HOUSE OF COMMONS

Business, Innovation and Skills Committee

Oral evidence: Business-University collaboration

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Witnesses including written evidence where submitted:

At 9.30am

Dr Malcolm Skingle, Director, Academic Liaison, GlaxoSmithKline

Professor Paul Beasley, Head of R&D, Siemens

Dr Henner Wapenhans, Head of Technology Strategy, Rolls Royce

Watch the meeting

Members present: Mr Adrian Bailey (Chair), Mr Brian Binley, Paul Blomfield, Caroline Dinenage, Rebecca Harris, Mr Robin Walker, Nadhim Zahawi

Questions 311-364

Witnesses: **Dr Malcolm Skingle**, Director, Academic Liaison, GlaxoSmithKline, **Professor Paul Beasley**, Head of Research and Development, Siemens, and **Dr Henner Wapenhans**, Head of Technology Strategy, Rolls-Royce, gave evidence.

Q311 Chair: Good morning. Can I welcome you and thank you for your willingness to contribute to our inquiry? Before I go through the formalities, Brian, you wish to make a declaration.

Mr Binley: I wish to declare an interest. I am the vice-chairman of the Northampton Enterprise Partnership, which is the recognised LEP for our county.

Q312 Chair: Thank you, Brian. It would be helpful if you would introduce yourselves for voice transcription purposes, starting with you Malcolm.

Dr Skingle: I am Malcolm Skingle. I work for GlaxoSmithKline, a pharmaceutical, vaccine and consumer health care company.

Professor Beasley: My name is Paul Beasley. I work for Siemens. I am Head of R and D in the UK, and cover all of our four sectors in the UK and corporate research.

Mr Binley: Would you be kind enough to speak up? I am getting quite aged.

Dr Wapenhans: Good morning. My name is Dr Wapenhans, and I am with Rolls-Royce. I am the Head of Technology Strategy, and as such my responsibility is planning and delivery for future technologies. Part of that includes the academic network we work with.

Q313 Chair: Again, please speak up slightly. Do not be worried about projecting your voice; we will assume you are not shouting at us. Thank you for that. If I could just open, the Science and Technology Select Committee has, of course, done a report on bridging the so-called "valley of death". That report made the point that the majority of business engagement with universities should be driven by business need. Can I ask, from your perspective, do you agree with this? Who would like to lead on this? I will just say that some questions will be collective and others will be individual. Do not feel that all of you have to answer every question if you have nothing to add to what a previous speaker has said. Professor Beasley, you wanted to come in on this.

Professor Beasley: Yes, this is a new area that Siemens is starting to explore in a co-ordinated fashion, working with universities. Our engagement with universities covers our four sectors, and is driven by our business need through recruitment of new talent coming into the business and also development of solutions to problems within the business.

Q314 Chair: Do either of the other speakers want to add to that?

Dr Wapenhans: Yes, certainly; I can add something to that. We see that the engagement with universities is driven by the business need, but actually there are a lot of mutual benefits that come from this engagement. We bring the real-world problems to the science community and we work together with them to solve those problems. That gives academia an avenue to receive research funding and build infrastructure. In working with industry to deliver real impact, it raises the competitiveness of the universities and their attractiveness to students, both domestically and from abroad.

Q315 Chair: Can I just explore this further? All three of you are representatives of major research-intensive businesses. I am thinking perhaps of the smaller businesses and, if university research and collaboration is driven essentially by business needs, you may have a lower level of business-driven innovation from smaller businesses than, say, the ones that you represent. That in turn may mean that universities are not aware of them or are not engaging with them to deliver that. Is there perhaps an argument for having a more entrepreneurial and business-driven culture within universities? Sorry, that is a rather long, rambling way of putting it, but I think you probably got the gist of it.

Dr Skingle: There is obviously a difference between the SMEs, the biotechs and the large pharmaceutical companies. Companies such as GSK will have people like me whose role is to leverage the science and the funding for the universities. That happens globally and we are benchmarking all the time. I have got a small team in Stevenage and I have got a couple people in the US. We do about 500 research collaboration agreements a year. Obviously for the SME sometimes they will have a platform technology—they might be world-leading. They will probably know through bibliometric analysis who the best groups are. The universities will seek to chase someone—such as any of us sitting along this row here—because they know that there will be a repeat prescription and they know there is a lot of research we want to engage in with universities, whereas they will not put

so much time into going after the biotechs and SMEs, because they know they have limited cash, limited time and are unlikely to be repeat prescription customers. That is the difference.

Q316 Chair: Have you anything to add to that?

Professor Beasley: I think the other factor, of course, as Malcolm said, is that we have dedicated departments to work on these programmes, but certainly within SMEs all of the employees are fully engaged. To spend time going out to search for appropriate universities is very difficult for them. The focus, clearly, within many of those businesses is to get product out of the door, so any engagement has to be fairly streamlined for them to take advantage of any collaborations they may want to do.

Q317 Chair: Yes, I appreciate that in many ways this question is better asked of the universities than you, but it is interesting to get your perspective. Could the universities themselves, by having a more entrepreneurial culture within their departments, do more from what starts as general blue-sky research to develop a commercial potential?

Dr Skingle: I think the knowledge transfer offices in universities have dramatically improved over the last decade. Organisations like PraxisUnico have done a great job in bringing people up to a level where they can negotiate across different sectors. I always try to think of things from the other person's perspective. I know pharmaceuticals inside out, and engineering companies will know engineering. Those poor guys in the universities have to deal across many sectors. If there was one criticism of more junior staff members in knowledge transfer offices, it would be that they tar everybody with the same brush. If you are talking about royalty provisions and milestone payments, it would be completely different for a piece of software that took three months to develop compared with a pharmaceutical that took 12 years to develop.

Dr Wapenhans: It is healthy for universities to tend to become more entrepreneurial. We work in long-term relationships with universities and we innovate within the space of the research that we do with the universities, but we are open to universities approaching us with new ideas, because innovation is not limited to the area of research that we are co-operating on.

Q318 Mr Binley: Could I ask a supplementary, particularly in regard to Mr Wapenhans? Rolls-Royce have a very sizable supply chain. Most of those suppliers would be classified as SMEs. They are pretty important not only to your manufacturing but also, from what I have seen of Rolls-Royce, to your research and development work. I was wondering what connections your company had with those supply chains to encourage them to work with universities?

Dr Wapenhans: I would say there is quite a lot of co-operation in manufacturing and manufacturing research. The Committee may be aware of the Advanced Manufacturing Research Centres, now the High Value Manufacturing Catapult, which is really an area where one brings together the prime plus various supply chain partners to solve problems of, in this case, productionisation. In terms of research for future products, it is a little bit less connected because it is more early research and blue-sky activities that we do with universities, and we do not yet co-operate and link this with suppliers in many cases. That

said, we do so in the research projects that are funded by, for example, TSB or on the European Union level, where we form partnerships with other companies to produce joint proposals to do research. In those partnerships we also include our universities. There is a natural way of connecting the community through a network like that.

