HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: Managing intellectual property and technology transfer, HC 755

Wednesday 2 November 2016

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Watch the meeting

Members present: Stephen Metcalfe (Chair); Victoria Borwick; Jim Dowd; Dr Tania Mathias; Carol Monaghan; Graham Stringer; Matt Warman

Questions 1 – 110

Witnesses

I: **Dr Tony Raven**, Chief Executive, Cambridge Enterprise, **Nick Sturge**, Director, Engine Shed, University of Bristol, and **Dr Claire Brady**, Head of Technology Transfer, Edinburgh Research and Innovation, The University of Edinburgh.

II: **Dr Phil Clare**, Chair, Advocacy Committee, PraxisUnico, **Dr Rosa Fernández**, Research Director, National Centre for Universities and Business, and **Dr Toby Basey-Fisher**, Chief Executive, Eva Diagnostics.

Written evidence from witnesses:

- Cambridge Enterprise
- PraxisUnico
- National Centre for Universities and Business

Examination of witnesses

Witnesses: Dr Tony Raven, Nick Sturge and Dr Claire Brady.

Q1 **Chair:** Good afternoon, everyone, and welcome. Thank you to our guests for agreeing to come to give evidence to our inquiry into managing intellectual property and technology transfer. For the record, could you say who you are and introduce yourselves for us?

Nick Sturge: I am Nick Sturge, director of Engine Shed at the University of Bristol.

Dr Raven: I am Tony Raven, chief executive of Cambridge Enterprise, which is the commercialisation arm of the University of Cambridge.

Dr Brady: I am Claire Brady, head of technology transfer at Edinburgh Research and Innovation, which is the commercialisation arm of Edinburgh University.

Q2 **Chair:** Thank you and welcome. From the evidence we have received, technology transfer appears to be less lucrative than other forms of knowledge transfer, such as contract research. First, would you agree with that statement and, secondly, what motivates a university to establish a technology transfer office and spend time and resources commercialising its IP?

Dr Brady: Would you mind defining lucrative? What do you mean by lucrative in that context?

Q3 **Chair:** I do not have the exact figures in front of me, but I think contract research generated about five times as much income as technology transfer. Would you recognise those figures?

Dr Raven: I am not sure we look at it from that perspective. Contract research is all about how you fund the research you want to undertake, either because industry has posed some interesting problems or because there are things we think are interesting that we want to pursue and we look for funding to do that. It is all about how we support that research. With contract research, obviously, come the costs of the facilities, the people and so on. The technology transfer part of it is what you do with the consequences of that research. As universities, we are charities and are there primarily to do things for the public good. For most universities, that is what drives technology transfer activity. If you look across the board, the US National Academies looked at this and said the money made was modest at best and negative for most of us, but that is not why we are doing it. We are not doing it for the money. It is the lowest of the priorities I have from the university. The highest is to get stuff out there for societal benefit.

Nick Sturge: Universities increasingly see their role as active players in the ecosystem, whether that is local, regional, national or international, so it is about getting research out there. My work is mostly around

supporting businesses as they grow, in the incubation side, whether they come from a university research base or not, and from our point of view, it is as much about creating jobs and the impact on the local ecosystem. For example, we have a spin-out at the moment that spun out two years ago. It is on track to have 110 people by the end of next year. The impact of that on the economy is not just that it is creating jobs; it is attracting other start-ups and motivating other academics to think differently perhaps about what they do with their research. It is very much a long game.

Q4 **Chair:** Did you want to add anything, Dr Brady?

Dr Brady: No. I think they have covered it. That is fair enough.

Q5 **Chair:** I get the sense that you disagree with Ann Dowling's review, which identified a tension between the universities' desire for short-term gain against delivery of long-term public benefit. Certainly, Dr Raven, you talked about long-term benefit being the motivation.

Dr Raven: If we were looking for short-term income, we would do very different deals. Most of the deals we do are not a typical deal, in that we do not ask for big up fronts; we just recover our patent costs. We do not ask for big milestone payments, but we do look for royalties, which are a tax on product sales, if you like, a sharing of the eventual success if it is achieved, and equity, which is the long-term value of the company that is created. We are not looking to suck out short-term money. The average timescale for a lot of the investments we are making is 10 to 15 years, from the early stage that the technology starts in a university, before it gets out. I think the Wellcome Trust and MRC estimate it is 17 years from lab bench to patient, so we are really playing a long-term game, which will go well beyond my retirement date in what I am doing at the moment.

Dr Raven: I don't think that means that universities should not have an equity stake in the technology that is spun out, to get some financial gain back into the system, but that should not be, in our view, the primary motivation.

Q6 **Chair:** But in your experience universities are willing to take a longer-term view on this and invest for the long term, not to try to make a quick profit. Why do you think Ann Dowling identified that tension? Have you seen it elsewhere, outside your own organisations? Are you the exception to the rule?

Dr Brady: In our organisation, we do our best to have productive dialogue with our customers—licensees—about how they value the technology, at what point they are going to extract value from the technology, and we try to structure deals around a business model that works for them. I do not recognise, as Tony was saying, that they have taken out short-term income. I am not aware of it in the sector. I am not saying it does not happen, but I am not aware of it.

Dr Raven: The timescale for these things happening is variable across sectors as well. Life sciences said 17 years. In software, it can be two or three years, so the returns can come back much more quickly.

Q7 **Chair:** Thank you. Changing tack slightly, the national survey of academics found that only 39% of respondents were aware that their university had a technology transfer office. Is that because that 39% have no interest or are not affected by commercialisation in their research, or is it because the TTOs are not doing enough across the university landscape and in their own individual university to make sure that their services are understood by researchers?

Nick Sturge: Looking from the edge of the university, not from the technology transfer office or from the academic base, my guess would be that a lot of academics are very focused on their particular work, and they might not see it as relevant to spin out or license out, and it does not appear on their agenda. We promote the services on offer at the University of Bristol very well and widely, but it will not appear on the radar of many. Those figures do not surprise me.

Dr Raven: It is a constant challenge: how do you reach out to people and raise awareness? We all know that emails do not get read and brochures go in bins, and so on, so it is very much a personal interaction in how you build connectivity with the community by word of mouth. We surveyed our own academics, and across our university, 80% of them are aware of us and what we do.

Chair: That is good.

Dr Raven: I can see that, if you are a small office in a big university, it is a much harder task. I have a team whose job it is to make sure people know we are there to support them when they want it.

Q8 **Chair:** Finally from me, in October, the Chancellor announced £120 million in new money for technology transfer. Have the Government communicated to you how that money will be distributed, and do you have views on where it would be best spent?

Nick Sturge: I speak on behalf of the SETsquared Partnership of Bath, Bristol, Exeter, Southampton and Surrey Universities, which is a very successful long-standing collaboration of enterprise activities, and our view is that we could use that money very usefully to do more of what we could not do on our own, and collaboratively find innovative ways of pulling more IP out of universities. We have a number of programmes already, and we could find ways to do more of that. For us it is about collaboration, because we get real opportunities both to engage with a broader set of businesses, especially more international businesses, if we start from a bigger kind of platform, and to engage across a more diverse research base.

Dr Raven: From my point of view, the most important thing about the announcement was the Treasury recognising the importance of what we

do and wanting to continue to fund it, rather than the amounts of money involved. I have had conversations with both BEIS and HEFCE about this, but there is very little detail at the moment, which we are all waiting for, as to how it will be applied. I would put it into one of the most effective things we have seen recently—the Impact Acceleration Accounts that some Research Councils have. Something like that could be more broadly spread across all the research councils. Perhaps a little more energy behind it would be very helpful.

Q9 **Chair:** In your discussions with BEIS, was there any indication about when there might be some detail around how the money will be allocated?

Dr Raven: The only thing I have been told is to wait for the autumn statement. There might be more detail after that. I would be misleading you to say that I know what is going to happen.

Q10 **Carol Monaghan:** Mr Sturge, you used to work for the SETsquared Partnership, which has been named as the best university business incubator in the world. I know that the SETsquared Partnership works across the south and south-west of England, so how is collaboration managed when the institutions are so widely spread?

Nick Sturge: The SETsquared Partnership exists to collaborate on the enterprise activities of the five universities on research commercialisation, student enterprise and business incubation. It is the business incubation piece that has been ranked globally No. 1. They are five independent institutions with their own agendas and their own relationships with the local environment, and that is critically important. The cities or the areas they are in are very different with different strengths. The collaboration benefits from a common brand to be able to deliver things on a broader scale. For example, we can run investor showcase events in London, where we bring people from a pool of 250 companies into one place, whereas if we were doing it on our own, it would be a much smaller pool. The collaboration is managed at multiple horizontal levels across the universities; it is about aligning the common bits of different agendas. It works very well. We have been doing it 12 or 13 years.

Q11 **Carol Monaghan:** From what you are saying, it sounds as though it could work in a much wider geographical area. Do you think that would be possible?

Nick Sturge: The principles of how we operate and the learnings we have made along the way can be shared. As to whether one collaboration can exist too broadly, you get a complexity of numbers, and it may be exponential in terms of the complexity of relationships. Universities are complex organisations with their own strengths, and, as I say, relationships with the city. In the south of England, the south-east and south-west, where we are kind of split across, there are a lot of similarities. I would suggest that in different parts of the country there

are very different areas of focus. The principles work. I could not comment on whether one partnership would work in a broader manifestation.

