HOUSE OF COMMONS

Science and Technology Committee]

Oral evidence: The science budget, HC 340

Tuesday 13 October 2015

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Written evidence from witnesses:

- Department for Business, Innovation and Skills

Watch the meeting

Members present: Nicola Blackwood (Chair); Victoria Borwick; Jim Dowd; Chris Green; Carol Monaghan; Graham Stringer; Derek Thomas; Matt Warman

Questions 224-335

Witnesses: **Joseph Johnson MP**, Minister of State for Universities and Science, Department for Business, Innovation and Skills, and **Gareth Davies**, Director General, Knowledge and Innovation, Department for Business, Innovation and Skills, gave evidence.

Q224 Chair: Minister, can I welcome you back to the Committee? It is very kind of you to return to discuss with us our science spending inquiry. It is three months since you last appeared before the Committee, and I am sure you have been working feverishly to see how you can get the best deal for science. I am also sure that you have been reading all the evidence we have taken, and that you are taking time to understand the concerns of the science community about the impact that the CSR will have on science investment in the UK. Could we start by hearing from you about some of that work, giving us an overview of where we stand at the moment with the spending review and your opinion about the direction in which we are going? I understand that you cannot speak for the Chancellor, as you said last time, but giving us a sense of progress and the direction in which we are moving would be very welcome.

Joseph Johnson: Certainly. Thank you, Madam Chairman. It is very good to be back. I am glad to have a chance to help you with your inquiry into the science budget. Since we met three months ago it has indeed been a very busy period. I and officials in the Department have been working hard to develop the strongest possible case for science, to assist the Chancellor's thinking as we go into the spending review. As I mentioned last time, he is not a Chancellor who needs any convincing as to the importance of science and its centrality to productivity outcomes in the economy. We are presenting strong arguments in support of science, and in the weeks that I have been in this role I have been assisted enormously by the evidence that I have been able to gather around the country as to the enormous contribution our scientists and researchers are making in their work.

I have seen for myself the strong fruits we are reaping as a country of our investment in our science base in countless towns and universities I have visited, from Cardiff where I looked at cutting-edge research into the impact of lightning strikes on aeroplanes to any number of other applications. Yesterday, I was on board Royal research ship Discovery, one of the fleet of ships that is keeping Britain at the cutting edge of marine science. It had docked in the Thames to celebrate NERC's 50 years. There, in a two-year-old vessel, I saw for myself the importance of sustaining investment in our science infrastructure; it is going to keep us at the cutting edge of marine science for decades to come. I was delighted to announce that we had entered into preferred negotiations with a bidder for a new polar research ship to replace the James Clark Ross and the Ernest Shackleton—an investment of £200 million which will keep us at the forefront of marine science. In that and many other examples around the country, I have seen the fruits of the science investment which we all care about so strongly. Going into the spending review, we can feel confident as a country that we have reaped the fruits of past investments and have every prospect of continuing to do so in the future.

Q225 Chair: I suspect that everybody on this Committee agrees that the Chancellor has shown himself to be a champion of science in the past, and we are hoping that it will continue. I am glad to hear that you are working hard to make the strongest possible case for science. That will be very welcome to those who have given evidence to us, but one note of concern that has been raised with the Committee is that in certain sectors some of the fruits that you spoke of just now are actually the result of past investment, and there is a risk that if investment is not increased, that fruit may fall away. Do you share those concerns?

Joseph Johnson: Clearly there will be lagged effects with any kind of investment pipeline, and at any point in time you will be reaping the benefits from investments you made in the past. The key thing is to make sure that you are continuing to invest as a country so that you continue to reap the rewards of that investment, and we are. That is precisely why we have set out the capital road map that we spoke about last time, all the way out to 2021, at a rate of £1.1 billion a year, which is a real-terms matching of inflation in our capital road map. That is important. It gives people, businesses, charities and everybody the certainty they need about the part that Government are going to play in facilitating investment in science.

Q226 Chair: Colleagues will probably want to press you on that a little more. Some other decisions will be made, in addition to spending, over the next few weeks and months. We are going to have structural decisions coming as a result of Nurse, Dowling and McKinsey. How do you see those reports feeding into the budget decisions that are coming forward? Are the decisions being made in a joined-up way?

Joseph Johnson: Yes. They are all doing different things. Taking them one by one, the Dowling report has already come out, unlike the other two you mentioned, although we are yet to respond to it formally. That made some strong recommendations about the interface between universities and business. In particular, it made powerful recommendations about the need for simplification of that landscape, so that businesses find it easier to exploit the great ideas that are being generated in our university research base.

The Paul Nurse review into the operation of our research councils and how they can be best equipped to carry out their important role is ongoing, and we expect it to report before the end of the year. The McKinsey report to which you referred is an exercise entirely separate from the spending review process, although some of its early findings might inform some of the spending review process. It is working on a much longer time horizon, namely what does the Department for Business, Innovation and Skills need to look like in a longer-term horizon—2020 and beyond? What is its optimal shape and structure? How does it relate to its partner organisations? How does it best carry out its core functions, and so on? They are all trying to do rather different things.

Q227 Chair: But all these different reports, which make structural recommendations, will feed into the spending decisions that come out of the CSR, will they not?

Joseph Johnson: They will certainly be taken into account and considered very closely in the spending review process, though they are not the same as the spending review process.

Q228 Chair: I understand. They are all slightly staggered, and there is a deadline for submissions and decisions made within the spending review. I am trying to check that all the recommendations are being made in a timely manner and it is all being joined up. I am trying to understand how that process will work in an effective manner.

Joseph Johnson: It is being joined up. I can absolutely guarantee that the Paul Nurse review will certainly be taken into consideration in the spending review, and the early findings from the McKinsey work, which is all about making sure that BIS's own work on what it should look like in 2020 is sufficiently realistic and ambitious, will also be taken into account during the spending review process.

Q229 Chair: Can I ask how the Treasury's economic appraisal models take into account R&D, and whether you are satisfied that they properly assess the input of R&D in economic value?

Joseph Johnson: The Treasury has demonstrated an understanding of R&D. It has put in place a number of schemes to support R&D in the country, underlining the central role R&D plays in generating greater productivity. I would point to our very generous R&D tax credit scheme. Small businesses can generate a 230% tax credit on qualifying R&D expenditure. It is one of the most generous schemes in the OECD. The value of that R&D tax credit now stands at £1.8 billion in the last year for which we have full data. That is an increase on £1.4 billion in the previous year. Off the top of my head, it is benefiting 11,000 or maybe 12,000 companies across the country.

Q230 Chair: R&D tax credits are very successful, but our national R&D profile is low and falling, and departmental R&D has a similar profile. Some Departments have risen. It is about trying to understand whether there is sufficient incentive within the Treasury models. We have received lots of evidence. The question is whether or not you are making that case as part of your policy position.

Joseph Johnson: We are making a very strong case for the public and private returns on R&D expenditure. They are unarguable. There are private returns of 20% in perpetuity on every pound of public investment. We all agree on the evidence base around the crowding-in effect that public investment has on private investment. We may have used these figures in our last hearing. For every pound of public investment, between £1.13 and £1.59 of private investment is crowded in. These are important factors, and the Treasury takes them into account.

Q231 Jim Dowd: If I could look at how we define the optimal spend on science and R&D, do you think percentage of GDP is a useful measure? If not, why not, and what would you put in its place?

Joseph Johnson: I think we are getting squarely back into the territory we were in last time. That is really about what we are trying to generate from the investment. What we are trying to generate is world-leading research that is able to move forward our economy and the frontiers of our knowledge base. In that respect we are doing very well as a country even though, as your question suggests, we are investing less than other countries. Even though we are investing less, we are coming out very highly in all the rankings of research outcomes. We mentioned them last time: spin-outs per pound of public investment and patents generated per pound of public investment. We are hyper-competitive. In terms of the field-weighted citation impacts that UK researchers produce, the figure is 16%; even though we account for only 3% of research spend globally, we account for 16% of the most important citations. We have a highly productive research base, and that is the thing we are focusing on.

Q232 Jim Dowd: Of course, the EU set the target of 3%, which we discussed last time. Do you have any idea how they arrived at that figure? Was the UK involved in its formulation at all?

Joseph Johnson: No. I read the transcripts of your earlier hearings and noted that Graeme Reid also did not know the origins of that target. I think it is a nice round number more than anything else. It does not seem to correspond with other evidence suggesting what an optimal level of investment might be.