Q319 Mr Binley: Can I just follow up very quickly, Chairman, if you will allow me? It is well known that SMEs are the most difficult sector to reach and motivate in terms of what might be considered extramural activity. They are all things to all men in many respects, with the boss often being the HR guy, the PR guy and God knows what else. I just wonder whether there is any more you could do to help that outreach to bring them into this sort of arrangement. Some of those companies are the acorns that are going to be the oak trees of tomorrow, we hope. I just wonder whether there was any more you could do to promote these sorts of connections in a practical sense.

Professor Beasley: From our side, as I said, this is a new space for us to work in. I welcome the TSB's AMSCI core—this advanced manufacturing core. We have engaged with many of our SMEs in order to try to put programmes together. Many of the SMEs are interested in this and are willing to support it. Really, I think, even in those cores, the threshold of support funding for them to engage is still probably too high. That can be a barrier to doing that.

Mr Binley: I am grateful for that.

Dr Skingle: I just want to make a point about the biotech SME supply chain. Obviously our supply chain in pharmaceuticals is not as well defined as in, say, aerospace or manufacturing, but it is an important part of our environment that we require to be successful. Actually, you need a three-pronged attack. You need a strong academic base, you need the strong multinational, technology-driven companies that are driving the science forward, but you also need those biotechs who are fleet of foot and are going to take the technology to a point where we can engage and take it on.

To that point, a few years ago we worked with Government, the Wellcome Trust and TSB in particular to set up Stevenage BioScience Catalyst, which is an incubator site next to the main R and D site for GSK at Stevenage. The purpose of that was small companies will often take technology to a certain point but do not fully understand the regulatory framework to take it to the next stage. By being adjacent to GSK, they can then tap into that resource and we will almost act like non-executive directors to help those small companies, because we see that as adding value to the science base that we ultimately tap into.

Q320 Chair: Can I just come back to the Government response to the original Science and Technology Committee report? In that response, on the issue of business-driven research, the Government said: "For the majority of businesses the engagement of universities should be driven by the business need. For those companies that are not aware of what services or help a university can provide then the use of an Innovation Voucher is an ideal way to create that first engagement, breaking down any barriers that may exist." I appreciate that you do not need innovation vouchers, but have you, from your perspective as major players in this particular area, any assessment of how useful these are and whether that particular approach might be developed at all?

Dr Skingle: Yes; I think the innovation vouchers have impressed. It was piloted early on. It started in Holland, but certainly Aston piloted it and others then took it on. I have only heard good things about the innovation vouchers. It does decrease the barrier to entry.

Professor Beasley: I have no experience of the matter.

Q321 Chair: You have partly answered some of my subsequent questions, but there is just one I would like to come to. In 2013, the BIS Department did a survey of innovative businesses, and what arose from the responses to that survey was that 35% of businesses ranked clients and customers as of high importance as a secure source of information for their innovative activities whilst only 2% cited universities. That does seem rather strange, in view of your experience. Why are universities not perceived as more useful in terms of sources of innovation for companies? What is your view on that?

Professor Beasley: We are looking to supply goods to customers and clients, so any problems that arise we need to get solved very quickly in order to correct things or improve; if there are suggestions from the people using the equipment, then that is really a primary focus. Typically the approaches we get from universities are around the sale of, or interest in, a technology for us to try to find a problem for them to solve. That is generally the case.

Dr Wapenhans: The survey result is not surprising, because in order for an innovation to work, you have to have a customer. Working closely with a customer to figure out the problems that will need to be solved or how to add value to the customer is a natural place. That said, I am sure the three of us here are amongst the 2% that cited universities as an important source for innovation. The point I would get at is: we work closely with our universities, so we have a mutual understanding of what it is we are trying to achieve, but the motivational driver for some of the academics tends to be making discoveries so that they can publish and create citations, because that is the way to make a career in academia, as opposed to having some more factors that would lead to real application and real sources of innovation.

Q322 Chair: We are going to go into this shortly, but could I just ask you generally: do you think that business-university collaboration is perhaps over-stated in its importance?

Dr Skingle: I personally do not, but that is because I have done it for the last 20 years. The reason I do it is that I know it adds value to my organisation. If you think about it, we have got 12,500 pretty good scientists doing world-leading research, but if you look at the amount of research we ultimately exploit, they can only ever do a very small percentage of that total research. Frankly, we will get it where we can. That might be biotechs; that might be through licensing or acquisition; but from my perspective it would be universities. My experience is that when we engage with universities, they are keen to work on real problems rather than just theoretical problems. I always say that it takes a little while to convince someone to work with us for the first time; I never have any struggle for the second time. That is because they want to work with us, because they get access to all the other platform technologies, reagents, et cetera, that would be commonplace to us but they would not have access to. That drives their science forward and together we move that bit of the science base forward.

Dr Wapenhans: I would say it is absolutely not overstated. The university collaboration is vital to us—vital to us in the future. The fact that we have such strong universities in the UK is a strength for us as a company.

Professor Beasley: The only thing I would add is it also gives you great flexibility. Siemens has a broad engagement from energy to health care, so to be able to react and explore new markets quickly is a good thing.

Q323 Paul Blomfield: Both universities in my Sheffield constituency have got excellent examples of collaboration—notably the AMRC, in which Rolls is clearly a key partner—but we have heard from academic witnesses as part of this inquiry that the emphasis on published research within the Research Excellence Framework and therefore within the drivers for universities is potentially a barrier to collaboration, particularly to the movement of people between industry and universities. Would you agree with that assessment? The point was made that excellent research can be going on within industry, but because it is not published, it does not carry the same weight and therefore limits transferability.

Dr Skingle: I disagree with that view, so I don't mind starting. Over the last 20 years I have probably signed, as a conservative estimate, about 5,000 collaboration agreements around the world with different universities for GSK. I can count on one hand the number of times there have been real issues about publication. Our scientists are just as keen to publish as the academic scientists. Sometimes we have to make sure the publication strategy is consistent with our patenting strategy, and the academic will know that there might be a slight delay before we publish, but the truth of the matter is they also know that the publication is in the bag, so they are not going to be gazumped by anybody and they appreciate that. I don't think it is the issue. Everybody always says, "Publication is the issue." It is true that it is a major driver for academics, to publish; of course it is, but our guys do their fair share of *Nature* and *Science* papers as well

Q324 Paul Blomfield: Is that the general view?

Professor Beasley: Yes.

