&D programmes?



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**Chris McDonald:** The business I run is a research organisation. We engage both with R&D tax credits and with grant-funded programmes. Part of our job is helping businesses to understand how those programmes work and to get the best out of them, and to collaborate with us to access our expertise.

What is really important, particularly for small businesses, is the responsive mode element of R&D tax credits. When I worked in a big business, I was invited to committees such as UKRI, EPSRC, Innovate UK and so on to contribute and give my views on the future direction of R&D, which ultimately helped shape future grant programmes. Small businesses do not have the time or ability to do that. They need to focus on running their own business. They need the best expertise at the time when they need it to deliver the programme they want, which is what makes R&D tax credits so suitable.

There is perhaps one other change that was proposed in the Budget that also causes me some concern. It was to limit the availability of R&D tax credits to be used against R&D that is contracted overseas. As someone who runs a UK research organisation, clearly I would like the research to be done in the UK. However, the most important thing is that the UK economy gets the benefit of the results of the research. For every £1 on research that is spent with my business, we generate £1 of GDP, but when those results are applied in a factory or another business, we get £8 back. Generally, there is an 8:1 return on investments.

I think the most important thing is to put ourselves in the shoes of the person running a small business and have policy that is responsive to their needs, and will therefore generate economic growth and wealth around the country, and maybe worry less about where that R&D is done and the time in which it is done.

**Chair:** We are grateful to you for taking time from your business to come and advise this Committee today. Chris McDonald and Stian Westlake, thank you very much indeed for your evidence. That concludes this one-off session on the R&D definitional changes.