Q233 Jim Dowd: I am not trying to trip you up, just quoting what you said last time: "What that rather crude comparison of the headline percentage spend overlooks, or does not give much account to, is the incredible efficiency, effectiveness and high returns we get on our science spend as a country." Can you formulise that?

Joseph Johnson: That was really what I was saying a minute ago, which is that, even though we account for only 3% of global research spend, we generate five times that share of the most important citation impacts, for example. There is also the effectiveness of our research in terms of spin-offs per pound of research, or patents per pound of research. We have a very lean and effective research base. That is because we spend our money and focus it on excellence, and we fund the best research wherever it is in the country.

Q234 Jim Dowd: I readily accept that it is effective spending, not just volume spending. I recognise that. Why then do you think it is—I do not know whether you have had any discussions on this—that the Office for National Statistics still insist on using the international comparator of share of GDP?

Joseph Johnson: It is a denominator to use that gives you a scale on your investment.

Q235 Chris Green: Have you grounds for believing that the judgment of your ministerial colleagues on the optimal level of science funding will differ substantially from 2010?

Joseph Johnson: I hope not. As I said to the Chair at the start, we are making the strongest possible case. There has never been a Chancellor who spent more time in high-vis jackets and lab coats than this one. I think we have to look at the Chancellor's interest in science and his understanding of its importance to our economy.

Q236 Chris Green: With the last five years having been about stability and recovering from the economic crash, for the next five years there is a great deal of emphasis on improved and increased productivity. Those are our stated aims. Towards the end of this Parliament we should be expecting to have a surplus in the budget. What factors do you think point to an increase in the science budget, and what factors do you think point to a curtailing of the science budget? Are there any particular factors you would like to pick out?

Joseph Johnson: I cannot pre-empt the spending review, but the fact is that we are going into the spending review making the strongest possible arguments for science. Set against that are head winds on our need to meet our fiscal mandate, which requires us to balance the books by 2019-20. Those are two rather competing policy priorities. We are hopeful for a successful outcome at the spending review.

Q237 Chris Green: We heard at conference that, while we are emphasising the productivity gains we are hoping to achieve over the next five years, 20% of excellence-rated grants are not taken up at the moment. These are excellence grants for science that perhaps we should be exploiting. There is clear scope there.

Joseph Johnson: I think one of the great strengths of our system is that it is ferociously competitive, and the very best projects get funding. There might be some excellent projects which do not get funding in one round. Let's hope they get funding in a subsequent round, but the real strengths of our system are that we fund excellence and that it is brutally competitive. That leads to the very high outcomes we were talking about a minute ago.

Q238 Chair: At a time when we are pursuing productivity as a national priority, are we sweating our assets, to use a phrase that comes up a lot, as effectively as we could be, and are we seeing science as spending or investment? When we hear a statistic like this about the proportion of excellent grant applications being delivered, and we hear from certain sectors of the industry that they are not necessarily operating at capacity and we could be doing much more, despite our excellent output and research, should we be spending in a different way to

increase our productivity in science and innovation? My question back to you is: how are you considering that question about productivity and sweating our assets and delivering the most in what is one of the best research and innovation bases in the world? Are we getting the most out of it with the way we deliver our spending?

Joseph Johnson: That is a very important question, and it is one which Sir Paul Nurse's review addresses squarely, looking at the way the research councils operate and whether they can be more joined up, do more multidisciplinary work and deliver genuine efficiencies that are not cuts in the way they operate. Yes, I think there is scope to do more with the assets and resources we have.

Q239 Chair: Will his recommendations be out in time to be considered by the CSR?

Joseph Johnson: Yes, absolutely; they will be fully considered in the run-up to the spending review.

Q240 Derek Thomas: If we take a glass half-full approach and hope for the science budget to increase, where would you see the particular gains? Where would you want to see that money spent?

Joseph Johnson: I take a glass-full approach. We have an extraordinary science base in this country and we want to maintain it; we want to be the best place in the world to do science. It is key to our future as a country and a knowledge economy. As a successful player in the global economy, we are committed to supporting the science base.

Q241 Derek Thomas: What would you say was the specific gain? What are the things we could achieve with a bit more money?

Joseph Johnson: The allocations of the science spend will be taken in the round after the spending review. I do not want to pre-empt those kinds of decisions, but they are important ones and we need to make sure that we give them a lot of thought.

Q242 Derek Thomas: You may find it tricky to answer the next one. If we look at the glass slightly less full and there is a hit and the science budget is reduced, what do you suggest might be the things at risk? What is vulnerable where we spend the money now?

Joseph Johnson: I would not want to lead the Committee astray by speculating about such a scenario, because it would be completely premature ahead of what is happening on 25 November.

Q243 Derek Thomas: Has any work been done to make a risk assessment and say, "If this is the result, this is where we'll spend it; if this is the result, this is where we'll cut it"? Has that work been done, even if you cannot tell us what your thinking is?

Joseph Johnson: I can give you a very broad indication of the ask from the Treasury, which is common to all unprotected Departments across Government. We have been asked

to model the 25% and 40% scenarios, and that applies to BIS as to other unprotected Departments.

Q244 Chair: For those of us who do not do this modelling on a daily basis, could you explain how deep that kind of modelling goes? Would it include looking at the impact on individual institutions, or would it just be at an individual fund level? For example, we received evidence from the STFC science board about the specific impact they envisaged if they did not get an increase of 10% on their operational ability to run certain of their laser facilities and so on. I know this is disputed evidence, but does your modelling look at that level of impact, or does it look at how you would deal with certain funds, such that the Innovate UK fund would have to deal with this and HEFCE would deal with that? Can you explain it?

Joseph Johnson: Inevitably, when you are presenting those scenarios you have to give an assessment of the impact on programmes and activities in all the areas the Department is engaged in.

Q245 Chair: You are not willing to go any further.

Joseph Johnson: It would be premature, and it would also pre-empt the spending review. But obviously the modelling is thorough and it is a serious piece of work.

Q246 Graham Stringer: One major change since you were last before the Committee has been to put Andrew Adonis in charge of the infrastructure projects. What assessment have you made about any changes that will bring to both the quantity and the shape of the science budget?

Joseph Johnson: That is a good question. It is not one which we have given a massive amount of thought to.

Q247 Graham Stringer: It is a huge change; it is hollowing out a lot of DECC, and there is a lot of science and innovation in there. I would have thought you would have given it consideration.

Joseph Johnson: Gareth, have you been thinking about Andrew Adonis?

Gareth Davies: Not particularly, no.

Q248 Graham Stringer: Can you give the Committee a commitment that you will?

Joseph Johnson: We will happily have a look at the read-across to the science spend and discuss it further with you.

Q249 Graham Stringer: You have said and the Committee agrees, and the Chancellor of the Exchequer agrees, that science is a good thing and spending on it is a good thing, but you know and I know that Treasury officials are mean-spirited in their nature; they have to be. I

would like you to give us a bit more insight. When you go along to the Treasury and say, "We know you agree that science is a good thing. We have a large impact from citations, patents and return on capital", I am sure they do not say, "We agree with you, Minister." What other assessment do they ask you for at that stage? How do they try to beat you down? What different measures are they looking at?

Joseph Johnson: Gareth might be able to give you the blow by blow of the negotiations with the Treasury, if it is appropriate, or a bit of colour anyway.

Gareth Davies: In my conversations with Treasury officials, they have been very supportive of the evidence. A good example is the productivity plan published earlier this year. The Minister has already talked about the impact on long-term TFP growth, the 20% economic returns and the crowding-in effect in terms of public spending with wider private sector R&D. All of that was reflected in the Treasury's productivity plan publication following the Budget. From that perspective, there is a broad shared assessment of the macro-economic evidence of the impact of science and innovation spend. I have found Treasury officials very open in the conversations I have had with them on the Haskel and Hughes-type work. There have been many joint commissions from both sides with BIS and Treasury officials.

Q250 Graham Stringer: Those are not Treasury officials I immediately recognise as being completely on board with a Department's spending plans, or even the science budget. What do they say about innovation, which might be where we are a bit weaker?

Joseph Johnson: On innovation, they have put their money where their mouth is, in the sense that innovation spending has increased year on year since 2007. There is now a budget of well over £500 million in the hands of Ruth McKernan at Innovate UK. On top of that, as I mentioned earlier, we have an increasingly effective R&D tax credit system to the value of £1.8 billion assisting over 11,000 businesses. That is significant support for our innovation infrastructure. Of course, we can always do better. Relatively speaking, we are less good at innovation than we are at basic research. We could always do better, even though we are doing very well on the global indexes of these things. We are second in the global innovation index.