Dr Wapenhans: There is a balance we have to strike. Clearly when we are doing research with the universities, if it is published too fast, we lose the value of the intellectual property. Some of our academics make the active decision to say they would rather be closer to industry and do interesting work than become the best academic in their field, because they would have to bias it more towards the publications. There is no answer to how to solve it in an equitable fashion for everyone, but I would say that there could be more encouragement of exchange between industry and university academics, like industrial fellowships and so on. We have found them to be very valuable, but there are only a very small number of people doing this. There are maybe a handful of people inside of Rolls-Royce who have got that opportunity to spend a year in academia again or to get a professor from academia to spend a year in industry. As I said, that really takes that kind of academic who has made a decision to be closer to real-world issues.

Q325 Paul Blomfield: That is interesting, because that was going to be my follow-up to Malcolm's point—that publication was not necessarily a problem—but are you therefore satisfied with the transfer of academics between industry and universities? You are

suggesting not, and that is a very helpful suggestion about how that might be addressed. Have you got other views on that issue?

Professor Beasley: We have our own corporate technology, mainly based in Germany, and I think there are exchanges there. We have not really got a corporate technology group within the UK, so it is more difficult for that exchange to happen in the UK, because you are taking people directly from production and trying to replace them with somebody from academia.

Dr Skingle: I have got a bit to say on people exchange. Just before we leave publications, I would like to draw your attention to a study that was done a couple of years ago by Thomson Reuters on behalf of Nesta, where they looked at the impact factors of the UK against half a dozen other countries, including Germany, Finland and the US. They put the study together to show that the UK punches above its weight, which it does. In biological sciences, the academics in the UK had higher impact factors. In the same study, they also looked at industry papers and what they found was in every country the impact factor for industry was slightly higher than that for academia. That did not surprise me; it surprised a few academics. That is probably because we only publish when we have got something substantive to say; it is not our major driver to publish. The really interesting point from my perspective in that study was that the combined papers had higher impact factors again. That is the message that needs to get out there. It is not surprising: if you take the best of both sciences and the best of both cultures to drive the science forward, that has to be beneficial. Whenever I go round to universities and give talks, I always make that point and show that data, because we both bring so much to each other's environments.

On the people exchange thing, wherever there is people exchange there is value, because not only do you get to see what the other side of the fence are doing, but you also get to tell them your problems. It might not be the person you are collaborating with who can deal with that, but they will know someone who can and so it increases those networks. People exchange at all levels. Undergrad placements, when sandwich students come in for a year—we've currently got 311 of those around our sites in the UK—are always valuable because they forge links with the supervisors. We are currently co-funding with the research councils 240 CASE awards. We have got 155 post-docs that we are supporting. Many of those will come and spend time in industry either to teach or to acquire a technique, which they will then go back to take the other way. There are schemes from the research councils like the BBSRC FLIP awards and the Royal Society Fellowships, where they provide funds for a person either to go from industry into academia or the other way. We see it as so valuable that just in the last six months I have put five agreements in place where five of our senior scientists have taken visiting chair positions at Russell Group universities. They spend anything between one and four days a week embedded within the university. That is either to learn something, to teach something or to help with curriculum development. I see that as essential if we are to be on the same page in real time.

Q326 Paul Blomfield: Before we leave this issue, are there any other views on how we might more effectively encourage people exchange?

Professor Beasley: Certainly we are experiencing the undergraduates and postgraduates with CASE awards. As I say, we are just starting to get into this space.

Chair: Sorry, can I just remind you to speak up? Brian is having difficulty.

Professor Beasley: Sorry, yes. We are exploring lots of CASE awards now and they have been very valuable. We are just looking into now a first case of post-doctoral support and whatever. So yes, it is very useful.

Q327 Paul Blomfield: Can I move on to another issue in relation to the Research Excellence Framework? That is the introduction of commercial impact criteria into the REF. Do you think that has altered attitudes towards collaboration from your perspective?

Professor Beasley: Definitely. Five years ago, certainly our experience was that industrial collaboration was almost seen as a stigma attached with some of the research, but we are now proactively approached to identify research programmes, asked about problems that we may have, offered solutions to problems they think we have and things like that. It has very much changed the whole scenario.

Q328 Paul Blomfield: Is that a general view?

Dr Skingle: I feel even stronger than that. I sit on REF Main Panel A. The reason I do that is I feel strongly that if you take public purse funding from the taxpayer, you should at least think about the potential impact and potential exploitation of what you are doing. It does not necessarily mean that everything has to have impact—we need as much blue-skies research to underpin the applied research, for sure—but academics are smart people; they chase the research funding. I certainly have academics phoning me now talking about collaborative proposals who certainly would not have done five years ago. The Pathways to Impact agenda with the research councils and the impact agenda from HEFCE have done more to change culture in the last few years than anything else that has gone before them. Interestingly, I think once the academics do engage and they see the value of the engagement, because it enriches their own scientific area when they collaborate with us, they then come back and word spreads and we cannot keep up with the amount of potential collaborations that we are trying to put in place at the moment. From a taxpayer's viewpoint again, when the REF impact studies are published when the REF concludes in November, I think you, the politicians—and indeed the public at large—will have enough examples that you can hold up to say, "Well, it is really worth maintaining the science funding because these are the outputs." There are some great examples in there, I have to say, across all sectors.

Dr Wapenhans: It is still fairly early in the way that the impact of the REF can be seen. Clearly, we have seen lots of universities approach us and ask for assistance in their assessment and their submission, so in that sense there is an immediate effect that we have their attention and there is more attention that needs to be paid to it. It was quite a frantic few months because it was one deadline for everyone, and I think there will be value once it becomes a repeat process. As you know, we have our long-term relationships with our university technology centres and we do go through an annual type of review. It is like a mini-REF internally, where we then draw conclusions about what needs to improve, which is something that any business does when thinking about performance management. It is a really good start. We are encouraged by it; we just need to see how it will develop going forward.

Dr Skingle: One of the things that did it for me early on in one of the REF meetings was that—they have international panel members on these various panels—one of the guys

from a very prestigious North American university said that if the UK get this right, we will be the envy of the world. I agree with that. I think we have grasped the nettle and said, "Look, we need to get more out of the university base. We are putting a lot of money into science funding." When the examples start trickling out—and I hope we do publicise them, rather than just sticking them on a website where no one sees them—I think you will agree that there is great science in lots of different scientific areas.

Q329 Paul Blomfield: Can I move specifically on to an aspect of Rolls-Royce's evidence? You stated that you "would welcome discussion on additional metrics that recognise successful university-business collaboration, and linking a proportion of funding aimed at UK growth to those metrics". What additional metrics do you think should be considered?