Q12 **Carol Monaghan:** Moving to the other panel members, there are not many examples of TTOs similar to SETsquared. The UK seems more institution specific rather than regional in its approach to technology transfer. Why is that?

Dr Raven: If I can comment as one of the people who started the SETsquared Partnership, it is four, now five universities that are geographically close enough that they can interact, but they are also very similar in their nature; they are very research-intensive universities. I was at Southampton at the time, and as well as meeting colleagues through SETsquared on a regular basis, I met all the heads of the local university technology transfer. We were very different in our skillsets and in what we were trying to achieve. The skillsets I had were not really of much use to the University of Portsmouth and what they were doing, which was less about research commercialisation and more about student employability and student entrepreneurship—skills that we had much less need of. That level does not work out. There is a formal set-up in SETsquared, but there are a lot of informal set-ups across the country. For example, every four to six weeks, I sit round the table with my counterparts, Claire from Edinburgh, from Manchester, from UCL and from Imperial College and Oxford. We invite people from the Wellcome Trust and Innovate UK and talk about what we are trying to do, and share our experiences, ideas and all the rest of it. A lot of informal stuff goes on without necessarily a brand on top of it.

Q13 **Carol Monaghan:** Do you think the informal stuff would benefit from a formal branding?

Dr Raven: I am not sure it does. It depends on who you are. In the east of England, they had what was called i10, which was a lot of universities that were very disparate but came together at the same time, but they were so disparate that it did not really work despite the branding. It is all about personal relationships. The Americans say it is a contact sport. It is all about building up trust relationships and getting to know people, more than brands and structures.

Q14 **Carol Monaghan:** The recent McMillan report emphasised the benefits of a Silicon valley-type ecosystem to science and innovation technology transfer, but this seems to be missing in the UK. Maybe it is not good, from what you are saying. Do you think there is scope to develop something similar to that? I am happy for any of the panellists to answer.

Dr Raven: There has been a lot of effort to copy Silicon Valley around the world, with very little evidence that it is copyable. We are lucky in Cambridge in that we probably have the nearest to it. There was a very interesting development just this week. Both MIT and Stanford have taken the view that they do not need to do a lot because they have all

the skills they need in the clusters around them and can tap into those. But MIT this week announced something called The Engine, obviously in deference to what SETsquared has in Bristol, but with $150 million in it because they are saying that actually Kendall Square is not doing what they need; it does not take a long-term approach and it will not invest in the early-stage technologies that are coming out of the universities. It is interesting that they are coming round to our way of thinking more than we are to their way.

Q15 **Carol Monaghan:** To what extent do you think the Government's science and innovation audits have influenced the work of TTOs, and can you provide any examples of that influence?

Nick Sturge: From our point of view, it is early days on that. I have not been directly involved with the SIA, but it has encouraged, forced or enabled a lot more conversation between institutions that have not necessarily been part of a formal partnership for us in the south-west, and with companies small and large. The process has been positive. I cannot comment on behalf our TTO whether it has made an impact.

Dr Brady: The report and evidence on the one in Edinburgh has only just been finalised. It has not been driven from a perspective very much around IP; it has been driven much more around data and data management, and how that impacts innovation and the ecosystem, and from a geography perspective as well—Edinburgh, the city and Lothians and beyond—not a TTO IP commercialisation strategy. It will be interesting to see where it goes, but, as far as a traditional TTO model and how it is implemented is concerned, it is probably quite minimal in that particular report.

Dr Raven: In Cambridge, there was a limited number for the first round and we were not lucky enough to be one of them, but we have an application in for the second round, which we are hopeful for. I cannot comment because of that.

Q16 **Jim Dowd:** In 2003, Sir Richard Lambert's review found that British business was not research intensive and that its record of investment was, as he said, unimpressive. Has that position changed in the intervening period and, if so, how?

Dr Raven: I think your predecessor Committee looked at this in 2013 and reconfirmed it as an issue. It is still an issue if you look at research funding from the UK industry; it has been flat over that period. It has been rising; I think 52% of research—BERD—in the UK is from overseas-owned companies, so we still have an issue there.

Q17 **Jim Dowd:** It has changed for the better but not radically.

Dr Raven: No, not radically.

Q18 **Jim Dowd:** How does demand for research vary across sectors and between SMEs and larger organisations?

Nick Sturge: From my perspective, having worked in incubation and now looking at the ecosystem of Bristol and Bath and how we make that really work, and how we get the universities to contribute as actively as they can and be accessible to SMEs, it varies across sectors. You always get the challenge that the smaller the business, the faster they want things to happen, and the more prestigious the university perhaps, the harder it is to get quick action. The scale of activity is often mismatched. That has always been a challenge.

Going back to the earlier question about how we can invest more—some of this £120 million—it is about finding ways to make it easier for universities to connect with SMEs and vice versa. The contact sport bit is absolutely key. It is about the right number of people and the right quality of people in the right place doing that interface. It is a challenge for SMEs to work with universities, which is kind of my area, but I think it is getting better. There is a kind of culture shift within the university base to be more attuned with the needs of smaller companies, but it is work in progress.

Dr Brady: Demand depends a lot on company pipelines and company need. Demand, therefore, is different across sectors and across different sizes of companies as well. To give an example, in the pharma sector, as many as three, four or five years ago, when the rhetoric was around pipelines drying up, we started to see the pharmaceutical sector trying to innovate. It is a big sector, very traditional, but it was trying to come up with schemes to work with universities—GSK with DPAc, for instance. You did see that, and it was recognition of problems in their own pipeline that drove them to try to get into universities and collaborate at an earlier stage. That is a sector-specific example of how demand can vary depending on how a company views its own pipeline.

Q19 **Jim Dowd:** Sure. You covered part of this, Mr Sturge, but is it a question of lacking awareness of what universities can offer and it depresses demand?

Nick Sturge: That is part of it. In the University of Bristol, I could not tell you how many different areas of research there were, but there are a lot, and, of course, for an SME that is increasingly working cross-discipline in a product or technology they are developing, finding the right front door into a university can be challenging. That is where the whole university sector needs to do better.

Q20 **Jim Dowd:** The university sector needs to project itself more.

Nick Sturge: And to find the ways to create routes in—the account management piece, if you like—to make sure that an SME or larger company can find the bit and translate the need that Claire talks about to what the university can offer. In terms of discipline, there is an increasing amount of cross-discipline research, so you might get something being developed in one faculty that is less obvious, but you thought it was over here. It is also about the product. Is it a KTP, is it some contract research

or is it a collaborative European bid, for example? There is a whole piece of translation. That is where we need to focus our efforts.

Dr Raven: We have to recognise that there is very high concentration in research spend in the UK; 34% of research spend by companies is in just 10 companies in the UK economy, and only 3.5% of it is by SMEs. It was raised in the Lambert report, in the report of your previous Committee and in other places, but it deserves a good look at why that is the case and what measures can be taken to stimulate more demand.

Q21 **Jim Dowd:** Perhaps they remain SMEs because they do not invest enough in research.

Dr Raven: Also SMEs are a very broad range of companies. There are 5 million SMEs, and we cannot support them all, and there are particular types of SMEs within that. We are very lucky around Cambridge because we have a high-tech cluster, a lot of small fast-growing SMEs that tap into what we do very effectively. I have to say that when I was myself growing my companies, I had no problem finding academics who were very willing to collaborate. You can go to conferences. Universities are unique in that they publish everything they do, so you can pretty quickly work out who are the key people in the field, and they are very receptive if you want to give them a call. I found it was not difficult, but it needs something to work out why that is not happening more widely, and particularly which types of SMEs we should concentrate on benefiting, rather than trying to work out how we serve 5 million of them, which is never going to happen with 180,000 academics in total.

Jim Dowd: They would be spread rather thin.

Q22 **Chair:** Following up on that, are there any sectors that you think have been particularly poor at engaging with you in terms of asking for assistance with research that you are surprised by and you think could benefit from having technology transferred into them?

Dr Brady: I have experienced what I would call a "not invented here" culture in some companies. You might see this more in high-tech silicon-type areas rather than pharma areas. When you are trying to license a new chip, say, or a new semiconductor, you are competing with an internal research team in that company; yours, the university one, can be quite good, but it can be quite hard to get over the barrier of what is actually an internal competing product. There is a little bit of that in some sectors.

Q23 **Chair:** What was that phrase you used right at the beginning?

Dr Brady: Not invented here: the internal research team favour their own research developments over those coming in from the university. There are good reasons for that, to be fair to them. There is a barrier to bringing in someone else's technology; there is learning, so it takes a lot of persuasion to displace an internal pipeline—shall we say?—or an internal development project.

Q24 **Matt Warman:** Looking at some of the stuff that you have been talking about but almost from the other end of the telescope, how do TTOs identify which businesses would be sensible ones to try to work with, and do you have the resources to do that efficiently?

Dr Brady: Google. There is a multitude of ways: attending partnering conferences and internet searches. We try to find companies that are operating in similar technology spaces to us and beat a path to their door. There will be variability in how much resources various offices can apply to that type of outward-facing proactivity. In Edinburgh, we have the resources to be outward facing, as Cambridge and others will, but some smaller offices probably do not.