Q251 Graham Stringer: I understand why you did not want to give an answer as to what projects might be at risk if there was a budget cut. Can you answer the opposite question? What carrots have you put before the Treasury as to what benefits there might be in increasing spending?

Joseph Johnson: As Gareth was saying, we are not short of ways to illustrate the huge returns to the economy of increased science spend.

Q252 Graham Stringer: If there was just one project, what would it be?

Joseph Johnson: I do not want to pre-empt powerful announcements that might come in months to come. I would hesitate to burn the strategic value of interesting announcements in months to come, so I am going to hold my fire, if you do not mind.

Q253 Chair: Can I follow up Mr Davies's points about the Treasury recognising the macro-economic value of R&D investment? If that is the case, and all the evidence we have received seems to demonstrate it amply, why have we had historically falling R&D investment in the UK? It does not make sense to me. What is your analysis of this fact?

Gareth Davies: When you look at the overall R&D spending, there is a natural tendency to start with public investment in it, but of course—

Q254 Chair: It is public and private. I understand that.

Gareth Davies: It is public and private. Certainly, some of the analysis I commissioned in BIS looked at the sectoral composition of the economy. There is an interesting sectoral comparison. If you compare, say, our manufacturing base with Germany's, the nature of tangible and intangible investment will reflect differently in the figures. I think it is fair to say that if you look at some of the ONS and OECD work on this, how we capture some of the intangible investments in R&D is probably not perfect. Economists recognise that that is an issue. Certainly investment in, say, software, brand development and the like is related to overall R&D. I do not think it is fully captured in the figure. Our initial assessment is that that does not completely offset the differences in the spend levels between countries, but there is certainly something about the composition of our economy that is an important difference. R&D is a well-researched area; it links through to economic growth and some of the incentives behind it. It is still a contested field among economists. Going back to the previous question, its overall beneficial impact on productivity is broadly accepted. I would widen that to include public health, individual health, cost avoidance and the quality of public policy more generally. There is a contested literature around how you can boost R&D investment. There are different levers we can pull, and we can talk about some of the direct and indirect measures the Government use over time. Quite how you can do that is not always clear.

Q255 Chair: But even if you accept the fact that we are not capturing the value of intangible investment, and that would offset some of the R&D growth in the UK, we are behind; we are falling. You could put the argument the other way round and say that we have had growth in sectors that do not require much up-front R&D investment because of the way our system is set up. What is it about the system that we need to change to stimulate R&D investment up to the level of our competitors, and make sure that we retain or increase our competitive edge in the next few years and decades to come? I am trying to understand what it is you would change?

Gareth Davies: It is not for me to change; it is for Ministers.

Q256 Chair: In your opinion?

Gareth Davies: In terms of looking at the economy and the models for economic growth, what is interesting is that effectively there are two models of innovation and translation from the science research base into commercialised products—what some researchers call the hard versus soft models of translation. The hard models are effectively where you need

large up-front capital investments, frankly, to help companies in terms of their balance sheet, and to take scientific innovation and work out how you commercialise it and turn it into products. The softer forms are where you have a more demand-pull model and effectively there are informed consumers. Governments act to drive through innovation from the science base. Essentially, it is tech-push versus demand-pull. There is a very interesting but still emerging literature around the relative balances of those two measures. Where you are talking about successful sectors of the economy that have not required large-scale R&D, often that is the demand-pull side. Especially in the UK, we have great assets in terms of a very active competitive market. We have very informed consumers, often very willing to adopt the latest technologies, and that acts as a very powerful pull-through from some of the public and private investment that you see in the research base.

Q257 Carol Monaghan: You spoke to us in July about spending decisions and said they should be focusing on outputs. How well placed are you to know what those future outputs are going to be?

Joseph Johnson: I think what I was trying to say was that we cannot just measure the inputs and measure our success in relation to how much we spend. It is only one half of the story; the other half has to be the results that the spending has generated. You cannot look at just the inputs. That was where I felt we were over-focusing our previous discussion. I was just trying to steer it back towards what the research spend that we do in this country is actually generating. I gave some examples of how well we are performing as a country in terms of share of important citations; how well we are doing at generating spin-outs per unit of research spend; how well we are doing at generating valuable patents, and so on.

Q258 Carol Monaghan: Professor Brian Cox spoke to the Committee last month. He was talking about the lag between spending and investment and output. He talked about a lag of 20 or 30 years and gave the example of how the laser was developed but had no real applications at that point; they came much later. With that in mind, are you taking that into account when you think about spending decisions in the science budget?

Joseph Johnson: Very much so. That is why when allocation decisions are made and research councils decide how they spend the money Government allocate to them they always put aside a significant chunk of money for fundamental research, responsive grants and so on, which enable curiosity-driven research, with no obvious immediate practical application in sight, to take place. That scientific activity can happen, so that the unknown can occur in due course—the kinds of things Professor Brian Cox was talking about. The lag in the return on that investment can take place over significant periods of time.

Q259 Carol Monaghan: A lot of the scientific community would feel that research that does not have any known application at that point is what makes the science community so rich in the UK. Would you be happy to come back and speak to a future Committee in 10 or 20 years' time and explain the decisions you made in November?

Joseph Johnson: I think anybody could look back at the decisions taken in the last Parliament and say, "Look, we defended the science ring fence at a time of massive fiscal

consolidation elsewhere across Government." Anybody is going to be proud to have taken that decision. We can be proud to have set out a capital road map to 2021 that again, at a time of significant fiscal consolidation, preserves the real-terms value of the capital pipeline. Those are decisions that people can be proud of. Let's wait for the spending review for the rest of it.

Q260 Victoria Borwick: Professor Cox came before the Committee and put the fear of God into us all. I would like to go back to resource spending versus capital spending and explore that a bit more. Do you think that resource spending on science should be increased to take into account the Government's existing commitment on capital increase? How do you see the balance between the two?

Joseph Johnson: Clearly, they are intimately related one to another ultimately, because once you have financed the capital investment in a project you need to resource it appropriately, and ensure that, if it is a facility, it can operate for the required period of its functioning life. Those are obviously important considerations.

Q261 Victoria Borwick: We have certainly been struck by the cost of keeping some of these significant things going, or I have as a relative newcomer to this topic. You have spent the money building it and then you have the cost of keeping it going, which is quite substantial. How do you see that the two should be optimised against each other? Do you have a view on that?

Joseph Johnson: When a business case for capital investment is approved, resource planning is an essential part of that, building in a reasonable life expectancy for the duration of the capital facility. It does not mean that capital needs to be resourced for ever. There might be fixed capital investment with a lifespan of x, and once x is reached it is reasonable enough that new decisions need to be taken as to whether you want to continue to resource it.

Q262 Victoria Borwick: When Professor Brian Cox, who was alluded to earlier, came before us his comment was that a flat cash settlement would be an absolute disaster for science, as doubtless you have read in your pre-briefing. Are you a little more optimistic than that, or would you like to give us a view?

Joseph Johnson: As I said, I am a glass-full person. I am confident that we have a Chancellor who understands the importance of science, and I hope that is reflected in the spending review settlement.

Q263 Chair: The evidence you have just given is that for every spending and investment decision the resources are there to follow the capital. We have had some quite concerning evidence along these lines. I am sure you have been briefed on it. One particular case from Innovate UK is concerning because it involves catapults, which I know you are going to be asked about by colleagues in a second. This particular case is concerning because Innovate UK take the position that up-front capital should run for a couple of years and then follow-on resource should run for about five years to bed in most investment cases. They say that for

high-value manufacturing capital, which has been a great success, two of the major CPIs are facing quite significant challenges, because the resources to run the centres were made available for only one year, which was not adequate to provide the value for those centres behind the capital. It is not clear to me why those decisions were made. I understand that they are partnered with a number of multinational companies that are providing partner investment, but you can see the concern that has come up in most of our evidence about capital and resource spending not being properly matched because they are not allocated together. This example is concerning for us. Can you speak to that and explain how you are going to make sure these sorts of examples are not happening going forward?