Dr Wapenhans: Perhaps first I should say that that comment was intended as a "Let's have a forum to discuss this", because we do not think we have the final answer to it. If we look at what we do internally with our UTC network, we have some hard measures, like patents, the amount of research revenue we can win proposals on and things like that, but we take a balanced scorecard approach to it, because there are a lot of soft factors in here as well—leadership, skills development, sustainable capability development and things like that. We have not sorted out yet what our final answer is in terms of a scorecard that we might develop, but I think taking that kind of an approach that would be open and saying everybody is doing it in this way, much like I said, would lead to a much stronger kind of an improvement in performance culture around it. Right now, we ask each one of our UTCs once a year to just give us the top six things that they think have made an impact to Rolls-Royce and to try to be as succinct and as numerical as possible. That is the only instruction we give them, because we know sometimes it is the little thing that made a big difference and sometimes it is really easy to say that it had a huge impact. What we are trying to encourage is a further development of the REF and how the REF is being conducted.

Q330 Paul Blomfield: I wonder whether Paul or Malcolm have any additional thoughts on the issue of additional metrics.

Professor Beasley: Not really. As I say, in the UK we have announced our strategic universities only recently, following similar discussions there—"How can we qualify those? Are those the right universities to partner with?" In that respect, we will have to try to put some metrics in place in order to gauge that.

Dr Skingle: Any assessment exercise is probably good for that assessment exercise, because the academics, as I said before, are very smart people—probably smarter than the people setting the rules—so there are going to be games played in REF and formerly RAE submissions. For any numerical KPI that you can put together, you probably have to look at a whole range of things to determine how serious a university is about engaging with industry, but for an impact case study for every 10 academics over a period of a REF exercise, you should be able to do that, I would have thought, with the amount of funding going into UK universities.

Q331 Mr Walker: I was struck by some of the points that Dr Skingle was making about the Thomson Reuters survey and also about the UK having the potential to be the envy of the world in this respect. A lot of the evidence we hear is that we are playing catch-up, particularly with Germany and Scandinavia in respect of university–business collaboration, so I was quite struck. You are all big multinational companies that are operating in lots of locations. Would you say that currently UK work with universities and research is greater than its fair share? Is there more focus on business-university collaboration in the UK than in other jurisdictions or is the picture more complicated than that?

Dr Skingle: I would suggest all the companies here would work in Scandinavia, Germany, the US, Singapore, China, India and everywhere else. We are going to get the science wherever we can. One of the good things about the UK science base—and I work with funders globally—is that they are relatively pragmatic. The Government keep them on their toes to engage with industry, which is great. We have got a very strong science base, as everyone here has said today. The other important factor is that you have got the research councils, who listen to what industry want, and we will work with them to develop an area of science that is going to underpin our in-house research. You've got the TSB, who are then looking to take it to the next stage, and we are very fortunate to have the Wellcome Trust headquartered in the UK—a tremendous organisation—and, indeed, the other research charities. You have got the whole mix of co-funders, and they see me, or GSK, as leverage for them just as I see that we are underpinning science together with the funding agencies.

Professor Beasley: I would say that there is a different framework in the UK. There is lots more opportunity, I would say, but certainly in Germany, working with industry is taken as the norm, whereas here we are just starting to introduce it and promote it. Hopefully if we continue in that direction, then, yes, we can catch up.

Dr Wapenhans: It is absolutely right the UK has an opportunity to become the envy of the world in many respects. There is a UK way of doing things, so the comparison is not so straightforward like-for-like. Let me try to explain. We have come a very long way over the last few years in terms of developing an industrial strategy that the Government buys into in terms of aerospace. The Aerospace Growth Partnership had involvement with the Government that led to the creation of the Aerospace Technology Institute, which gives really the confidence for industry here in the UK to invest over a long timeframe. It is £2 billion in total, of which industry has committed £1 billion of internal investment here in the UK towards aerospace. The reason I mention this is that it is an environment, and the universities are part of this ecosystem that industry needs to be able to bring those products to market. It is a question of how we deliver the low-end TRL, how we deliver the higher-end TRL and what mechanisms we have in the country to do so.

I would observe, for example, that in the aerospace sector the UK universities have started to move into that gap that was developed because national research centres were falling by the wayside over the last decades. What that means is that some of these UK universities have got infrastructure that really is much more advanced than some of other universities' infrastructure in other countries. That is a real benefit, because that gives the researchers at the universities here in the UK much closer to a market type of experience as well. It is kind of an "apples and oranges" comparison, but I would agree that the UK is in a strong position as far as we are concerned, and that is why 19 of our 31 UTCs are in the UK and we make no apologies for that.

Q332 Mr Walker: When you refer to "UTCs", you are referring to university partners.

Dr Wapenhans: Yes. This is our model of university collaborations.

Q333 Rebecca Harris: I want to ask some questions about accessing information on available support and collaboration. Siemens, in their written evidence to us on the need to make funding opportunities and capability more accessible through a single portal, said: "The Government should not look to create its own interface without opening the data set of opportunities," because this would risk duplication of existing provision. Do the other members of the panel agree with that, and would you like to comment on it?

Dr Skingle: Looking at individual science subject areas, the Gateway to Research portal that RCUK put together used to be quite clunky, but they rewrote it and re-launched it and now it is fit for purpose. I can, for example, put in keywords like "GSK" and see every contract that we have that involves TSB funding as well as research council funding. They have got it all in one place now. Or, if we are going to a new area and I want to see who is working on chemical biology or green chemistry, I can put that in. The value of that to a company like GSK is that you do not have to wait for the publication; you can see who is receiving peer-reviewed funding, which is quite competitive, and you can see if there are any players in the space that you might want to collaborate with. From an individual topic area, the Gateway to Research works for me. It does it.

I read the transcript; I think what Siemens were talking about was accessing funding and the various schemes. There did used to be something called the Knowledge Transfer Portal with RCUK, and that was pretty good for people who did not know their way around the landscape. Even in my own organisation, there are bits of the organisation—manufacturing, for example—that are not as au fait with the university space as perhaps the people in R and D; people like me. Certainly they have said that they have struggled to get to the right technology base and to the right academics who they might work with to help drive their science forward, and so they would work with—and do work with—TSB and the KTNs to do that.

The RCUK Knowledge Transfer Portal was taken down—it is no longer on the RCUK website. I did find it useful, because I used to signpost internal people to that whenever they were asking me for potential funding opportunities. I would always ask, "Well, what do you want to do? Rather than try to find a scheme, what are you trying to achieve?" and then later on we would work with the research councils or whoever to co-fund the research. I would suggest that RCUK perhaps should be encouraged to put that Knowledge Transfer Portal back up.

Dr Wapenhans: We have such close networks already into academia that we do not really need the gateway ourselves. It is quite a useful tool. We do not really have a view whether it should be driven by Government or driven by the public sector.