Dr Raven: It depends on what you are doing. If you are in pharmaceuticals, there are a few major players that might be your first natural port of call, but a lot of it is that the academics usually have a very good understanding of their field, because the companies go to all the conferences they attend and talk to them all the time, so it is tapping into the academic knowledge. It is doing your research and it is cold calling. Nothing beats putting the shoe leather in to get a result.

Nick Sturge: There is also a local perspective. We have a very vibrant ecosystem across multiple sectors in the Bristol and Bath area, and we do a lot now, and we strive to do more, of what we call engineered serendipity, trying to connect academics with businesses and act as an ecosystem so that the more relationships there are, even if they are low-level relationships, the more opportunity there is for a transaction to happen.

Q25 **Matt Warman:** Is there anything that you do or that you would like to do that is not the kind of obvious business development that any business would be doing, and you happen to be spinning out of universities, or is it actually just the same sort of thing, and you just do it in a slightly different way because a lot of it is based around research that already exists?

Dr Raven: In a lot of what we are handling, as I said, the research has been done and we are dealing with the outputs. There are pretty standard ways of doing this, but all the time we are trying different approaches. There are new things, such as the Konfer database. NCUB is doing a lot of experimental work with us and with the universities as well. We are trying new ways of reaching out there all the time. There are conferences in pharmaceuticals. There is the BIO conference to which we send a big team, because it is a good way of getting things out. The landscape is constantly changing and the interests of the partner companies are changing, so we need to keep on top of that. If you are in pharmaceuticals, you need to know what particular disease interest they have, because it is no good going with a neurological one to a company that has no interest in the neurological sector. There is a lot of keeping tabs on what is going on.

Q26 **Matt Warman:** Is the challenge essentially around having the resources to put the time in—about having enough shoe leather rather than anything else?

Dr Raven: Yes.

Q27 **Matt Warman:** Were Government to criticise universities for not doing enough of what they are being asked to do in this area, it is about resources, not about anything particularly unique or challenging.

Nick Sturge: We piloted a project, in conjunction with Innovate UK, across the SETsquared Partnership called ICURe, which is based on the ICOR model where you take an early career researcher, give them a bit of money and they have to spend that money on visiting companies or going to shows and they have to ring up, I think, 100 companies, potential customers, and ask what their customers or potential customers might need. The evidence of that so far—it is just coming to the end of its first phase—is that that is generating traction for those companies, and therefore from them to the research base, and in the process, of course, you build up new connections. There is some work happening now that we can build on that really helps that issue.

Q28 **Matt Warman:** Have you found that any of the online brokerage tools that specifically try to connect business with academia have been helpful or particularly impactful?

Nick Sturge: I have no experience.

Dr Brady: Predominantly, it is about resources, as Tony describes—the shoe leather. The bio sector stands out slightly compared to others because there are very well-established partner events in that area, so it is far easier to invest two to three days-worth of time at a particular event where you know nearly every company is going to be and get some face time with them. That is achievable in the bio sector but very difficult in any other sector.

Q29 **Matt Warman:** I have two things finally. Do you have a sense of what the return on the investment in resources in your area is in practice? How do you make a business case for getting more of the resources that you implicitly say you would like?

Dr Raven: As we said earlier, for almost all tech transfer offices, apart from a few that have a current serendipitous big win, it is a negative return on investment. It is actually costing the universities money. Even the two stand-outs of MIT and Stanford are both coming to the end of one of their big-winner patents and will be going back into loss-making activity. It is a challenge for all of us. Where the return is, though, is in the economy, which is not something that the universities see a return from. That is where the cycling back of some of the returns in the economy, through things like HEIF funding and other things, to help support the universities in funding this activity has been quite important.

Q30 **Matt Warman:** Where you have, for instance, researchers talking to companies spinning out their research, obviously a lot of those researchers then go off and work for those companies. In a sense, we should not necessarily think of those people as lost to academia but gained for the wider economy, if you like, but is that a problem in the sense that, from a narrow university perspective, it is easy to see why losing people would be frustrating?

Dr Raven: I am not sure we would necessarily lose people. Quite often the senior academic stays with the university and, in my experience, it is usually the young postdoc who has been the person working on the laboratory bench who will transfer over to become the CTO in the company and drive it, with the senior academic staying in place, continuing to do the research from which the company can benefit in the future, and being the wise guru who sits on the scientific advisory board.

Q31 **Matt Warman:** That is obviously storing up a massive problem for the future in the sense that you have lost all your high flyers. Is that something that you think is going to be a real problem or is that more of a fear than a reality?

Dr Raven: Within our university, most of our postdocs will not go on to have a long-term academic career.

Q32 **Matt Warman:** It is not a new problem in that sense.

Dr Raven: We play that round the other way; we encourage them and we say, "It is unlikely that many of you will have a long-term academic career, but you have the opportunity for your own career on your lab bench in front of you." For us, it is very positive. If that happens, you start to attract really good students to come in as postdocs as the next wave coming through. If you look at it on the whole, it is very positive, not negative at all.

Q33 **Matt Warman:** Although possibly not very positive for the bottom line of an individual university.

Dr Brady: There is attrition in the system anyway, whereby—I am not really 100% sure on the figures—only a proportion of RAs, probably a third, will go on to have academic careers, so you already have two thirds that are maybe doing one or two postdocs and then choosing alternative careers anyway. If universities can grab hold of them and they get focused on projects that are the ones we would hope would walk out of the university as commercialisation projects, that is a good thing; they can build entrepreneurial skills into a group that is never going to go on to have an academic career anyway. It does not suit everybody.

Q34 **Matt Warman:** Although there is a whole separate conversation around soft money and careers that are particularly unappealing to women and all that sort of stuff, isn't there, but that is not necessarily the point you are making?

Dr Brady: No, I am not.

Dr Raven: The thing you have to recognise is that most of these postdocs are on three-year contracts for a grant, and a lot of them spend their time grant hopping from one to the other, from university to university, so in terms of—

Q35 **Matt Warman:** People in that position have come to us and said that is a bad thing. It is part of the problem rather than the solution, isn't it?

Dr Raven: Yes, it is, but given the reality that that is where we are, if we can give them three years' security to go into a company instead of on to another grant, it gives them another option and a career possibility, which I think is all very positive.

Nick Sturge: The connection, the relationship, they are likely to maintain with the university is more likely to stay or grow.

Q36 **Matt Warman:** Yes, but again it is very hard to put a number on.

Nick Sturge: That is the challenge. Putting the numbers on is where we started, I think. That is the challenge.

Q37 **Graham Stringer:** Following on the last two points, Dr Raven, you mentioned the valley of death report that our predecessor Committee did. What I learned in that report, primarily from the excellent evidence that Cambridge University provided for us, was that technology transfer, the benefit of the knowledge in universities getting into the economy, was a much more organic process. It was sending academics to help with problems in the private sector, learning about commerce, setting up their own businesses and bringing back the experience. You seem to be contradicting the evidence we got last time by saying there is a much more step-by-step process that you go through, a less organic process. Can you put me right on that?

Dr Raven: We are talking about different activities. Licensing is when we have a piece of intellectual property that we think could be of great interest to industry. It is going through the process of finding out who is going to be interested and getting—

Q38 **Graham Stringer:** It is not helping them in the way that the evidence last time—

Dr Raven: No. I think the evidence you are talking about is that our academics have lots of interaction with industry, either through collaborative research where they are working on common research problems, or probably the biggest form that we do, which is consultancy. There are academics who consult for external organisations, and that is an interesting one because consultancy is something you can do on a day or a week quite short term, and we find that our consultancy with SMEs is almost as large as it is with big companies, so there is a much better balance with the SME sector. Our academics, I think, really value those areas. They go out; they learn about the problems of industry and bring

new challenges and insights back to their research group. It is a two-way flow.

Q39 **Dr Mathias:** Can I ask all of you whether you think there are metrics that can help us to gauge the level of technology transfer in the UK? Are there such metrics?

Nick Sturge: I was kind of alluding to putting figures on it. It is challenging to work out what those measures are, and which are within the direct control of an institution. For example, at the incubator that I have been running until recently, and still look after, and that we have been running for 10 years, between 10% and 15% of those companies have come out of the university research base, but it is the spin-outs that dominate the fundraising. This year 60% of the fundraising has gone into spin-outs from within the incubator. But we have generated 1,000 jobs over the last 10 years or so—high-value jobs predominantly in the local area. That is a significant impact, and they are sustainable jobs because the companies we support typically do not fail or the failure rate is very low.

Q40 **Dr Mathias:** Those metrics could be the number of spin-outs and the number of jobs.

Nick Sturge: The picture I am trying to paint here is that the university produces not only the environment in which these companies can flourish but some are direct spin-outs. Having those spin-outs in the ecosystem helps attract investments and talent.

Dr Mathias: Sure.

Nick Sturge: Talent is a critical thing, both at leadership and development level.

Q41 **Dr Mathias:** Do you think there could be indirect metrics?

Nick Sturge: I think there should be. The other challenge with metrics is that they risk distorting behaviours, especially if there is money attached to them. We have to date in my domain avoided metrics that become targets because that risks stopping us trying to do the best we possibly can. We record and publish indicators of success, which are jobs created, sustainability of businesses, and therefore the jobs, and money raised. But money raised, for example, should not be the be-all and end-all, because we want to create sustainable businesses that continue to employ people and are wealth creators.