Joseph Johnson: I was in Darlington not so long ago at the CPI, opening the new National Biologics manufacturing centre there. It is a £38 million investment, and an extremely important boost for the local economy and for our ability to stay at the cutting edge of that particular branch of science. The resource element of its life will be decided at the spending review, but baked into its capital case was a full understanding of what the resource implications of such a facility would be.

Chair: Perhaps I should write to you about these details afterwards. I am sure you will want to make sure that all the catapults are properly resourced going forward, because they are going to deliver important productivity issues for the community.

Q264 Matt Warman: Minister, you touched on this: is the current spending review going to continue to treat research capital and resource funding separately?

Joseph Johnson: For the spending review in November, my understanding is that they will observe the existing conventions of treating science resource and science capital as distinct pots of money. Thereafter, ESA10 will start to apply, as it does in the ONS national accounts, and there will be a new definition of resource spending as capital.

Q265 Matt Warman: This might be for both of you. Does that incoming change have any effect on negotiations that you are having, or is it just an administrative thing essentially?

Joseph Johnson: For the purposes of this spending review, we are maintaining the existing convention.

Q266 Chair: What we are trying to understand as a Committee is whether the accounting convention will be merely a convention, or will it materially change the way in which spending allocations happen, meaning that institutions and others get one bulk allocation of funding, which they then have to divide up according to capital and resource? Will that be beneficial, because it will mean they have flexibility as to how they use the spending, or will it cause some risks for institutions that are not as effective in making sure they manage their forward spending?

Joseph Johnson: I understand. When everything is in a future world of being just capital, whether or not there will continue to be a line between intangible and tangible capital remains to be seen, and those sorts of decisions will be taken in the spending review.

Q267 Chair: Do you have any indication as to when you would be able to give those answers to the Committee? It is something that obviously raises a concern.

Joseph Johnson: After the spending review.

Q268 Chair: Immediately after it.

Joseph Johnson: Yes.

Chair: Thank you very much.

Q269 Graham Stringer: Maybe you have answered this. I did not quite understand one of your answers. If it is rational to ring-fence capital and, in your words, these things are intimately related, is it not rational to ring-fence them both, either independently or together?

Joseph Johnson: Of course they are related one to the other. The extent of any protection of the resource side will become clearer at the spending review, as I have said before, but I can certainly see the logic of what you are saying.

Q270 Graham Stringer: You said something very interesting about considering amalgamating the research councils—I do not want to put words into your mouth. When the predecessor to this Committee asked the research councils that question they said, unsurprisingly, that they did not see the case for amalgamating them and you would have to specialise again. Have you had much discussion with the research councils about potential amalgamation?

Joseph Johnson: This is squarely within the terms of reference of Sir Paul Nurse's work, as you know. He is looking at how they can be more effective and add up to more than the sum of their parts than they currently do. I am looking forward with great interest to his report when it comes out. As I said earlier, I think there is real scope for genuine efficiencies that are not cuts masquerading as efficiencies in the way the research councils operate. I think they could do much more to simplify and co-ordinate the way they process grant applications, for example.

Q271 Graham Stringer: The final decision will be yours.

Joseph Johnson: Among others in the Government.

Q272 Graham Stringer: This is only half a question; it is bringing something to your attention. I do not know whether you read the final report of the predecessor Committee, which indicated things that this Committee and the Government might wish to look at in this Parliament. One of those issues was the gap left in the funding of particle physics and astronomy when PPARC was abolished. Have you read the report? I had to look up PPARC myself. It is the Particle Physics and Astronomy Research Council.

Joseph Johnson: Brian Cox referenced it in his evidence.

Q273 Graham Stringer: Yes. There was a hole left in that, and two questions follow from that. One has an obvious answer. Will you bear in mind, if you are looking at amalgamation of councils in future, that there is a hole there? Secondly, have you had time while you have been in the job to look at the situation particle physics and astronomy are in since PPARC was abolished?

Joseph Johnson: Not as closely as I should have done, but I will take your steer and get more involved in it. Gareth, do you want to add anything?

Gareth Davies: The only thing I would say about the structures of research councils, and coverage of the sectoR&Discipline areas, is that it is very much where we are looking to Sir Paul Nurse for his advice in terms of the most optimal way of structuring them. The theme I took from the triennial review of research councils was that while they are individually strong organisations, there is potential for them to be more than the sum of their parts, as the Minister said, in the more back-office operational areas that we talked about—applications for PhDs, response to grants and some other grant calls. If you go to Swindon, the research councils, while they have made great progress in the last five years, recognise the benefits they could gain from further simplification and joining up.

The other aspect of the Paul Nurse review is looking at spending across the disciplines and how one balances the need for breadth over depth, and where the UK research community can show strength. The issues around particle physics certainly will come into that. It also touches on the very high cost of some of these areas, particularly energy costs and the like, in terms of mapping the capital and resource issues.

Q274 Jim Dowd: The Government have an ambition, which you reiterated earlier, to make the UK the best place for science and innovation. You also cited the global innovation index which puts us at No.2 behind Switzerland. To make it the best place, is it your ambition to move up to No.1 in that index, or is there a better way of measuring the effectiveness of science?

Joseph Johnson: There is no one easy way of identifying this. Certainly, an index on its own might be too crude and simplistic, but we want to see it reflected in how well British companies are staying at the forefront of innovation, how successfully we are innovating as a society, how well we are doing at exploiting the intellectual property created in our universities, and how well we are doing at generating good patents and other forms of intellectual property. I would not want to focus on just the global innovation index, even though we are second. It is tantalising to think that we might get into first place. I definitely would not want to leave that as the only benchmark of success—far from it.

Q275 Jim Dowd: Clearly, a key component of that is the calculation of measurement of performance. In that regard, the research excellence framework is a useful tool. Do you agree that it is a useful tool? But does it go far enough in measuring impact?

Joseph Johnson: Impact is a relatively recent addition to the research excellence framework. I think it has been in it for only one iteration of the REF. Possibly it has to have time to bed down, but it is an important element in it, and we would want to make

sure that we continue to look at impact going forward when analysing how excellent research is.

Q276 Jim Dowd: But HEFCE has put the next round of REF appraisal on hold. Is that indicative of the fact that it is going to be either radically altered or even abolished, or merged with the research council funding system?

Joseph Johnson: HEFCE has put its consultation on the next round of the REF on hold pending the spending review, as is appropriate given that we want to see the resources that are available at the time. That will inform how we operate the REF.

Q277 Matt Warman: Innovate UK is currently outside the ring fence. Does it now, and do you think it will in the future, have the resources it needs to get the most out of the science base?

Joseph Johnson: As I said a while ago, the Government are putting their money where their mouth is when it comes to innovation. Since the Technology Strategy Board became Innovate UK its funding has continued to increase. It is now over £500 million. There are other sources of support from Government for innovation. I mentioned earlier £1.8 billion of tax credits. Those are significant chunks of money. Could we do better at our innovation function? Undoubtedly. Even though we are doing well in the global indexes that Mr Dowd mentioned, there are undoubtedly ways we could be significantly better at exploiting all the IP and excellent research that sits in our system.

Q278 Matt Warman: Part of what we have been trying to do currently is get more private money for the early stage of commercialisation. That is obviously the riskiest part of it. How realistic do you think that expectation is, and how well do you think we have done so far?

Joseph Johnson: Getting more private money into this space is really important. That is why as a Government we have set ourselves the target of increasing to £5 billion from currently around £3.5 billion the amount universities generate from their business partnerships. We also want to deepen the pools of capital that support innovation. There are some really encouraging models developing across our university sector, whereby we see big investors come in and partner universities to support their ambitions for physical infrastructure or whatever, in return for which they share some of the proceeds of intellectual property generated in the universities. There was one in Oxford the other day with Isis Innovation, which is a good model; Cardiff has done a similar thing with one of its new science buildings. We want to see more of that.

Q279 Matt Warman: One of the things that came up in the Dowling review is that with those different approaches we are getting an increasingly complex ecosystem. Do you think we need to simplify it around science and innovation?

Joseph Johnson: Yes. One of the strongest and clearest recommendations of the Dowling report is that the interface between business and universities is cluttered and hard to

understand, and would benefit significantly from simplification. When we respond to the Dowling report in coming weeks, we will reflect that.

Q280 Matt Warman: Can you give us a sense of what that simplification might look like?

Joseph Johnson: I am happy to do so fully in a few weeks' time when we set all this out in our response.

Q281 Victoria Borwick: What comfort should Innovate UK take from the Government's manifesto commitment—I think the Chair mentioned it earlier—to expand the catapult network?