Professor Beasley: Just to qualify there, as I say, this is a new space we are getting into, so we were having to work our way round—I am not as experienced as my colleagues here. It has been a tough learning experience to get round there. Again, just to reiterate, if a company like ours is investing time and effort in order to find its way around, you can see small or medium-sized businesses do not have the time and effort to do that. If we are

having difficulty coming in early days like we are now, it is going to be more difficult for small businesses to do that.

There are other minor opportunities. We talk about here funding PhDs through CASE awards. We recently found out that you can convert existing grants from the research councils into CASE awards. Little tiny things like that can have quite a large impact, particularly in new areas that you want to try to explore. Really, it is not until you dig down with the university, and if there is a desire at the university to do it, they start to promote some of these schemes.

The other impact for us is to work within our financial-year budgeting structure. To have some idea of what you want to do going forward and methods maybe to support that and the deadline dates that you need to get these things submitted for is of great advantage. It is difficult. We get approached by many universities recommending particular programmes, and if that is a fair way through a financial year, the funds are not really available in order to start things immediately. Certainly with our strategic partner universities, we welcomed their input and they drew us to their Impact Acceleration Accounts, which got the program started within that financial year and then we could kick off our own internal funding for the following financial year.

Q334 Rebecca Harris: Do you use any commercial providers to assess capability and funding opportunities?

Professor Beasley: For the UK, we have explored Research Professional. We are looking at that. That gives you a global view on all funding opportunities. I think that is one of the reasons for the comments there; it cannot be that difficult to pick these things up, and in these days of app development I am sure that somebody could find a very quick, easy and maybe competitive method to explore that space.

Q335 Rebecca Harris: The Technology Strategy Board, the research councils and the National Centre for Universities and Business are all working together to develop an online platform to improve business access to the knowledge base. Are any of your organisations involved with the development of this platform?

Professor Beasley: No.

Dr Skingle: I have been asked about it by consultants.

Rebecca Harris: Right. But that is as far as it goes.

Dr Skingle: As I say, I think Gateway to Research works. I'm not sure there is a real need for _connect, because in these days of LinkedIn and the various social media groups at a professional level, you can probably achieve the same objective. I do not think we should be wasting our money on all-singing, all-dancing, one-stop shops above and beyond what we have got. That is a personal view.

Q336 Chair: Just on the basis of that, you are obviously sceptical about the need for it, so are they really engaging resources and time in developing something that is really a duplication of those facilities already there?

Dr Skingle: I think Gateway to Research works. I do not know what else you would want to add to that. We have the world wide web; you can pretty much get to where you need to be from an information perspective. It is difficult for SMEs, as has been highlighted on a few occasions. The SMEs could do worse than having a look at Gateway to Research and engaging with the KTNs. They will know the schemes. I always get to hear about the schemes, coming from a large company, because whenever there is a new scheme there are usually 20 forms on my desk that someone wants me to sign because we are going to engage with various universities in that initiative. I will give you an example of that. When the Centres for Doctoral Training were announced with EPSRC, I had 50 requests for letters of support for those. We ended up supporting 20.

Q337 Chair: Could I just backtrack slightly? You are using a lot of acronyms that I do not readily understand. EPSRC?

Dr Skingle: Sorry. Engineering and Physical Sciences Research Council.

Chair: Thank you.

Dr Skingle: Sorry; I thought you would know that.

Chair: Yes. Well, we may on consideration but we do not naturally focus on it immediately.

Dr Skingle: Fair enough. We all slip into acronyms. So, the Engineering and Physical Sciences Research Council, and CDTs, which were Centres for Doctoral Training.

Chair: Thank you. Okay, that is interesting. I want to bring in Brian now on the TSB.

Q338 Mr Binley: Can I just refer to what Henner said about UTCs? We have got two in Northamptonshire. We have got a whole industry allied to motorsport and aerospace, which is working very often at the frontier, and I know that your involvement with them is very important, so I just wanted to support what you said about UTCs and that sort of work. However, we have heard that the Technology Strategy Board currently turns around about 75% to 80% of good quality applications from the SME sector. In my sort of world—aerospace/motorsport employs 40,000 people within about a 40-mile radius of Silverstone, as you know—that means there are a lot of good people slipping through the net. When you try to balance that with the difficulties of money in this place, you recognise that this is not the place we are going to get very much more from—certainly not enough to cater for that sizeable deficiency. I just wondered whether there were other ways—I am really looking at Henner here now, but it might impact upon the other members of the panel—that we could more effectively, in a private sense, leverage money. Some of those 75% to 80% we are missing out on could be very important indeed. Some of them might not be. I just wondered if there was a way of doing it through the private sector, on the basis that Government is not going to provide all our needs for quite some time.

Dr Wapenhans: It's an interesting question. I'm not sure we have given it deep thought like that. I would say, though, that we think that the budget for the TSB should be increased, not at the expense of other areas, because if you consider that the TSB helps bring those early ideas that are funded through the research councils into something that is then ready to cross the "valley of death", there should be an alignment between how much

is invested in early research and how much is invested in pulling it through. Typically, if there is not enough investor capacity in one area, like the TSB, we have to start looking internationally. We have to start looking at European Union level and what the funding programmes there are and then bring people along on that. I recognise that that is not easy for SMEs, because if it is hard in-country as SMEs, it is really hard on European Union level. This is where forming consortia for bids into European Union-level programmes can help, and that is where we, as a prime, do our bit to create those connections.

Q339 Mr Binley: Henner, I recognise you said that you had not thought an awful lot about this, but clearly you are in a position to be able to help us. I just wonder if you might think about it and write to us so that we can get your thoughts. I have just thrown a question at you that needs a lot of thought, and I understand that. Could you help us in that respect?

Dr Wapenhans: I am happy to do that.

Q340 Mr Binley: I would be very grateful. Any other comments?

Dr Skingle: I will just make a point on that. If I heard you correctly and I understand you correctly, 75% of TSB—

Mr Binley: 75% to 80% of the applications.

Dr Skingle: 75% to 80% do not get funded.

Mr Binley: Yes.

Dr Skingle: So the hit rate is 20% to 25%. I would say that is pretty good.

Q341 Mr Binley: But hang on. TSB are classifying "good quality applications", so they are already sorting out the applications they do not think are good quality. 75% to 80% of good quality applications really is a concern, and we need to try to crack that in some way.

Dr Skingle: Brian, that is no different to the research council hit rates, is it?

Mr Binley: My football team plays in the fourth division; I want to play in the first division. I want improve on what we are doing, and I think in our particular area of the world and the area of engineering composites and all of that sort of stuff we can improve massively. We have got the opportunity to be sizable leaders for a very long time to come. It does concern me that 75% to 80% of good quality applications are not being funded, and I want to find other ways of doing that. If you have any thoughts on that and could write to us, as Henner said he would, that would be very helpful.