Q42 **Dr Mathias:** So you have a group. It is also having a metric in the context of the other measurements as well.

Nick Sturge: Yes, and the broader impact, some of which is indirect.

Dr Raven: This is a subject that has been discussed extensively internationally in the community for all the 16 years that I have been in it, in the US and all the rest of it. There is a big problem with metrics,

which is that you can measure activity now, but that does not mean you will get an outcome in 15 years' time, and when you have an outcome in 15 years' time there are so many players who have come in along the way that it is very difficult to track it back to a particular activity. We are trying to get to the long-term aim. The US now has this thing called the Better World Report, and it is the basis on which the REF impact case is done, and the thing that most people are coming down to is that actually you write your case studies. What you do not try to predict is that what you are doing now you will do in 15 years' time. You say what you did 10 or 15 years ago, because otherwise, as Nick said, you get into what my counterpart at MIT called WYMIWYG—what you measure is what you get. It is very easy, if you set a number—

Q43 **Dr Mathias:** You like a historical metric.

Dr Raven: Justifying what you have done by looking back at your track record, rather than trying to crystal-ball read the future, is what most of the community have come round to thinking is the way to do that.

Q44 **Dr Mathias:** But not a looking forwards one: you think that is too damaging, or limiting.

Dr Raven: It is not only damaging, but foresight has been notoriously bad in most areas. I am doing at the moment what I think are the right things, but I will only know whether I have done the right things, whether history is kind or cruel to me, in 10 or 15 years' time, because that is how long it will take for a lot of these things to gestate into an outcome that is economic or drugs treating people.

Q45 **Dr Mathias:** Dr Brady, would you agree?

Dr Brady: I can answer yes to the question, "Can you measure technology transfer?" because it is the transfer of something from the university into another institution. Yes, you can do that, because you can measure the number of contracts we do. There are various types of things that you can measure.

Q46 **Dr Mathias:** So you do volume.

Dr Brady: What my two colleagues are trying to stress is, as Tony says, that you get what you measure, that we can measure technology transfer. That is not really what you want.

Q47 **Dr Mathias:** Sure. They have made their case very clear.

Dr Brady: That is not really what you want.

Q48 **Dr Mathias:** Would you agree?

Dr Brady: Yes. What you really want us to do is achieve benefit, uptake and all those other things that come around it, and that is more difficult and a much longer time.

Q49 **Dr Mathias:** You are in agreement.

Dr Brady: I am in agreement with them, yes.

Q50 **Dr Mathias:** Understood. Do you think technology transfer can be broken down by the technology sector and, again, is that useful?

Dr Raven: I think, absolutely, every sector is different. The process when you are developing a drug is quite linear; you know exactly what you have to do to get to phase 1, phase 2 and phase 3 approvals, and so on. We know how long it takes and roughly how much money it takes. If you are in software, it can all be grown up and disappear within two or three years and it takes a very different approach from those two.

Q51 **Dr Mathias:** Is it useful doing it by sector?

Dr Raven: When we are dealing with it, we have to think very much about what sector we are actually applying this within, what the characteristics are of that sector and, therefore, how we handle it. There is no use handling software in the same way as you would a drug.

Q52 **Dr Mathias:** Do you think it is useful having a breakdown of it at all?

Dr Raven: Yes. We do it intrinsically when we are working with our opportunities.

Nick Sturge: If we look at the incubation side on the output of technology transfer, specialism around sectors, even if not too precise—SETsquared incubation is about high-tech, high growth specifically, which is only a part of the piece—it allows specialism, sector knowledge, industry knowledge that you can then capture and give to companies. What is really important is that technology entrepreneurs, be they academic derived or not, feel comfortable in a community of like-minded or like people. That clustering is really valuable.

Q53 **Dr Mathias:** Thank you. Finally, do you think there is a way of measuring the quality of the relationship between business and the universities? Are there metrics for that?

Nick Sturge: I would go back to saying there are indicators that will indicate the level of activity, and if you then have confidence that that activity is the right activity and you learn from the activity, that is the essential thing—that whatever activity you do you learn and assess and make sure that, yes, you are doing the right things. Knowing how much of that you are doing and where it is happening in an institution, which is sometimes the challenge with a university staff of 10,000 or whatever, is a lot of relationships to try to measure. Trying to capture where those are, so that you can make the most of those relationships, is an important thing, but I would not do it by target.

Q54 **Dr Mathias:** The indicator rather than the measurement.

Dr Raven: One of the tools we use is user-perception surveys, so you actually ask people not what their experience was but how they perceived

their experience and which points worked well and which worked badly. Then we can feed that back.

Dr Mathias: It is a qualitative approach.

Dr Raven: For adjusting our processes to be more open and transparent where they need to be, one thing we are talking about at the moment is how we learn to say no better, which is always a point of conflict if someone wants to do something.

Dr Brady: We do the same. We do perception studies as well. I would not like to use the word "measure" but I guess you could look at repeat business, whether somebody comes back again, and is interested in working with you again, as an indicator that you can't have been that bad the first time.

Q55 **Dr Mathias:** I get that sense, so an indicator rather than going for targets.

Dr Raven: There is a lot of focus put on, "Are universities difficult to work with?" and so on, but the surveys we have done of the business community, which have been done by professional survey organisations, came out with "difficult to work with" at the bottom of the bottom five characteristics that were associated with the university. It does get around. If you ask people, it is very low; I think 3% found us difficult to work with, of all the businesses that were surveyed.

Dr Mathias: Like TripAdvisor—great. Thank you.

Q56 **Victoria Borwick:** Going back to proof-of-concept funding, we have heard that it is not necessarily widely or consistently available, and some universities have established their own funds. Can you talk to us a bit more about that? Are they filling these gaps or not filling the gaps? Can you tell us a bit about that?

Dr Raven: There are several gaps. There is proof of concept, which is really where we give academics a small amount of money—£25,000 or £50,000—to do some key experiments or get a market study done to understand where the application or the interest might be, and so on. Those are relatively small, essentially grants, for the academics to get things done. Those can really enable things to happen. Most of that comes out of the university budget. It depends on the university how much flexibility they have to devote money to those resources against all the other calls on their money and time. We get beyond that to seed funding, which is getting things started. A lot of universities now have taken that on themselves, because very early-stage venture capital is scarce. That is now something that American universities are copying from us.

Then, more recently, because of also maintaining the downstream, we have gone much more into the follow-on funding arena. We have quite a lot of instances where at the end of the day the academics end up with

essentially nothing. The classic case was Biovex, the UK's first billion-dollar biotech company out of UCL. The story in the *Times Higher Education* of the academic founder behind that was not the celebration of a great success but a story of how "I founded a billion-dollar company and made $709 from it," so we have got into the later stage to control that process much more and make sure that our academics, who are the engine for all this, remain incentivised to do it and do it again.

Q57 **Victoria Borwick:** Patient capital, the long-term capital, seems more common in bioscience. Is that correct? Is that because the area has been more deprived of funding previously, or because bioscience is more likely to generate a return for the university?

Dr Brady: It is a longer time. It needs what is called patient capital because it takes a longer time. If I could rewind to the other question, the vast majority of universities do not have any of those proof-of-concept funds that Tony described. Only a handful do.

Q58 **Victoria Borwick:** Is that a negative point in the sense that it holds things back?

Dr Raven: Yes.

Dr Brady: It is difficult to pump-prime things with just £10,000 to £50,000 to get a project going to a stage where you might have any hope of somebody external looking at it one day.

Q59 **Victoria Borwick:** That is valuable. The Royal Academy of Engineering has called for technology transfer offices to increase the transparency of their operations and to consider publishing anonymised details of some of the deals that have been agreed. Is that feasible or not? Would you like to comment on that?

Dr Raven: We are often constrained. When we are doing a deal with a company, they often put constraints on us. There are things we would love to talk about that we are not able to talk about. You could anonymise it, and there is an anonymised deals database that you can get from AUTM, the American tech transfer organisation, where we can look up what comparable deals are, but the problem with small datasets is that it is very easy to de-anonymise them. You just need to do some cross-correlation. If we have done five deals a year, it is pretty easy to work out what the individual deals are if we published five of them.

Q60 **Victoria Borwick:** Particularly as it is in such a specialised field, and it is often possible to cross-correlate, presumably.

Dr Brady: Transparency could be a bit more around what I would refer to as deal principles instead: what is the thinking that goes behind how a university approaches and structures deals? Maybe when people are entering those kinds of entrepreneurship or fellowship schemes, if there is more dialogue and conversation around that at the very early stages with TTOs, it might help smooth the process, rather than fixating on

specific numbers around a 1% royalty in that company, 2% in that one and why they are different. It is less about that and more about the principles of why you take a royalty, why you have amounts done and why you do it this way versus that way. I think something more could be done there.

Victoria Borwick: That is most helpful, thank you.

Q61 **Chair:** This is the final group of questions. There must be a lot of research going on in your individual institutions. How do the technology transfer offices assess the suitability of the research being done to be commercialised? Do you have to be an expert in that field to be able to understand whether there is a commercial application or the potential for commercialising, and if there is, where do you get that expert advice from?

Dr Brady: I would say yes and no. What I mean by that is that technology transfer itself is an expert discipline, the sort of ability to ask a fairly consistent question set around an opportunity, to at least do a provisional assessment, to then be able to point in the direction of more relevant industry experts to find out how it might work inside their organisation and how they may adopt something like that. There is a certain generic approach that can quite successfully be taken across the piece, and you can go in-depth beyond that, calling on industry experts, your alumni, entrepreneur network and so on and so forth.