Joseph Johnson: All manifesto commitments will be implemented. That is what the Prime Minister says, and we will. Indeed, we have already started to do that with respect to the catapult network. We have announced the creation of a precision medicine catapult in Cambridge and a medtech catapult in Alderley Park in Cheshire, so the network is being supported and it is already expanding.

Q282 Victoria Borwick: You are confident, therefore, that all of this can be achieved in principle without compromising other elements of the innovation ecosystem?

Joseph Johnson: They are supporting the innovation ecosystem; the catapults are an integral part of it. They are shared facilities which companies on their own could not afford to build, and they gain access to state-of-the-art facilities and the best scientists in the field to help them to do prototype development and product testing in a manner which on their own they simply could not afford, so they are absolutely vital to our innovation ecosystem.

Victoria Borwick: That is very reassuring.

Q283 Chris Green: What role do you believe the Higher Education Innovation Fund plays, and should continue to play, in our innovation ecosystem?

Joseph Johnson: I think HEIF receives about £160 million a year from the Higher Education Funding Council for England, and it supports universities in building relations with business. It often pays for business development managers within universities to reach out to businesses and help them understand the IP that is being generated and the research that is going on. It plays an important part in bridging the gap between research and applications of that research, so it is an important function.

Q284 Chris Green: Does it make sense to have separate HE sector innovation funding and Innovate UK funding fishing from the same pool?

Joseph Johnson: They are not necessarily the same thing. The activities of Innovate UK, for example with respect to catapults, are more directly providing facilities that a number of businesses can access. The HEIF function is more about enabling universities to bring

businesses into their own research facilities and understand what IP is generated there. On the catapult side it is about creating shared facilities for prototype testing, product testing and access to scientists, versus exploiting the knowledge base that is specific to a university. Does that make sense?

Q285 Chris Green: Yes. The reported view of Secretary of State Sajid Javid is that industry should play a greater role in funding the early stages of the commercialisation process. What should people read into that—that the Higher Education Innovation Fund should perhaps pay less, or just that industry should do far more?

Joseph Johnson: This is a comment from the Secretary of State?

Q286 Chris Green: It is reported as his view.

Joseph Johnson: I am sorry; I have not seen that comment. I do not know whether that is his view, so I could not comment on it.

Chair: Minister, thank you. You have answered questions for over an hour. We are very grateful to you for taking the time to come back, and also to you, Mr Davies, for your comments. I hope that as you go forward into the spending review you will redouble your efforts to make the case for science. There are obvious consequences from the evidence we have received about not just spending decisions but also the structural decisions that are coming forward with Nurse and Dowling and, we think, the McKinsey report as well. We look forward to hearing that your case has been not just well made but also listened to at all levels in the Treasury by those wonderfully understanding Treasury officials you have been speaking to. Thank you very much.

Examination of Witnesses

Witnesses: **Bernard Ross,** Chief Executive Officer, Sky Medical Technology Limited, **James Bromley**, Chief Operations Officer, SwiftKey, and **Dr Paul Beasley**, Head of Research and Development UK, Siemens, gave evidence.

Q287 Chair: Can I welcome you all to this panel? Thank you very much for making time to come and give evidence to our inquiry. This is our last session of oral evidence so it is very important to us that we hear from those of you who have not only sometimes received innovation funding but are also on the receiving end of various changes of public policy. I hope that in answering questions you will feel free to comment exactly as you think, and will not feel in any way that you need to constrain your views. Can I start by asking each of you to outline what public funding for innovation and research has meant to you? We have had lots of people giving evidence about statistics and policies. What we are really after at the moment is to hear from business how the Government's policy on innovation has helped stimulate the innovation sector, particularly in your businesses. Dr Beasley, would you like to start?

Dr Beasley: Siemens for a vast period of its history invested in its own internal research, in our corporate technology divisions, which are currently based outside the UK. It is only

over the last five years that we have started to investigate the opportunities the UK has to offer. Since then we have found it really interesting, and in doing that we have set up strategic relationships with a number of UK universities. We are now starting to understand the ecosystem of the UK. It has taken a long time for us to get to grips with the funding mechanism of the ecosystem and how collaborative programmes work, but now we are very interested in developing that further and utilising the partnerships with universities for collaborative programmes through EPSRC grants and Innovate UK grants, bringing research together with our companies and also attracting funding from our headquarters in Germany to the UK to play a part in those programmes.

Q288 Chair: What was it about the UK innovation landscape over the last five years that changed and made you as a company decide to change your strategy and start to investigate and invest in UK R&D?

Dr Beasley: Globally, technology is expanding at a great rate, and as a business we have to be more flexible and agile in identifying the products of the future. The model of just having a corporate technology group is very restrictive. We buy and sell various businesses and we need to react to that as well. Once the decision was made on a global scale to look at various research networks, and as the UK has a reputation for world-class researchers, it was natural that we started to look here.

Q289 Chair: Do the decisions that the Government make on long-term investment in science matter to you? Does that change your decisions at headquarters level?

Dr Beasley: Definitely. Siemens is a global business, and almost every day we are approached by various countries to invest in research in those countries, and with very attractive funding packages. Of course, we like to focus initially on excellence, but if those packages become very attractive R&D funding is globally mobile and it can move around to suit.

Q290 Chair: Mr Bromley, would you like to add to that?

James Bromley: SwiftKey has been going for six years. In our early period of trading we received about £100,000 of what was at the time TSB grant. It was very important to the business, when it was the two founders with very little investment. Since then we have also made pretty substantial, for us, use of the R&D tax credit rebates, but one challenge for us is that there is a cap on the total state aid we can receive as a business. That is linked to our funding, which is under EIS, so we are now quite quickly at the point where we are not able to apply for any of those grants; otherwise, the funding we receive from venture capital under EIS is not able to operate. It has been very positive for us, but we are at a stage where we are largely outside anything other than the ability to use the tax credits.

Q291 Chair: What has been your experience of engaging with TSB, and then Innovate UK? Have they known what they are talking about? Have they been overly bureaucratic? Have they been largely effective? What do you think?

James Bromley: I engaged with them for the first time only three or four months ago. Prior to that, for a relatively long period of time we were not particularly engaged, mainly because we were very limited in what we could do because of our total state aid, if you label it in that manner. I found Ruth to be every engaged and direct about how she wanted to see things move forward. The obvious challenges come in many different shapes and sizes, and clearly the different companies that want to engage range dramatically from a large corporate to us, who are significantly smaller—at the moment.

Q292 Chair: Mr Ross?

Bernard Ross: We have been going for roughly the same period of time. I founded the company and we are now up to about 25 employees. We have had total grants funding of £1.5 million; we have had R&D tax credits over that period of time of £1 million; and we have attracted equity investments of £15 million, so we have been quite well funded. What we have been funding is a platform technology used in medical markets to save lives in hospitals by DVT prevention and a whole range of other products. It is platform technology. What we have found in working with TSB, through to Innovate UK, with SBRI grants, biomedical catalyst and also Smart awards, is that generally we are interacting with people who, once we win the grants, understand what we are trying to achieve and work with us. Usually, they are individuals who can add to our business on a project-by-project basis as well. Sometimes we find it is difficult for us to communicate the benefits of a specific project, so sometimes we fall short and do not win the grants, but that is usually because we have failed to communicate properly where the added value of the project is rather than the assessors not being on the ball, or maybe it is a combination of the two.

Q293 Chair: To go back to your figures, you said you had had £1.5 million from Innovate UK.

Bernard Ross: From TSB and Innovate UK.

Q294 Chair: And £15 million from private sector investment.

Bernard Ross: Yes.

Q295 Chair: Do you think you would have had that £15 million if you had not had the £1.5 million?

Bernard Ross: No. I was going through that in my mind while looking at the kind of questions I might be asked today—you can forget the chronological order of events when you are busy running a business. When we started off, the first funding we got, other than my pocket, was a grant, from a Smart award at the time. That triggered us to build a prototype—a concept—of what the technology could do. It also enabled us to negotiate a research contract with one of the universities in the UK to help us—a three-year programme of research. Then I had to go out and juggle a little bit to raise the equity finance. I raised £500,000 at that early stage to fuel the research project and the early

product development. Getting the grant funding when there was nothing other than a blank piece of paper enabled the whole ship to start off in the first place.