Q342 Chair: Do I take it that you think the funding for the TSB is adequate?

Dr Skingle: I think all three panellists here would welcome more funding going into TSB, but, as Henner said, not at the expense of underpinning funding for the research councils on the basic research, because the basic research is as important to us as the applied research.

Chair: Okay. That is very helpful.

Q343 Mr Walker: The Association for University Research and Industry Links said in its evidence to our inquiry that many of the weaknesses within the UK's innovation system relate to low demand-side pull on technology from businesses. Do you agree with that?

Professor Beasley: As I say, we have really started to engage on a strategic level with the universities. No; I would say that we are starting to, with our strategic partners, identify problems for them to solve. Our frustration in many of these areas is you find a decent partner to work with and identify a programme and then spend the best part of several months up to a year trying to agree a contract for it. Is that piece of work that you are trying to do of value after those contract discussions? I could go somewhere else and get a contract agreed with another university more quickly and I could get the results more quickly. In some cases, that is tempered with failed approaches to universities.

Q344 Mr Walker: You do not see a lack of demand from your competitors.

Dr Skingle: Robin, you are talking to the wrong companies here. GSK last year spent £3.4 billion on R and D. One billion of that £3.4 billion was spent in the UK. We have got 30% of our scientists in the UK. When you compare that with the 4% of the global prescription market spend—usually businesses follow their market—the UK is punching above its weight. I have already given you the figures; we have 240 CASE awards and 155 post-docs. We will work with all of the funders to drive the science base that will help underpin us and others. The other thing that we are doing nowadays more than ever before—because we have to make the research dollar go even further—is working in consortia with our competitors to drive science forward. That is not only in the UK but also through the Innovative Medicines Initiative with the European Union.

Dr Wapenhans: It is obvious that we have quite a lot of demand. I have mentioned already the Aerospace Technology Institute and the fact that, if you look at the High Value Manufacturing Catapult, it is not solutions looking for a problem; it is real problems being solved there. There is lots of demand.

Q345 Mr Walker: So the role of Government is not necessarily to go out and increase demand; the role of Government is to co-ordinate that and, with things like the industrial strategies, to pull together how it can be met. Slightly against your argument that the UK is in pole position or the envy of the world, the Department for Business, Innovation and Skills' own analysis found "concerning weaknesses in the talent base, especially in terms of basic skills, science, technology, engineering and maths (STEM) skills and management skills". Do you agree with that as a concern for the UK in a competitive environment? Does that offer any specific challenges for your businesses?

Professor Beasley: Definitely. We have invested across the whole spectrum. As you may be aware, we have collaborated with the University of Lincoln in our gas turbine development to develop a dedicated engineering school looking at skills development there. We have been very active in the UTC space, as principal partners for six UTCs. We see the development of skills in the UK as a real concern. Certainly the UTCs offer a great opportunity in order to develop engineering technicians and engineering scientists of the future, tailored specifically to the business, with hands-on skills. We have a number of outreach programmes looking to develop STEM within schools. We see this across Europe, but certainly for business in the UK it is a big concern.

Q346 Mr Walker: As an international business and a business based here, you feel the UK is particularly challenged in that respect.

Professor Beasley: There are some key areas that concern us. Things like power electronics certainly are of interest. We have graduates coming from a number of universities and, even though they are fairly highly qualified, we are surprised at their level of skill.

Dr Wapenhans: STEM is certainly very important to us. It is a question of volume rather than quality, because there are excellent graduates coming out of the system here. I will come at it again from the perspective of the ecosystem. We have to start very early. We are quite active in doing the ambassadorships into the schools and we are in a sponsorship for the Bloodhound programme, which you might be aware of, which is all intended to create more passion and excitement around STEM skills so that we can get these young people through an education system—be it the technical colleges, as mentioned here by my colleague, or into university STEM subjects. We will need more people with those skills in the future—more than we have today.

Q347 Mr Walker: Can I ask specifically: what do you mean by "very early"? Is that primary age?

Dr Wapenhans: Yes, really in the primary age. There are different ways of doing it, but you can capture a young person at an early age by showing them phenomena that wake them up and make them want to explore more. We have explored this in different kinds of forums as well: what is the standing in society of somebody who has got an engineering job? There are other countries where that is a very highly respected profession. I would say we still have a ways to go here.

Dr Skingle: The Government have recently introduced the industry partnerships, which you may be aware of, where they are encouraging industry to step up to the plate and take ownership for driving the skills agenda. For as long as I can remember, our industry has never had enough of this particular skill or that particular skill. The Government say to us, "How many do you want in five years' time?" We say, "Well, we are a fast-moving business; we cannot give you a number." I have always stepped back from that, because it just did not seem to change very much; there was always this yin/yang.

Now the Government are putting real money into the skills base and getting industry to take ownership. They have just put £32.6 million into our particular industry partnership—the Science Industry Partnership. GSK are very supportive of that, and I am chairing that on behalf of the England SIP. It is a two-year programme, just to get things going. We are going to produce 1,360 apprentices and there are going to be 5,900 learning experiences. We have only had the contract signed a few months. That took a little bit longer to put in place than I had hoped, but we have now hit the road running. This month, in fact, we had our first 150 apprenticeships start. We will have 300 by Christmas and we will deliver the 1,360 by the end of the two-year period.

It is very much driven by industry, and that is the important thing. I just hope we do not have any more schemes over the next couple of years that might interfere with that, because we need to bed it in. Cogent are the skills council who are providing the secretariat, but it is very much driven by industry. I have got 20 companies, both large and

small, on the board—and it is company-only—and they are all stepping up to the plate to put their time and their money into driving the agenda. That is from pre-apprenticeships all the way through to modular masters-level training. It is invaluable.

The other thing that I have found—not knowing this world, because I had not engaged up until the last year—is how many mediocre training providers there are. What we are quite good at in industry is cutting costs and picking the winners, and we will do that. We will dock that tail of mediocrity and we will make sure that the people we are working with only provide good training.

Q348 Mr Walker: That sounds very exciting, particularly where you've got the industry engagement at a time of growth where there is a skills shortage and where you are pulling through. I guess the challenge for the long run is how you keep up that level of engagement from businesses over a prolonged period of time in which markets will change and you will go through down-cycles in which perhaps there is not so much pressure on the skills base. Do you have a view as to how you keep up that enthusiasm?