Q62 **Chair:** In your particular area, are you out there looking at all the research that is going on all the time and then trying to link it up with people who might be able to assess it further?

Dr Brady: Yes, but we try incredibly hard to recruit people from a variety of disciplines and match them, to ensure that you are working in a discipline within our university that you have a background in, usually both scientifically and usually in industry as well. The vast majority of people in certainly some of the bigger TTOs will be matched in that sort of way. If you think about the universities sector and how research really is, pre-competitive, pre-industry, there is always going to be something that is left field to anybody's knowledge set, and that is where some basic principles can reasonably be applied.

Dr Raven: It depends a bit on the university. At Cambridge, we are lucky; we have reasonably big teams, but even then we have to cover everything from archaeology to zoology and in between, and you cannot cover all of that, but we are lucky that we have locally a large number of successful entrepreneurs who help us in that process, and we can actually contract in people to do it. If you are a very small office and you maybe have one or two people and your primary focus is student enterprise and employability and then you get something of the nature of, for example, Bradford Particle Design—Bradford came up with Bradford Particle Design, which was a very successful company—it can be very difficult and challenging for people in the smaller offices. That is

where we have a community and people can pick up the phone and say, "Can you give me a hand?"

A few years ago, when I was at Southampton, Porton Down had their first spin-out opportunity. They phoned me up and asked if we could help them, and one of my team went and worked alongside them, going through their first spin-out, which turned out very successful. The second one they were able to do themselves because they had learned how to do it. A lot of community help goes on that supports the smaller offices.

Q63 **Chair:** Even though an office is small, as you say, you do not think they are missing opportunities because of that scale. You think they are ready and willing to pick up the phone to the wider community, so that we are not missing opportunities, or do you think we need to put something more formal in place?

Dr Raven: The opportunity is more about encouraging and incentivising the academics to come forward with their ideas. We only have 1,500 academics in Cambridge—it is a relatively small university—and it is difficult to know what is going on in all their labs all the time. It is all about making them aware that the support is there and encouraging them to come forward when they do, which is why most universities have quite a generous sharing policy of any of the proceeds of this activity with their academics as part of that incentive. That is probably the main area, and if you look at the NCUB study that was done, lack of time is their primary issue.

Nick Sturge: The only thing I would add is that it is another reason why it is really important for institutions to develop their external relationships in advance, so that there are people to pick up the phone to, whether they are entrepreneurs or industry specialists. For us, there is a very local perspective, because we have such a diverse set of industries in the city region, but of course it is national. There is a role that the incubation plays in being a real catalyst of that local ecosystem that is a much broader community of expertise that can be tapped into, and we do that.

Q64 **Chair:** Thank you. One challenge or barrier to the collaboration, we have been told, is the time it takes to negotiate and put deals in place. I cannot remember which of you said it, but small businesses, SMEs particularly, want everything done at breakneck speed. What is at the root of those delays, or is that not a fair perception?

Dr Brady: Whenever that gets levied at us, when a company says, "I need this done and done quickly," I always assure them that I can run as fast as they can. It rarely sits on my desk longer than theirs. The root of those perceived delays may be experience around doing those types of deals—a combination of potentially mismatched expectations and experience of doing those deals. In a big office, like Edinburgh or Cambridge, we are doing hundreds of these deals. That is why we can go as fast as they can, generally. If you are dealing with an SME, or the SME sector in particular, or even some big companies—although some big

companies set up equivalents to TTOs, so they know all the challenges of working with universities, know what to expect and it can be very smooth—an SME that is working with a university for the first time does not even know where to begin, so there is a lot of conversation and fact-finding before you are even putting pen to paper. Although they want a deal done today, there is a lot we have to find out about each other before we can start coming up with anything that looks constructive for either party.

Q65 **Chair:** Rather than there being particular sector challenges, it is more to do with the experience of the individual parties involved.

Dr Brady: I would say so, yes.

Dr Raven: We need to recognise that when we are doing these deals there are things about a university that companies will not be used to in their normal company-to-company dealings. We are charities, and we have issues around the publication rights, and issues, as charities, in that we put in diligence provisions, for example, which say that we are not licensing intellectual property, so that it can sit on a shelf in a defensive mode; we want it to be actively worked. There is the idea that if they do not actively work it there are clauses that can take the ownership back from them. Those types of things can be quite new to companies that are trying to work with us. Part of it is explaining that the university is not a company, and we have different constraints—state aid, the Charities Act, and so on—which we have to comply with. Part of it is just working out if these are the right people. The fact that someone wants to take it does not necessarily mean they are the most appropriate person to take it, so part of it is working out what we have here, what is the best use for it and whether these are the right people to be working with.

The last thing, going back to the point Claire made, is that one of the most successful things we have had in speeding up the contracting time in our activities was simply chasing the other party if we had not heard back after five days. It reduces the turnaround times enormously if we pick up the phone to them and say, "We sent you this five days ago and we have not heard. Is everything on track?" One needs to look carefully at where the delays are. They are not all in the university. We both contribute to them and can both improve on that.

Q66 **Chair:** Is any particular sector or technology more difficult than others to do deals with quickly?

Dr Raven: The pharma sector is more difficult purely because of the complexity. We are entering into something that is a long-term commitment; there is a lot of money going to be invested, which is where things like diligence clauses can become quite an issue that need to be sorted out. On the other hand, as I say, the whole idea of doing this research, and the intellectual property, is not that it is sat on the shelf to prevent other people using it and competing.

Dr Brady: The semiconductor sector that I already referred to can be challenging. There are about 300 pieces of IP on the chip in your mobile phone, and some of that can be quite challenging when you take a university approach around publication, ownership and reversion rights, and they say, "I want to pay you. I want to own it whether I use it or not—none of your business." That can be challenging to square for a university.

Q67 **Chair:** Very finally, the Intellectual Property Office recently updated its Lambert toolkit. Does that mean you are now more likely to use it, or do IP agreements still need to be developed, written on a case-by-case basis?

Dr Brady: It is between the two. In terms of boilerplates, they are a very sound starting position and universities in the main are very happy to use them, but, as Tony and I both touched on in those two sectors, for example, there are always going to be nuances. You have a conversation with your customer, you take a boilerplate and, hopefully, you make some fairly minor amendments. That is probably fine for at least two thirds of deals.

Dr Raven: Most universities use the Lambert agreements as their starting template. It would be nice if we could just do a standardised number and everyone signed it, but that is not happening and not going to happen, I think, so they are really the starting point of negotiation rather than a standard contract that can be signed.

Chair: Fantastic. Thank you all very much indeed for your contributions. It has been very useful and informative; thank you. We will move on to the next panel.

Examination of witnesses

Witnesses: Dr Phil Clare, Dr Rosa Fernández and Dr Toby Basey-Fisher.

Q68 **Chair:** Welcome and thank you for joining us. For the record, could I ask you to introduce yourselves, say who you are and where you are from?

Dr Clare: I am Phil Clare. I am chair of the advocacy committee for PraxisUnico, which is the national association for professionals who do knowledge exchange and commercialisation. In my day job, I am head of knowledge exchange at the University of Oxford.

Dr Fernández: I am Rosa Fernández. I am research director at the National Centre for Universities and Businesses, which is a partnership of around 130-plus leaders of universities and businesses, unsurprisingly, plus public officials. We are working together to try to maximise the benefits of university business collaboration for the UK.

Dr Basey-Fisher: I am Toby Basey-Fisher, the CEO and co-founder of Eva Diagnostics, a spin-out of Imperial College London that is seeking to

enable blood counts and blood tests to be performed anywhere. I also hold an enterprise fellowship with the Royal Academy of Engineering.

Q69 **Chair:** Thank you very much. We heard in the earlier panel and from Professor McMillan's recent review that the one-size-fits-all approach to technology transfer does not work. Does that mean that we have to do every single case on a case-by-case, university-by-university basis, or are there some best practices that can be shared and then tweaked to individual cases? What would be your advice to move forward?

Dr Basey-Fisher: I would say from my side that there should be flexibility. There absolutely has to be. Every deal is different. Something that is perhaps not so much represented in this inquiry is industry's input. It has been up to the Royal Academy of Engineering and the Royal Society to put forward the case of people like myself, but having reached out to many of my peers in the space who have been through technology transfer, whether it be licensing or spinning a company out, the frustration has often been that they have been presented with a one-size-fits-all deal that has no flexibility. That has often come from the fact that universities are using policies that are perhaps slightly outdated. It is not necessarily any fault of the TTOs, which actually have exceptionally innovative people—they really want to make deals happen—but they are constrained by not having that flexibility. From our side, yes, flexibility is key.

Q70 **Chair:** In terms of industry input, are there any particular examples of poor practice that you would point us towards—examples that you are aware of?

Dr Basey-Fisher: There are numerous cases of poor practice, but I would say they come from the side of industry or the academic side as much as from a TTO. It is often, as has been mentioned before, a misalignment of expectations; there are underprepared academics and individuals trying to take ideas to spin out of universities and then being confronted with different equity expectations, royalties or different frameworks within which they have to work and have to negotiate around. I do not think there are any particular examples, but there is definitely resentment sometimes; it is often there in industry but it is not necessarily the fault of the TTOs.