Moving on, we got more investment in. Investors are keen that you focus on very key areas. They want you to focus on just one or two things and do them very well. If you have a bunch of bright people who can see a huge range of opportunities in other areas, you have to find a way of keeping them focused, but at the same time let them be creative and move the technology on to different areas. The likes of SBRI have been superb in enabling our team to look at adjacent opportunities which are now driving revenues; they have gone from fundamental research through to product development and clinical development and they are now generating revenues. Early stage research and intermediate research is now in products being exported to China, Canada and Japan.

Q296 Chair: Is that a picture you recognise, Mr Bromley? If you had not had that initial TSB engagement, you would not have had the later engagement from other sources.

James Bromley: Yes. It is slightly different, in that the funding was very small and very early, which meant that it did have that impact. When you had two founders, it allowed them to continue working on the project for three or more months, and then they went out to raise. It is absolutely critical. It is also very dependent upon, in the example of new companies being born, the funds available to the founders. In different walks of life, some people have easier access to some of those funds. For this business it certainly was. The ongoing impact of the efficiency with which we can conduct our R&D because of the tax credits is really important when you then go out to raise, because there is efficiency in transferring cash and equity into tangible output.

Q297 Carol Monaghan: Mr Ross, you spoke about the investment you got; you said you feel you have been well funded. How easy do you think it is for businesses to identify and then access sources of funding? I am thinking in particular of possibly new ventures starting out.

Bernard Ross: I have to be a bit balanced here. It is a challenge to spend time looking at funding sources and then diverting attention, when you are a very small team, back to running the business, utilising the funds and making best value. When you are going out and continually looking for additional pots of money it is a distraction from growing the value of the business. You have to balance that against venture capital investors who would not necessarily look for a broad spectrum of applications of the technology in parallel, which means that in some respects you could be slowed down, so it may be best to look for smaller pots of money over a longer period of time. That is where Innovate UK is very helpful, in that you can look at increasing the financing of your business on a project-by-project basis and say to your shareholders, "We've got this opportunity. The risk to you is this, but the benefits could be this, and also we are getting some support from the UK Government because they can see the opportunity for the UK as a whole." The combination of the two along the way is probably what is going to give the best value to shareholders and to the business.

Q298 Carol Monaghan: Dr Beasley and Mr Bromley, is that a picture you recognise?

Dr Beasley: Yes, definitely. We are in a much more fortunate position than these guys and are able to put resource aside. We spent a year to 18 months going round talking to the individual funders—the universities. It was quite interesting to go to universities to talk about individual projects and then try to scope something out. These guys are coming out with, "Have you heard of this particular scheme?" They can be very creative, particularly if they want to get a product up and running, but it certainly took us quite a bit of time to get our heads round the actual ecosystem.

James Bromley: Speaking generally for smaller start-ups in the tech sector, the biggest issue is that it is a lottery whether you get an award, so you have a really difficult decision to make. Do you invest your valuable time and attention in entering the lottery and creating reports for what you hope is the correct application, or do you speak to funders and try to progress that route? The important thing we need to consider is that, if you are in Silicon Valley, the time you spend writing the application is probably enough to have half a million from someone who is going to take a very small equity slice as a result, so the ease with which a company can ascertain whether it has a likelihood of being successful in an application is very important, if you want to encourage the right companies to apply—certainly small companies.

Q299 Carol Monaghan: The Dowling review has come up with some ideas for simplifying the process. Do any of you have any ideas you would like to highlight, or ideas of your own, that might make the process more straightforward?

Dr Beasley: The thing highlighted by the Dowling report that has caused most friction for us generally is around intellectual property. The Minister mentioned earlier the desire for intellectual property. When you are looking to invest in a university and establish a research programme, you bring the problem and fund it. The last thing you expect is to have an additional charge for the patent coming back at you. It is very difficult. We have been in negotiations with some organisations for over a year. In that time I could have done the research somewhere else, got the result and moved on. We need to look at that in the round because generally, if the university holds the patent and has to pay the maintenance fee for it over a period of time because industry is not taking it up, what is the benefit of investing in that patent in the first place? The desire for universities to chase IP is a little difficult to understand, particularly when there are orders of magnitude more investment coming from industry than from intellectual property.

Q300 Chair: What do you think is behind that particular problem? Is it lack of expertise in universities? Is it a desire to get maximum profitability out of IP and a short-term horizon, or is it that they are not experienced enough and there is not enough expertise?

Dr Beasley: Yes, experience in that particular area. As their patent portfolio grows, the maintenance fees go up. Of course, if industry is not willing to take it up that is a burden they will have to take on. The US followed this model for quite some time and they are now reversing it. Here, if you work with consultants as part of a funded programme, they tend to offer the intellectual property to industry in order for them to operate and take advantage of that intellectual property.

Q301 Carol Monaghan: Do either of you want to add anything to that or are you happy with it?

James Bromley: I would add just two things. You will be aware that a number of companies operate to support people making grant applications. I have worked with one, not through SwiftKey, called GrantTree. That has been very effective in providing wider advice than simply applications, but that does seem to be an unprescribed field as a business looks to make a grant application. The other thing I have been made aware of more recently is the opportunities around EU grants and investment. It seems as though it's got a whole lot more complicated for small companies as they try to understand where they should be making applications.

Bernard Ross: State aid caps are troublesome, particularly when they seem to be imposed by European legislation, as I understand it. I am nowhere near an expert on that. It is problematic. On the grant application process and dealing with grant bodies, Innovate UK has done a tremendous job in taking it from where it was at the early stages to where it is now. Continual focus on the commercialisation strategy, and giving companies who apply for grants the instruction they need—a go to market strategy—is quite important as well. The product cannot be just research. How is it going to benefit the UK and all of us?

Q302 Chris Green: How straightforward is it for a business to identify and access sources of funding for innovation?

Bernard Ross: I think we have done quite well at it. If you have someone within the business to devote the time and energy to it, it is there for you if you spend time to look for it. When you have very early companies who have to prioritise their time, it becomes problematic. A lot of different organisations seem to interlock and overlap in some respects outside Innovate UK, but Innovate UK seems to be particularly straightforward in that respect.

Q303 Chris Green: So Innovate UK is pretty good.

Bernard Ross: Yes.

Q304 Chris Green: But outside that the innovation ecosystem is rather complicated.

Bernard Ross: There are a lot of five-letter acronyms. I can manage three, and that's about all.

Q305 Chris Green: I suppose that each of these different areas may have a particular interest in what they are enthusiastic about, but someone with a start-up business not familiar with the innovation ecosystem, so to speak, just does not know where to begin. It can be incredibly confusing, and you are busy trying to develop your product.

Bernard Ross: That is absolutely right. I am working with the founders of a company that is even smaller than ourselves, at a mentor-type level. They spend an awful lot of time

trying to find out which acronyms are genuinely barriers and gatekeepers rather than introducers and facilitators, particularly in healthcare.

Q306 Chris Green: One of the things about the internet and Google is that you can search and find so many different options that you just do not know where to begin. Mr Bromley, have you had a similar experience?

James Bromley: As you say, you can search with Google—other search engines are available—and struggle to ascertain where you should spend your time. You can engage with specialists, who certainly for me, outside SwiftKey, have been a very good way through the maze, but it has become a lot more complicated. When SwiftKey started five years ago, it was TSB that was relevant for an internet start-up business, and there were not as many different places where we could apply.

Q307 Chris Green: At a previous Committee meeting we reflected on the fact that the innovation ecosystem is incredibly complicated and there are all kinds of different sources, so a front end for people with ideas would be quite handy: "Here is the entry point and you can be directed from there."

James Bromley: Yes, but with some degree of scoring as to your likelihood when applying. If we are a very strong applicant for a grant of £100,000 but there is a one in 50 chance, we will probably not prioritise our time to make that application, even if for us there is a relatively high sum behind it. Without that knowledge, probably a lot of companies will decide not even to try to work out that ratio, or gain advice on it, because it is time not well spent.

Dr Beasley: I think it can only get worse with a lot of the regional funding through local enterprise partnerships having their local priorities as well. It will be interesting to see how all of that develops, particularly the tensions between the research councils and the local enterprise partnerships.

Chris Green: At a recent meeting, it was highlighted that different regions within Germany will have a Minister for science or innovation. If we go through this devolution process, perhaps Greater Manchester will have someone specialising in it and therefore you would have yet another route in, so we have to look at access.