Dr Skingle: Yes, and it has happened, because industries do come and go; they ebb and flow. Already as a process, the Science Industry Partnership has helped to better join up our supply chain—it really has, because you have got people sitting round the table who are part of that supply chain. Government get it, because they realise that large companies like the GSKs of this world who do have strong training providers are dragging up the skills levels of the supply chain, and that can only then benefit us because we tap into those building blocks for our business. I really do think it is working, and I am not just saying that. I just want it to bed in. We do not want any more schemes for the next couple of years.

Q349 Mr Walker: One more for GlaxoSmithKline. In your evidence you said that "the old form of 'long-term sponsored post-docs' in the UK is disappearing as overseas universities are getting stronger, and many offer better value for money". That is obviously a challenge to the UK's position of leadership. Over what time period has that been going on?

Dr Skingle: Full economic costing has driven some research funding to be of shorter duration. Budgets for external spend are of a finite size. I chair the ABPI Academic Liaison Committee and we pool all of our data every two years. We have been doing it for more than a decade. It is interesting to look at those data. In fact, we have not published the 2013 data yet, but I would gladly send it to you. We hope to publish it in a month or two. When you look at the trends, for the last decade the industry has funded between 600 and 700 CASE awards, for which the funding has not changed, but when you look at the post-docs, they have halved since 2007. They have gone down to 250. 155 of those are funded by GSK, by the way.

A decade ago, we would have funded, possibly, a research programme for five years. We do not do that any longer, unless it is a critical mass, large programme. We would not do an individual for five years. We would always have a get-off point, where we would do a three-year agreement but we usually extend to five. Now those terms are shorter. It is almost like you are treating the university closer to a contract research organisation, where you are dipping in and dipping out. That is really not what we are about, because collaboration for me is when there is an intellectual contribution from both parties and you

both contribute to pushing that bit of the science base forward. We do not want to treat them like CROs, because CROs deliver on time and they deliver on budget; you cannot say universities always do that.

Q350 Mr Walker: What would need to change to make sure that the post-doctoral community can be sustained and have the opportunity to engage in longer-term projects?

Dr Skingle: It is pragmatism and a recognition of the fact that we put far more into collaborations than just cash. In fact, sometimes cash is the least of the problems. You add up the access to the platform technologies, the biological reagents, the transgenics—all the goodies that can drive the science forward. They are not always taken into consideration. If you were to cost that properly, you might even look at it and say, "Why are we"—industry—"doing this?" We are doing it because we are trying to drive the science base forward together.

Q351 Mr Walker: Is that something reflected in the experience of the other two businesses on the panel?

Professor Beasley: Not to the same degree. We have just started to see a number of projects reach that particular stage—go through the PhD funding—and we would really like to continue that research. It is not at a high enough TRL level to promote a KTP, but it is just in that little bit of a year or two more and we could get some really good work from that. Yes, it is very expensive compared with other global offerings, but yes, we are struggling to find ways to push that through the system.

Dr Wapenhans: I would say that post-docs are an important part of what we do with the university technology centres that we have. There may be a bit of a structural problem coming at us, in the sense that it costs a lot of money for the individual to go through studies and then have a PhD and even do a post-doc. It gets quite narrow, when you are in academia, about how many professorships there are. For the individual there is a balance here of how long they are going to stay in a post-doc role and when is the right time to move into industry. I would say that oftentimes if you just did the pure economic calculation, you would go fast into industry. That is why I am saying we might have a structural problem in this. There is something here about the adequate recognition within academia of post-docs who may not achieve a professorship type of role.

Q352 Mr Walker: So it is partly a problem within the academic field in terms of the opportunities available there.

Dr Wapenhans: Correct.

Q353 Mr Binley: Before I delve into my questions more deeply, can I ask you each—and if you would each give me a quick answer, I would be very grateful—whether you have had a contact or relationship with your local LEP? If you have, what was the quality of it?

Dr Wapenhans: Not me personally, so I cannot—

Mr Binley: No, I understand that.

Dr Wapenhans: We have had contact particular to the Derby and Bristol LEPs, because those are two areas where we have large engineering populations. It is the early days of engagement, and it still has to develop.

Professor Beasley: Similarly, I do not have personal experience of that, but within the organisation we have had contact with Manchester and Lincoln. We have two major facilities there. Certainly interactions with Manchester have been very fruitful, and I think there was engagement there with the graphene centre as well.

Dr Skingle: It is very early days, but we are working with the Harlow LEP and we are also working with the Stevenage area LEP. We have got factories on research centres up and down the country, so we will probably dip in and out of quite a few. Perhaps to be effective from our perspective, if we wanted to drive the bioscience cluster in the south east, we would need several LEPs working together because it covers a larger area than just a single LEP.

Q354 Mr Binley: I only ask because it has got to be business driven. If it is local government or quango driven, it will fail and it will not be helpful. It must be business driven, with your involvement, as it were, and that of many other people. I am really rather encouraged by that response. Can I go on to ask you: with regard to the LEPs, should they have a more active role in promoting business-university collaboration? Do you think there is an opportunity there? Can I take it further? Your question about skills is a vital question in this respect. We in our LEP have a particular connection with the county council and with the university; there is a real connect there. I wonder if you feel enough is being done at that level to answer your question about skills.

Dr Skingle: I mentioned earlier the Stevenage BioScience Catalyst, where we have small companies on the same campus as our large research site. Certainly the local LEP there has done much to help those small companies. I have personally not had engagement with them, so I am not talking from personal experience, but I know they have certainly helped the Stevenage BioScience Catalyst.

Professor Beasley: It is difficult for me to comment because I have not had personal experience.

Dr Wapenhans: I imagine they will have a role to play. We are not shy; we go out and do the collaboration with the local universities as well for STEM skills and so on, and so it will likely develop, I would imagine.

Mr Binley: The evidence we have received suggests that the Government has been hopeful that business would play more of a role in financing LEPs. I am dubious about how well that can work, and I think the Government has got to get down to recognising there is a management cost here if they are going to be of use to you. I just wonder if you have come across that problem at all—perhaps at your level you haven't. I am grateful.

Q355 Caroline Dinenage: I want to talk about private investment in research and development. In 2012, we have heard from the ONS, over half of the UK's total R and D funding came from companies that are headquartered abroad. We have had both negative and

positive responses to that. I really wanted to find out first of all what your reactions were to that.

Professor Beasley: It can only be a compliment that people want to invest in research here. Coming to previous comments my colleagues have made, there has to be the environment in order to take it on board and expand if you want to grow that technology within country. In our own examples, many of the businesses around the country receive their budget from Germany, but it is invested in order to develop technology for the local business. It is a mixed bag there.

Q356 Caroline Dinenage: Do the other panel members have anything to add to that?

Dr Wapenhans: Yes. We are in industries that are global industries. We happen to be at home in the UK and we are investing quite a bit in R and D in the UK, but we also do R and D in other countries as well. It is more a question of, when investing in R and D, also investing in value creation in the country in which the R and D co-investment is happening.