Dr Fernández: Seconding that to some extent, in our experience in working with universities and business, with both sides, they both have a portfolio of different ways of looking at university intellectual assets. That is because intellectual property rights are one type of transfer of assets that they would normally try to gain exploitation from. As was said earlier in the previous session, there are other types of intellectual assets that businesses would like to seek and work with, and those would need different types of agreements. I would like the Committee to consider that a lot of the evidence you are considering is research produced in the wonderful research space that we have in this country, and that does not have, necessarily, rights, as a patent or a licence, attached to it.

However, it potentially is helping you with better government. Certainly, flexibility from both sides is what we have been hearing about. One size would not fit all, but it would not fit businesses either because they want to be able to do contract research and consultancy, as well as licensing and patenting.

Dr Clare: There are examples of bad practice, but they are a very small minority. By and large, if you look at the range of interactions between universities, businesses and external organisations, it is a phenomenally successful environment where lots of many good things happen. You will probably hear about the things that go wrong more than the things that go right. You asked a question about shortcuts—one size fits all. That is a challenging question. Professor McMillan's report was mostly about technology transfer, but in the wider sense we have been talking a lot about contracting between the universities and industry more generally. I think the Lamberts are a very good example of an attempt, which has been underpinned by Government and developed over many years, to try to reduce the transaction costs. The Lambert agreements were designed as a compromise agreement that can be signed. I have heard people, both in universities and in industry, say they do not like Lamberts because they do not get them what they want, so you can trade a long negotiation to get more of what you want for the possibility of a very short negotiation, signing a standard agreement and accepting the compromise. The Brunswick agreements that universities agreed between themselves as standards for MTAs to cut down the costs of doing so many contracts was also another step in the right direction. I also agree that relationships are complicated—it is a contact sport—and that having people who can take the time to understand the needs of a business, or within a business to understand the needs of a university are very important in constructing these deals.

Q71 **Chair:** The role, therefore, of the TTO presumably is key to that. It sits in the middle of those two.

Dr Clare: The TTO is a specialist office that deals with the licensing of technology that has already emerged. The Lambert agreements deal with research contracts between companies and universities who wish to do research—a piece of work where the IP has not been created but in the hope of generating some. To a certain extent, those are harder because you are trying to contract about something where you do not really know what the answer is going to be, otherwise it would not be research. The research offices and the research contracting offices in universities are at the heart of that process, as the TTOs are at the heart of the licensing deals.

Q72 **Chair:** Once it is ready to be licensed and you have the TTOs, presumably they would need different skills, sector by sector, because what will be right for one will not be right for another sector. Do you provide support to TTOs, or do any of you work with TTOs to improve their ability to assess research, and whether it is ready for

commercialisation?

Dr Clare: Universities across the UK have different contexts and different models. There is always an important and strong relationship between the people who support research activity and the people who conduct the technology transfer activity, which is further down the line. The complexity of making sure that the contracts that are written to support the research facilitate later technology transfer, and take into account the needs of the funders—charities who fund research will expect a return—and untangling the complexity of the genesis of that intellectual property, can be quite challenging. In my own institution it is a collaborative arrangement between Research Services, who do the contracts, and Oxford University Innovation who do the technology transfer. Many other organisations have similar units and approaches that are appropriate for their local contexts.

Dr Fernández: From the point of view of the National Centre, there is a great deal of shared and mutual learning going on in different types of networking events. There are organisations that do training specifically for how to do research contracts, and as new types of contracts come about they probably tweak them. What we have found working with all levels of practitioners in universities and businesses is that by talking to each other we often learn a lot about what to do, and sometimes what not to do. Failure is part of the discovery process.

Dr Basey-Fisher: The question was on potentially how TTOs recognise when something is commercialiseable.

Q73 **Chair:** Yes, who is helping them to do that?

Dr Basey-Fisher: In our case of spinning-out at Imperial, we ended up in a situation where the individual who was put in charge of our case did not initially understand our industry or our space, so it took a number of months to educate that individual. They were very proactive in that; it was simply down to lack of resources and the breadth and depth of academia now and the depth of it, that you cannot have someone who can cover a huge area. That being said, there are some incredible organisations out there who have very big knowledge pools that could be drawn upon far more by the likes of TTOs in that tech transfer space. For us, the Royal Academy of Engineering has been an absolutely incredible font of knowledge for myself as an ex-academic moving into the commercial world; they have a group of fellows who are some of the most successful engineers in the country. Between them, there are people they can bring in to help assess technologies and help in the commercialisation process. The same can be said for universities. I was very fortunate to have two very well-established academics who had been in industry, and the two of them helped assess the technology and helped with that transfer process. Quite often the resources are there, but as to whether the TTOs actively reach out to them, that probably can be improved.

Dr Clare: PraxisUnico, as a professional association, has also done a lot of training of technology transfer and research contracts offices. Over the last decade, we have trained maybe 4,000 people on our courses. We recognise the need to improve the training and education for academics, early career researchers and the students. What we are going through at the moment is a culture change within universities, which has been decades long, and we recognise now the importance of the whole university community being prepared to engage in this entrepreneurial activity. We, as professional organisations, are very keen to support that in any way we can, and we work together to do so.

Q74 **Chair:** Thank you. Obviously funding is a key to this and the Chancellor announced in October another £120 million of new money for technology transfer. Where do you think this money would be best spent? Don't say with yourselves—you can actually.

Dr Basey-Fisher: Financing is an absolutely critical factor, especially for my area, which is the spin-out process. There is still a valley of death that exists, but we should also be proud across the UK of how well we have done to establish a framework that allows early-stage companies to access financial resources; for us, the likes of EPSRC's pathways to impact programme and Innovate UK have been absolutely fundamental. Innovate UK is a huge success, and in all the companies that I know that have received funding it has changed the entire face of early-stage companies spinning out of university. Then there are organisations such as the Royal Academy of Engineering that have the ability not only to provide financing but to surround it with mentoring, the right expertise to deliver, which has far more impact than would come just from money being delivered to an academic spinning out a company.

Dr Fernández: I second that. It is very important to know that, while financing is a very important matter, giving a direct subsidy is not always the best way, as you were saying earlier on, and it will probably come up again. For some of the smaller companies, when they report a lack of resources to engage in collaboration with universities, it is not just about having the money, but about not knowing what to do with it, not knowing where to find a solution to the problem. For those types of occasions, the resource is not, strictly speaking, "Give us money, but give us time, expertise and business support." Perhaps direct subsidy, like the Catalyst you mentioned—the Biomedical Catalyst has been very successful at bridging the valley of death—and other types of interventions are also potentially more effective. It has to be targeted and tailored depending on the kind of problems you are looking at, and £120 million is a lot of money; you can play with it.

Dr Clare: It is worth saying that the money the Government have already provided to support knowledge exchange through the higher education innovation fund has been incredibly important in establishing posts for people who can support this activity. We hope very much that it will become a much more stable and long-term funding stream that will

enable staff and universities to plan strategically. This is an additional fund to support collaboration between universities, as I understand it, and, as with the previous panel, we await details. There are two ways of looking at it: first, the collaborative efforts of organisations such as the Royal Academy of Engineering, the Royal Society and PraxisUnico help bring together best practice between institutions, and it might be good to spend some of it in that space; but I am also conscious of the increase in large collaborations between HEIs to deliver big strategic projects, I think, about quantum technology, which involve lots of universities and businesses coming together to help underpin future industry for the UK. Those are two examples that would benefit from more money, but it will be interesting to hear what the Government intend.

Chair: Before I pass over to Jim Dowd, as we are on funding, Dr Tania Mathias would like to ask a couple of quick questions.

Q75 **Dr Mathias:** Thank you. Following on from what you were saying about a funding stream, how much of an obstacle is proof-of-concept funding, which is not always consistent? Is that critical in the big picture?

Dr Clare: It is always a difficult piece of funding to get within a university to help develop a prototype or an idea or work an idea up, which is why I think many larger universities have looked to develop their own funds, and why things like follow-on funding, impact acceleration accounts and, to some extent, HEIF have been used by universities to do this. The appetite for such funding outstrips supply, so it would always be good to have more.

Q76 **Dr Mathias:** Okay. Would you agree?

Dr Fernández: I would agree with that. We are not ground-level practitioners, but the way we would look at something like proof of concept—I like the idea that IP management includes managing success and managing failure—is that proof of concept is a bit closer to managing failure than other types of funding, so I think in that respect it is indeed more difficult to decide when a particular project, a particular idea, is worthy of this type of funding. In that respect, it requires much more of the expert type of input to decide it. Is it an obstacle? I think it is part of the nature of the particular problems we are looking at, which are very uncertain and difficult to decide. It is a concept that you are trying to prove: is it going to work or not? That makes it more difficult to compare to other types of funding, like Catalysts, which are much closer to bridging the valley of death. I agree that it is necessary, and it probably is the case that institutions find their own ways of financing these types of projects, because they are more difficult to sell as a success eventually.

Q77 **Dr Mathias:** Dr Basey-Fisher, on your engineering enterprise fellowship, where you had funding, support and mentoring, which was more valuable, or are they all on the same level?