Q308 Chair: Mr Ross, I was interested in your comment that you had done an analysis to find out the good acronyms and the dodgy ones—the ones that just act as gatekeepers or barriers. We are quite interested in this. I am very upset by Professor Dowling's diagram, which I have somewhere in my pile of papers, that looks like a spider's web of different organisations in the innovation landscape. Would you like to name and shame some acronyms which are troublesome for you?

Bernard Ross: Am I allowed to do what the Minister did and say I do not want to prejudice your inquiry?

Q309 Chair: Or that now would not be an appropriate time to comment. No. You can write to us afterwards if you like, but it is in the public domain.

Bernard Ross: I would not mind doing that.

Q310 Victoria Borwick: Do you have any particular grounds for believing that the funds available from Innovate are sufficient or insufficient to make the most of the assets created?

Dr Beasley: From a large business perspective, we are very interested in the challenge-based funding calls. I think they have been very successful, so increased funding in that area would be very welcome.

Q311 Victoria Borwick: It is a very welcome point. Does anybody else have any views on that? Dr Beasley, do you want to say a bit more?

Dr Beasley: We have used that very successfully to attract funding from headquarters. It has the benefit of lowering the threshold of interest for additional funding from industry. It also gives the opportunity to seek out start-up businesses to bring them into those sorts of development programmes. I mentioned before that we have university partners. We try to work with our university partners to utilise the system and draw the initial concept development worked up at the university through the valley of death into something that could be a product.

Q312 Victoria Borwick: Do you have a view as to possible further activities you might pursue if more funding was available?

Dr Beasley: Siemens is a very broad business. Certainly, a lot of our business overlaps with the eight great technologies, so there is a lot of coincidence there to fund research in energy and transport systems. There is a whole range of things we could start to do, not just at a small scale. Many of the challenges going forward will be cross-subject areas—cross-theme areas. The recent internet of things call was very interesting for us. It was a shame that we were given only three months to bid for a £10 million programme, which is crazy. It can take you that long to get the contract in place in order to take it forward. The hope is that some of the larger themes can be drawn into that, and a little more time to put in some of these larger programmes, maybe with better quality bids as well, could be advantageous.

Q313 Victoria Borwick: Does anybody want to add anything on Innovate UK?

James Bromley: I don't think so. There is an ongoing challenge with the different sizes of business trying to access these funds. When Paul said it could take three months to get a contract run, I thought that a company could be born and die in that period, on the small side. I do not know whether there is an easy answer to that, but it is definitely not one size fits all.

Q314 Victoria Borwick: What about the National Physical Laboratory? Does anybody have any views on funding from that? How important is it to you?

James Bromley: No.

Dr Beasley: No.

Q315 Victoria Borwick: If more resources are needed to cross the valley of death between inspiration and commercialisation, who should be providing them? What resources do you think would be needed to help that link through industry or Government?

Dr Beasley: There is a balance between the two. Both industry and national facilities or organisations can benefit from those. Investment in particular local programmes can grow not only, say, a particular product for a business but also capability in the local university; it adds opportunities to spin out businesses around the university.

Q316 Victoria Borwick: That is fine for a large business, but I go back to some of the smaller businesses where I see the problem that there are fantastic ideas but an issue about getting them to market for a variety of reasons, using whatever metaphor you want to describe it—valley of death or not—whether it is funding, innovation or whatever. Do you want to talk briefly about that?

Bernard Ross: We are in healthcare; we have a medical device that increases blood flow, as I mentioned earlier. A very important part of what we have to fund is clinical trials. That is probably a really good example of where there is that huge gap. There is a huge gap as well between what you need to create for a health economic business case and what the clinicians are looking for and the payers are looking for. If, as a very early stage company, you create a clinical study that has all the parameters clinicians are going to be happy with, you may fall short when it comes to the extra bit that you need in the health economics area. That is frequently neglected.

Q317 Victoria Borwick: On the healthcare sector, obviously you can sell wherever you wish. Do you find that the NHS is open to new technology or difficult for new technology? We are Science and Technology, and if we think artificial barriers are being put up by other departments it is only right we should flag them up. In the technology business are you selling better in this country or abroad? Who welcomes your innovation?

Bernard Ross: The trick is that you are going to have to tell me when to stop. I am going to start now. We have created a phenomenal environment with EIS, R&D tax credits, grants and various other things that really are phenomenally supportive of innovation. We have an NHS that could be used as the first market, the first customer, for new products that could then be exported all over the world. Should we be asking the organisation we use to save our lives, our children's lives and our parents' lives to stop doing that for a moment or two and try out this new product? We want that because then we get the first customer. That is exactly what we have been able to do. Even the National Institute for Health and Care Excellence has set up a medical technology evaluation programme which is there to champion early products, innovative products, within the NHS for that specific

reason—the benefit of patients; they may have lower levels of clinical evidence but in all probability they are going to do a lot of good.

When I was younger, if you went on to a hospital ward you would see a group of nurses having a cup of tea and a chat. Nowadays, on a hospital ward if you can find the nurse he or she is generally moving at speed, so the ability for people in the NHS to learn new things and new ways of doing things is somewhat limited, because frequently they do not have the time. There are challenges in the NHS.

Q318 Victoria Borwick: To go back to the position today, which is about getting a product to market, is the NHS a good customer, or are there other preferred customers?

Bernard Ross: We have found that the NHS can be an early adopter of new technology. You have clinicians, nurses and staff and a whole range of managers who want to do the best for their patients, so we can get our products adopted. You have to join the dots, but it can become seamless when you go from research, innovation, commercialisation and into the NHS. Getting those early reference centres in the NHS, which we have been able to do, could be better. Perhaps it could be helped; it could certainly be improved, but it is there if you persevere. That has enabled us to get reference centres to export to many other countries because of the first customer being the NHS, and also private hospitals in the UK.

Q319 Victoria Borwick: Are the rest of you reasonably confident about the valley of death which was described so eloquently by Dr Beasley earlier?

James Bromley: In the online tech sector the valley of death is normally between the R&D hitting the marketplace, and then consumer adoption and eventually monetisation of that adoption. People have long talked about the UK having somewhat of a deficit in the middle funding there. I think it is improving, but the ability to move incredibly fast but then take a long bet on adoption to be a global player, as opposed to monetising a small market, is a challenge now. Being able to use your funds efficiently becomes very important, for which reason the R&D tax credits work incredibly well for us. There are improvements we can make there which fiscally would make very little difference in terms of cost, but would make a great improvement for individual companies. At the moment, they are conducted on an annual basis at the end of the financial year. Typically, you may not get your R&D tax credit for 15 months after you first start incurring the cost, at best. It has to be said that they are very efficient in the way they are processed and they are paid very quickly, which is great, but moving to a model that is more like VAT, which is quarterly, even if there was an ability to pull back if there was a disagreement at a later stage, would be very important. Many businesses in the early stages of funding have runways where £500,000 could be the difference between running for nine months or three months. That would be a very limited cost to anyone, but a massive benefit to the companies.

Q320 Graham Stringer: If you were a combination of Jo Johnson and the Chancellor of the Exchequer, how would you target public funding to improve our performance on innovation? How would you change the current system? Do we have a perfect system?

Dr Beasley: I do not think we have a perfect system yet. There are things we need to iron out. I mentioned intellectual property. That is really one for big business to try to get programmes up and running quickly. The knowledge economy is a global business. Currently, we have a world-class research network, which hopefully we can maintain. I am emphasising the need to maintain the base and the generation of original ideas. Some additional funding in the valley of death, the innovation space, to take those ideas and be able to commercialise them is probably where I would tend to focus, certainly in the short term. I am sure my colleagues will agree that growing small businesses is very difficult. Similarly, we need to take a gamble on some of the innovative technologies coming through quite rapidly now, and where the risk can be reduced, there is definitely interest to do that in areas of the world that support it.

Q321 Graham Stringer: Could you make a prediction? Do you think there will be more private sector money going into innovation, or do you think people will sit back and wait for the public sector to put in more money?

Dr Beasley: Certainly for business, there is a need for some sort of stability. The introduction of the impact agenda and the industrial strategy five years ago was quite important for us to convince headquarters that there was strategic importance in any investments they made, and we could grow that. The possibility now that some of that would be reversed and that there is potential for a cut would call into question future investment in this particular area.