Dr Skingle: There are two ways of looking at it: either you can see it as an overseas company coming in to top-slice IP to then exploit it in their home country, or you can see it as them helping to underpin and support the UK science base. Either way, it is a compliment to the UK science base that that is happening. There is data from the ABPI that shows that 25% of the funding from UK-headquartered companies is currently going to universities overseas, so it is a two-way thing.

Q357 Caroline Dinenage: What about the risks that could potentially be associated with it? One of the people we spoke to said, "At one level it is scary, in the sense that one decision made in one headquarters in the United States could take £30 million, £40 million or £50 million out of the UK research base." Do you think that the Government is sufficiently engaged with the risk that that poses to the UK innovation system?

Dr Skingle: Again, I will say if the science base is strong, then companies will want to invest here and the companies that are already here will want to stay here. It is very much a partnership. Companies do not want something for nothing; if it is an equitable relationship and there is co-funding of research that underpins your science base and the science is good, why would you want to do it anywhere else in the world? I am hopeful that the Patent Box legislation might help anchor more IP in the United Kingdom.

Professor Beasley: Another potential knock-on from that is that in developing the technology in the university, there are also opportunities to spin that knowledge out of the university to other small companies to kick them off as SMEs of the future. You are developing a capability there that can potentially be utilised in other areas.

Dr Wapenhans: I would say in our industry doing something as large as you have mentioned there—about £50 million in one go—is a pretty significant shift, because there is a lot of infrastructure involved and longevity of programmes. Usually it does not happen quickly and unexpectedly like that. There are times in developments of industries and companies where there is a question of whether to invest quite heavily in the UK or to have to find some other place to invest, and that is a really important topic. That can be handled through things like the industrial strategy, where one has a view of something

larger coming down the track and a decision to be made whether that can be done in the UK or not.

Q358 Paul Blomfield: You all represent companies that are deeply committed to investing in R and D. As a country, we have moved over a generation from being one of the leading investors among developed economies—in terms of investment as a proportion of GDP in R and D—to trailing the pack, which poses different risks to us. Why do you think that is? What could we do about it?

Professor Beasley: There are initiatives in place—things, for us, like the High Value Manufacturing Catapult—in order to develop manufacturing again in the UK and the capabilities associated with that. You have the centres for innovative manufacturing at universities and the doctoral training centres, which were mentioned earlier, in order to develop a spectrum in a particular sector. It needs to be structured and address the key areas that the UK feels it needs to be strong in. I don't think you can go across the whole spectrum; it's just too wide and would cost too much, but if you focus and you join up all of those initiatives into something that addresses the TRLs, there is a great opportunity.

Dr Skingle: Government funding has been flat for a few years now as well.

Q359 Paul Blomfield: Private sector investment in R and D has fallen faster.

Dr Skingle: Sure, but I was telling you that we spend £1 billion on R and D in the UK.

Q360 Paul Blomfield: I appreciate that. I am looking for your perspectives as people who are committed to R and D.

Dr Skingle: Sure. Manufacturing has been mentioned. I would say that manufacturing is turning round in the UK and I would say, certainly from our perspective, it is a success story. We have got manufacturing up in Montrose, Irvine and Barnard Castle and down in Worthing, and we are winning contracts back from places where it was perceived as being cheaper to get your substances manufactured. That is because the technology that we are tapping and the skills of the people we have got are fit for purpose. There is an environment in the UK where, as we in our industry go from large batch production to a continuous process flow, there are the catapults and the engineering and physical sciences research centres that work in manufacturing that we can tap into to help us with that. We will still get technologies from other parts of the world, but we will pull them together and drive our manufacturing base here. We have also got manufacturing in other places, but it is not doom and gloom in the manufacturing base.

Q361 Paul Blomfield: I am not saying it is doom and gloom in manufacturing; I am saying there is an underlying concern about the fall-off in investment in R and D, which I would have thought is critical in the longer term.

Dr Skingle: You are right—anything we can do to highlight the Government support and the potential benefits of collaboration across sectors. We try to do it through the Confederation of British Industry, where we try to share best practice across sectors. We are not backward in coming forward when we go to other sectors who are more competent at some things than we are. We would go to automotive and aerospace for some of the

automation-type activities that are just second nature to them. You cannot be good at everything. It is just sharing best practice.

Dr Wapenhans: I really cannot comment on the wider economy. In the aerospace world, we are making a comeback, and I think what was said here by my colleague in terms of manufacturing is true too, but it will take time. It does not happen in a matter of just three or five years; it really is a generational question for manufacturing to start coming back very strongly.

Q362 Caroline Dinenage: Just finally, in relation to improving business-university collaboration, I really want to know in a nutshell what you would like to see included in the forthcoming innovation strategy, please—that puts you on the spot, doesn't it?

Mr Binley: You might want to write to us.

Caroline Dinenage: Yes. You are very welcome to put it on a stamped addressed envelope and send it back.

Professor Beasley: Well, I think all of us will probably comment on funding. It needs sustained funding in order for it to grow, and certainly no continual introductions of new initiatives or re-naming of initiatives. Industry needs some stability; it takes some time for those to be embedded for us to plan into our budget cycles and things like that. So, if anything, stability.

Q363 Caroline Dinenage: Does everybody else agree or do you have anything else to add to our wish list?

Dr Wapenhans: Broadly speaking—I have said it twice or three times already—it is about the entire environment. There is the skills agenda; there is infrastructure; there is the right support for the right kinds of strategies that are required. That is it in a nutshell, but there is lots of detail down below that.

Caroline Dinenage: As Brian says, do feel free to pop it in writing to us if you wish to.

Dr Skingle: The key things have been said. Be supportive of the impact agenda and see that through, so it does continue to change the culture in academia. A quick win would be to put the RCUK Knowledge Transfer Portal back so that people less familiar with the funding base than I can tap into it, and some continuity in the industry partnerships for the skills base.

Q364 Chair: Thank you. That concludes our formal questioning. Before I close the meeting, is there anything that you would like to say—any of you—that you feel our questioning has not covered but is important?

Dr Skingle: I think we have given it a good airing.

Chair: Good. I would emphasise what other Members have said: do feel free if, in retrospect, you feel that perhaps you would like to elaborate on an answer that you gave or maybe answer a question that we should have asked but did not. We would welcome any

further evidence that you could submit on that. We did touch on a couple of issues that we would be grateful to have further correspondence on, and indeed would be grateful if you could send that in. Equally, of course, we may feel in retrospect that there was a question that we should have asked but did not and we will therefore write to you to ask it; and, again, we would be grateful for your reply. Can I thank you very much for your participation? We hope to have the report out by the end of the year, and your contribution will be a significant element of it.