Dr Basey-Fisher: The mentoring. We have been very fortunate over the creation of our company—the scope of our mission as a company—that we have attracted quite good financial resources. For us, the biggest requirement has always come from having the right individuals who are very knowledgeable in our space to guide and help us understand how best to allocate the resource that we have been given to achieve the greatest impact for the company as a whole. We have long-lasting relationships with the individuals and the mentors we were assigned two years ago when we first spun out at Imperial, to the point that even after we have follow-ons, with probably directorships being formed.

Q78 **Dr Mathias:** Thank you. Dr Clare, it has been stated that the incentives, the research and development tax credits, are not straightforward. Can you explain where the problems are with these tax credits at all?

Dr Clare: R&D tax credits are really helpful and important things. They stimulate and incentivise spending on R&D, which we need more of. Part of the challenge is that they are inevitably a complicated accounting activity that requires detailed assessment on whether something fits in the box or not. If you are a university and you are talking to a business, you can say, "R&D tax credits are potentially very valuable. You should investigate them, but you are going to have to ask your accountants whether you can claim and how much. It is quite complex and we do not have the expertise." If, for example, you were able to say that any R&D spend in a university was eligible for an R&D tax credit, it would be very clear, simple and easy for us to promote and explain to our partners that if they spend money with us they get a benefit. They are great things and, if they could be simplified and made easier to understand, it would be excellent.

Dr Basey-Fisher: I agree with that. We are going through this at the moment. We are putting in an R&D tax credit claim and it got to the point where our accountancy firm did not understand it, so we had to move to a specialist firm just to get the R&D tax credits.

Q79 **Jim Dowd:** These questions are really just for you, Dr Basey-Fisher, but you covered part of them already, in response to Dr Mathias's question. I want to look at the genesis and growth of Eva Diagnostics. You said mentoring was the most important part—some of what I am going to say you have already covered—but when you started talking about commercialising it, did you know where to go for assistance with getting information and support? Was it obvious to you at the outset?

Dr Basey-Fisher: No, it was not. The initial idea of commercialising, I think, was initiated by myself, but then was supported by a third-party organisation called Oxbridge Biotech Roundtable. They are a very vocal group that have done a lot of work in technology transfer for early-stage biotech entrepreneurs and ideas. It was actually through their programme OneStart that we were able to secure financing and develop the company around the framework that they offered, and then we were

able to take that to the technology transfer office to get them to take us seriously enough to spin out from the university.

Q80 **Jim Dowd:** Was this the TTO at Imperial?

Dr Basey-Fisher: Yes.

Q81 **Jim Dowd:** Was your experience of them a positive one?

Dr Basey-Fisher: It was challenging.

Q82 **Jim Dowd:** Challenging is a great euphemism.

Dr Basey-Fisher: Whatever happens in the future, the spin-out process is always going to be challenging, because it involves many different stakeholders with many different views and expectations of what they want and what they would like to see happen and those coming together. It will be a difficult process.

Q83 **Jim Dowd:** Was there anything you felt could be improved about it, or was it just naturally a difficult process?

Dr Basey-Fisher: There are a number of really clear things. As I touched on before, flexibility has to be introduced. What is really nice is that I actually had a meeting with Innovations again yesterday. We have had a long-standing relationship: they sit on our board and it is a very positive relationship. They have taken on board what has happened over the last few years, with the fact that more and more academic entrepreneurs are coming out of universities, and they have recognised that their existing framework, the existing policies from the university, no longer cater to organisations that already have the resources and the capability to take an idea forward without quite so much infrastructure and support from the university. They are actively changing that. Cambridge is a fantastic example of how well technology transfer can work, and that comes from the fact that they have the flexibility and autonomy to try different ways of commercialising technology.

Q84 **Jim Dowd:** Did you feel at any stage that Imperial's policies and/or structures were militating against you?

Dr Basey-Fisher: It was very much, "For the last 40 years these have been the terms we have given every start-up." There was no justification of what effort would then need to be put in past that.

Q85 **Jim Dowd:** "We do it this way because we do."

Dr Basey-Fisher: Yes, but that came more from the university's tradition. At the same time, the TTO were actively trying to help us to try to find ways to work around the policy to incentivise management and incentivise the academics who were leaving universities to move to the company, so they were very proactive in trying to assist us but they were working around an outdated framework.

Q86 **Jim Dowd:** Was the process of allocating equity a genuine negotiation or

was it just take it or leave it?

Dr Basey-Fisher: I would not have said it was take it or leave it, but it was very much, "This is how much we take typically of a start-up, and we will have an options pool on top of that to incentivise management." That was the starting point, and then, in the end, we spent eight months in negotiations to agree on something that really represented the value of the IP in a way and what they were going to continue to contribute. Looking back, we ended up in a very good situation where the parties were happy with what was allocated.

Q87 **Jim Dowd:** Generally, your experience was that, although clearly in some areas it could have been improved, it was a positive process.

Dr Basey-Fisher: Yes. Despite all the frustrations and the length of time, absolutely in our case it was a positive outcome, but I know many cases where people have not been fortunate enough to have such a good TTO there to support the process.

Q88 **Carol Monaghan:** My questions are directed towards Dr Fernández. I would like to ask a bit about konfer. Maybe you could start by explaining the difference between the smart specialisation hub and konfer, which I understand is an online brokerage service.

Dr Fernández: That is true. Konfer—konfer online—is being tested as we speak and is there for free. It is a digital platform for brokering new relationships between users of university knowledge. It was created by the National Centre, together with the Higher Education Funding Council of England and Research Councils UK. It was born because of the evidence that has already been mentioned—lack of resources and the difficulty of finding partners as the first and second barriers to more collaboration. The idea was, "I have a problem; I do not know whether a solution exists, and I do not know where to find it." The konfer platform provides solutions and answers, from a repository of information about university expertise, to questions that any user can pose. It will tell you, to the extent that it can, whether a solution exists and where to find it. After that, as a user you can contact the contact provided in the platform, or otherwise refer to the present konfer team and they will try to find you a set of partners. A one-to-one match is at present perhaps more aspirational than real; it reduces what we call the bandwidth of search, so instead of having to call every single university out there to see if they know what you are talking about and how to solve your problem, you get a limited number of them. It also provides real information about the kinds of things that universities are pushing out, in terms of their expertise, because it searches thousands of websites on a regular basis. The idea is to put out information that otherwise would be difficult to either find or understand by users who perhaps are not involved in it at present. That is konfer—a brokerage platform that pushes out information from universities.

The smart specialisation hub is a bit more complex and a bit simpler in a way. As such, it is more like an advisory service. It is online, but we have a lot of stakeholder management going on. The smart specialisation hub is a section of all collaboration. It is the section of collaboration that tries to find the best areas of specialisation in a particular location. The idea is to try to encourage practitioners in any location, large or small, to look at what they have, and take decisions on innovation and collaboration based on their strengths. There is going to be an online observatory of where innovation strengths lie. We are building it with evidence. Evidence is always partial, so we will have in the observatory contextual information as to how reliable are some of these maps of where the strength lies and how long lasting they are, but the idea is to try to find locations, not just solutions, of innovation strengths in a geography.

Q89 **Carol Monaghan:** Would that need universities themselves to input data? How is the data gathered for it?

Dr Fernández: One aspiration of the smart specialisation hub is to try to help local authorities where they normally would not have the types of expertise to search and generalise the data on innovation strengths. An innovation ecosystem is a rather complex thing to try to put in numbers, charts or maps, so we are at present only using existing data that is publicly available and can be applied to all single geographies in the UK. This is restrictive to start with, but what we want is to engage potential users who would not go into the more complex data-gathering exercises by themselves. Over time, once we have a system that can be applied to all localities, we might allow—we probably will allow—for specific studies, a specific area or sector, data analytics to be included, but we are starting by building blocks from a very simple level in order to engage local authorities.

Q90 **Carol Monaghan:** Can I take you back to konfer? You talked about finding partners? Are we talking about a match.com-type scenario where algorithms work it out, or is there a real person trying to match universities and business?

Dr Fernández: Konfer has been described a few times as a match.com-type of platform, and eventually it will be. We only launched it six months ago. We have had about 250 users register, and because it is a prototype or pilot, all the inquiries, of which we have had more than 50, come to us, and we try to use our knowledge of our network to try to find these people a solution, but over time, it will be more mechanical. It will be a matching process that is based on algorithms that will change, obviously, and will be flexible, but that will be in the next development phase, which is going to start probably this or next month. We are trying to develop ways to make it more mechanical and less people-based.

Konfer rarely will give you a one to one. We are normally trying to describe konfer as saying that it will give one, two or three potential dates, but you still have to go to the date and find out whether you want

to go with one or another. It is unlikely at this stage that konfer will give you the person you will marry; it will give you a few possible candidates.

Q91 **Carol Monaghan:** Okay. Obviously, it is very new—six months old. How are you monitoring and evaluating the success of konfer in allowing SMEs to reach universities?

Dr Fernández: At present, we do not have a huge number of SMEs that have used it, so we are monitoring—we have an analytic obviously—what kind of people come, how long they stay and what kind of things they look at afterwards. We have direct feedback; emails are sent back to the team. It is a small team, and, as I say, it is being built, but we have had over 50 unique pieces of feedback, some of them from the big players, such as Rolls-Royce and others users. We have had 250 users register. We can follow those a little bit better because they give us information about them. These 250 users have, in sending to konfer, sent potential opportunities to the konfer team. As we grow, we plan to have specific methods to follow up the types of businesses and other users, such as academics looking for other academics or universities looking for businesses. That will be built over time. Registration gives you information about the users, and those are the lines that we will try to follow.