Q322 Graham Stringer: That is answering a slightly different question, isn't it? I assume a standard level of public sector funding. Do you think that private capital is going to put more money into science and innovation or less over the coming months? Is it going to wait for the public infrastructure in science investment to improve and go on the back of that, as appears to be happening in antibiotics? The development of antibiotics has slowed almost to a halt and they are waiting for an initiative, which has actually happened, where the Government say, "Why don't we put this money in and do it this way?" Which do you think is going to happen?

Dr Beasley: When ideas come up that have an opportunity to be developed and investigated, interest from industry will be there, particularly if there are opportunities to support that development. If there is a supportive ecosystem, I can see industry continuing to take an interest. In the particular case of healthcare and antibiotics, there are special cases associated with that, and the cost of developing those technologies, but for some of the smaller businesses making small pieces of equipment that are critical to various industries, where the technology has been developed interest will still be there, as long as the ecosystem is there to support it.

Q323 Jim Dowd: Can I look at the role of public expenditure on its own vis-à-vis research and innovation? What do you feel is the correct balance between the amount of public money spent on one and the other?

Bernard Ross: To me, it seems to be a continuum. If either end dries up, you get stalemate and everything stops. If you do not have investment in fundamental science, you will not

find out what can be commercialised. I do not have the actuarial qualifications to be able to say investing in which, at what level and what priority would give you the best results. The only answer I can see is to do it all.

Q324 Jim Dowd: Indeed. Wouldn't we all, always? What about supporting pure research, which is very unlikely to be supported by commercial business interests? Is that not where the balance should lie?

Bernard Ross: We have had a total of £2.5 million of Government support. This year, I am paying £500,000 in national insurance; in 2019, I will be paying, God willing, £19 million in corporation tax.

Q325 Jim Dowd: This is just on your salary, is it?

Bernard Ross: I wish. The company will be paying £19 million-odd in corporation tax and about £3 million in NI. You can see that from a relatively small investment we can develop something quite substantial. If that is ploughed back in part in helping companies such as ourselves, as well as paying for roads and everything else we need to pay for, we have to put it into fundamental research, because without understanding how the body's vascular system worked in the first place there is no way that the clever guys who invented our technology would have known that stimulating specific nerves at a specific point would have such tremendous benefits to the human body. You cannot take any of it away. Where is the balance? I don't know.

Q326 Jim Dowd: Does everybody agree with that?

Dr Beasley: I completely agree. You have to invest wholly in the research base to generate the new ideas. In the 1970s and 1980s many new ideas were commercialised overseas. It really depends on what you want to do with that research base. Do you want to do that? Do you want to create the ideas but then commercialise them overseas? There has to be a balance. The businesses we have in the UK have strategic relationships with universities, not just to look at product development; we are now also looking at fundamental research development to take many of the products we are looking at today and see how we can continue to progress them and have a product business going forward five or 10 years. There are small technologies coming through, such as graphene. By adding that to existing products, you can prolong the lifetime or improve the performance of existing products in a very short space of time. We are now getting involved, not just on technology development but also on product development with universities.

Q327 Matt Warman: Could the private sector be doing more to increase the UK's overall spending on research and development? Conversely, what do you think would happen if the Government cut back on what they spend on private sector investment?

James Bromley: If there was a cut-back in some of the incentives, for internet businesses there is a real decision as to where you base yourself. As we have seen recently, companies can operate in and pay taxes in different ways in many different jurisdictions.

For efficiency in converting capital to research and output in the UK, the tools that are made available to us are good, but this is a global stage and it is moving incredibly quickly. To pick up the last question, you have to benchmark the amount you want to assist by how you see the global competition evolving, not just in the UK, certainly in the tech sector. Any suggestion of hesitation when people are making plans would make it very difficult for companies to consider where they base and how to continue raising funds.

Dr Beasley: I completely agree.

Bernard Ross: I totally agree with everything that has been said. When we have headline figures, such as, "UK Government investing £500 million in this and £1 billion in this in science and technology," it helps people overseas to see that the UK is serious about where it is putting its money. We have just attracted a £3 million equity investment from a Japanese company. The reason is that they like the idea of what is happening in the UK, in preference to or perhaps as well as investing in their own markets. That kind of statement at a high level is surprisingly effective.

Q328 Matt Warman: It sounds like you all think that the balance between public and private investment is pretty good at the moment.

Dr Beasley: You have to fold into that the fact that we have a world-class research network. My colleagues in Germany are chasing the money; they are for ever saying, "Oh, well, we get a better funding model in Turkey," but the fact that we have a very high quality research base as well, and an attractive method to access it, is exciting and interesting for us to continue to invest.

Q329 Matt Warman: In a sense, what is holding back increased private investment is a lack of increased public investment.

Dr Beasley: I would say it is a long-term strategy. If you feel, after you have made the investment, that every x number of years the strategy is going to change, there will be some hesitation. It has taken five years for us to get into a position where we have re-established a research centre in the UK.

James Bromley: In terms of your question about whether it is enough, I think the SEIS and EIS schemes have been absolutely brilliant for tech businesses, but there is one major issue: they have a lifetime cap. It has been under revision, but it is a very serious issue. As businesses like ours grow to scale they need to continue raising funds. They cannot access funds, yet they are still risky—although not too risky. By nature of the fact that we are an R&D-focused business, it will have inherent risk, and you would expect and deserve that incentivisation for investment. To commend what is being done with EIS and SEIS is correct, but there are some dark clouds looming for a number of companies who are reaching their lifetime limits.

Q330 Chair: Dr Beasley, in a way you have answered why you transferred R&D investment to the UK, so this is probably for Mr Ross. Why are you here and not in Silicon Valley?

Bernard Ross: Me?

Chair: Go on.

Bernard Ross: It was for personal reasons as much as anything else. You balance it. Britain is a good place to be. Before this I worked raising funds on the east coast of America to acquire globally pharmaceutical assets from university, and then setting up companies in the States listed on the stock exchange. I was raising money on the east coast, doing M&A in California and licensing technology from Japan. I fancied being home a bit more, so setting up a company here was good. Why do we stay here? Access to capital has improved in the UK. With access to earlier stage capital, because of EIS and SEIS, we are able to grow here as well. With Innovate UK and access to other funding, it is not a bad place to set up and maintain a business. We have to make sure that in our case the business is not sold too early and that there is the ability to build up a very large company in healthcare in the UK, and keep it in the UK. I believe that environment is in place, and we should keep it.

Q331 Chair: Where are you based?

Bernard Ross: In Daresbury Innovation Centre.

Q332 Chair: Do you find that access to capital outside the capital, London, is as good, or is it mainly London-centric?

Bernard Ross: I come down to London every week. We have offices just west of London in High Wycombe as well, because this is where they keep the money.

Q333 Chair: You find that access to finance is centred on the City.

Bernard Ross: We have got funding from outside London. That was a bit of a flippant remark. I should not have said it—apologies. By and large, the country is tilted in this direction somewhat, but there are other areas where you can access capital: Liverpool, where I live, and in Manchester, Leeds and Sheffield, but they are smaller pots.

Q334 Chair: Mr Bromley, as a tech start-up what are you doing?

James Bromley: We are incredibly proud to be British. When the company started five years ago it was a very different environment. We had some early support from the Technology Strategy Board, and we were helped greatly by some of the organisations to move us to a more global stage. I have a few observations. When we create any materials we write in American English because that is our main audience; the most popular country for using our product, which is a keyboard that you can install on your mobile phone and makes it easier to type, is in America. We have opened an office in San Francisco and we have people based in Silicon Valley, so we have tried to straddle both. The really important thing we need to understand is that there are now North American companies based in London that we are aggressively competing with for staff. They have a different

tax and funding structure from ours. Our big challenge as we go forward is not where we are based but how we are corporately structured against some of those Goliaths.

Q335 Graham Stringer: I asked a question earlier about what you would do if you were George Osborne or the Science Minister. You did not indicate that tax benefits compared with North American competitor companies would be an advantage, but that was a very interesting answer. I would like you to expand a little.

James Bromley: I was referring to the number of high-profile companies that trade in substantial volume in the UK and repatriate revenues to different elements of their companies without participating in the taxation system as one might expect, rather than as the rules might be written in the UK.

Chair: We might follow up that point, but we have come to the end of the session. Thank you all for coming before the Committee at what was short notice. We are very grateful to all of you. It has given us an important perspective in our inquiry which we have not had yet. We have had Innovate UK here, who told us about their work, but it is always very helpful to hear from people on the receiving end to check out the facts. Your answers have been very to the point and have given us a lot to think about. I am very grateful to all of you for taking the time this afternoon.