Q92 **Carol Monaghan:** Do you anticipate that you will allow universities to reach businesses that have never had any collaboration with higher education or research before, or is it more likely to be established ones with established relationships?

Dr Fernández: We definitely hope we will encourage some of the current non-players to come on. Inevitably, there will be more of the already-players playing with it, because for them it might be a way of finding things they would not through their own channels. We hope definitely for both. One aspiration of konfer is to get in users, businesses— possibly or predominantly small businesses that are, as I said earlier, a little bit daunted by the prospect of having to contact a high-flying academic—to come on and leave their query and see what happens with it. The aspiration is definitely new participants.

Q93 **Carol Monaghan:** How are you marketing that? Are SMEs aware that this exists?

Dr Fernández: The marketing budget is at present still small, I suppose, but we are using the value chains of our members for them to encourage other businesses they collaborate with to try it, and over time there will be a plan to attract more businesses. My colleagues tell me that there will be a campaign directed at smaller ones, maybe the scale-ups, the ones where there a higher probability of them being interested. The one thing I should say we are aware of is that only 3% of businesses out there use universities as sources of information for their innovations, and therefore we know, as Tony Raven said earlier, that all the 5 million SMEs out there might not like to use konfer, but however many there are—probably in

the hundreds of thousands—that could benefit from finding potential partners, we would like to reach out to them.

Q94 **Victoria Borwick:** We might be asked to vote soon, so I will speed it up, if I may. PraxisUnico told us it ran a course for SMEs about engaging with universities but that take-up was a bit low. Do you have any insights as to that and what you would do another time?

Dr Clare: Yes. It is similar to the problem that was just referred to. It is very hard to find and reach out to people who are interested in doing such a thing. The feedback on the course itself from the people who came along was very positive, and the small businesses felt that they had a good experience and gave us some very good feedback on what they might want. If we do this again—we would like to do it again—it is about working with partners, with Innovate UK, the CBI and others to help reach out to small businesses. The challenge is that many businesses still do not know what they might get out of a relationship with a university. We work very well with businesses who come to us who know what they want and can see working with a university as part of their strategic plan. We would like to work with business organisations, LEPs, all those organisations whose job it is to engage regularly with small businesses, to find ways to produce materials to help them understand what the value to them might be, at which point we hope the courses that we might provide will have a higher take-up.

Q95 **Victoria Borwick:** Of those business that attended, were you able to get success case studies that you can then use to sell it?

Dr Clare: We have feedback from those companies and we have positive comments that we will use when we are marketing it next time around. We will also use their comments to adjust the things they felt could be better improved and the sorts of information they wanted.

Q96 **Victoria Borwick:** Just to complete, was there any information that you learned from that that helped you indicate or find businesses where you were more likely to be successful? What guidance or advice can you give to others?

Dr Clare: The sample size was too small. We worked with partners, we marketed it through SMEs that the universities already knew, which was good and helpful and we would like to do more of that. I could not point to any specific thing that we have learned where we think, yes, we had to do that. It is a difficult problem, but we will work with our partners to solve it.

Q97 **Victoria Borwick:** Does anybody else want to add to that?

Dr Fernández: The one thing I will say, which I think has been relatively recent, is the increased amount of co-ordination in the sector to try to get more of those SMEs. We know some of them are there, and some of them come to events and say, "I would like to get a solution to our problem. How do I go about it?" Nearly every single member of

PraxisUnico will say, "Come to us," but they could not go to all of them. I would concur with Phil that it is a difficult problem and it is not just about funding. It is about information; it is about overcoming a barrier—an information hump that you have to overcome by working with them. Just throwing money at them might not do the trick.

Dr Clare: It comes back to the demand-side problem that was referred to in the earlier session. How do you stimulate industry in the UK to reach out to universities and see the value? That requires universities to be ready, to be on the front foot and to be prepared to engage and explain what we do, but our partners in UKRI will be an opportunity, I hope, to improve the voice out to businesses, as will the CBI and other organisations. The CBI produced a very useful document a couple of years ago explaining to their members what it was like, and what they could expect, when they set out to work with a university. Promoting those sorts of documents and that kind of educational material to businesses more would be enormously helpful.

Q98 **Chair:** Can you say a little bit more about this? Did you target the type of SME that you approached? You said there were 5 million SMEs. They cover absolutely every conceivable trade and industry and so on, so it will not apply to all of them. What did you do specifically to target SMEs? Was the targeting wrong perhaps, which is why the take-up was low?

Dr Clare: We did not have a preconception about who we wanted. Anybody was welcome, because we recognised it was a difficult problem. We did seek to engage SMEs, generally ones that we know, or in sectors or in trade associations where historically we could see that there might be a benefit from working with a university. On the other hand, one cannot always predict what sort of SMEs will benefit from working with a university. In my own organisation, the historians work with groups of country houses to improve visitor experience and visitor turnover, so that is a university working with SMEs, but it is not the sort of thing you would traditionally target. We are agnostic in one sense about the possibilities. I think anybody can come and find something interesting at universities, but we need to work hard perhaps to target messages to particular sectors about their individual needs; I recognise that we need to do that better.

Q99 **Chair:** Finally, and then I am going to pass over to Matt Warman, I asked the previous panel whether they were surprised that any particular sectors did not engage, and I did not really get a clear indication of that. Are you surprised that any particular sectors of small industry that you would think would want to engage with university collaboration have not?

Dr Clare: That is a very difficult question to answer. There are some industries that are more predisposed to engagement than others. The pharmaceutical industry by its very nature is far more likely to engage with the universities because of the obvious relevance of what we do to what it does. One might suspect that the airline industry, for example, is less predisposed because it would be less obvious what the benefits are,

but my own organisation is working with Emirates—mathematicians are working with them on their customer-facing data analysis. How that sort of conversation comes about is often through serendipity, which is part of the challenge.

I am surprised by the companies and sectors that come and talk to universities. In every sector, there are businesses that see a strategic advantage in working with the universities, and there will be many businesses that do not. If you are thinking about penetration and the demand side, it is not so much that one sector is good and another is bad; it is that within a sector there will be some businesses that have a vision, pursue it and knock on our door because they can see the value, and there are others who do not see the value. Our inclination, because we are limited in resources, is to work with the ones that knock on the door, because they have a vision and we know we can help them deliver it. Stimulating more businesses to see that as something where they can get value, because we are ready to help them, is what we need to do. That is not an answer but an observation.

Dr Fernández: Could I quickly qualify that? We do deep dives into different sectors on a regular basis at the National Centre, but, whereas I do not disagree that some sectors are more involved with some types of collaborations—the construction sector might not do a huge amount of collaboration for innovation, but they do a lot of collaboration for talent development, so that is one type of qualification I make to this idea of how you classify a collaborating or not collaborating sector—more importantly, I think it is not just about being surprised. It does not happen only by serendipity that some businesses in some sectors are more engaged than others. We recently looked at the food sector—the whole of the value chain, from the farmers up to the retailers—and, interestingly enough, the ones that had more difficulty in innovation and translation were the ones in processing, because they were limited by the goods they were given and by what the customers wanted to do at retail. Whereas we would expect them to be the most engaged with universities in order to find solutions to better process the foods, so that consumers were happier, they were the ones that were more constrained by the way in which the sector works. It is not always serendipity, and this Committee has had enough deep dives into sectors like graphene or satellites to know that each of them has their own rules of engagement: sometimes they are constrained by the sector they are in and not by their needs.

Q100 **Matt Warman:** We will need to be quite brief because these are four slightly disparate questions and we have to vote fairly soon. In her review, Ann Dowling criticised the innovation landscape for being too complicated. First, is that a fair criticism and, secondly, has it got any simpler since that review?

Dr Fernández: It is complex; I would agree with the assessment. It is complex for good reasons. It is complex in terms of the funding. As I said

earlier, tailoring funding sometimes gets you better results because you are customising your incentives to the area that you want to incentivise, and that means that the funding landscape is complex. We have a landscape that now funds—

Q101 **Matt Warman:** The criticism was more that there were umpteen different pots and it was impossible for people to work out where to go, rather than that the bespoke solution could not be forthcoming from a single point of contact kind of model.

Dr Fernández: The multiplicity of funding might mean that you do not know which one is best for you, so you have to look for that. But, again, having only one stream of funding that everybody goes into might not solve the problem; people would know where to go, but the allocation might not fit the kinds of problems they have.

Q102 **Matt Warman:** Do we need a better way of triaging people who know what they want but do not know where it is? Is that the role of the National Centre in a sense?

Dr Fernández: We need ways for information to flow better between the funders and the potential users of the funding. That is true. Phil mentioned UKRI earlier. There are opportunities for better co-ordination of funding in UKRI because they will be talking to each other more often than they do now. I am sure they do talk to each other a lot at present. I think information is flowing more freely. Inquiries like this one—certainly organisations like the ones you are having here—are trying to improve the flow of information in terms of how things are allocated and for what purposes, so it is improving. Complexity is not a bad thing; it shows maturity in the research base.

Dr Basey-Fisher: I would agree with that. It is complex, but we have not really had much of an issue, once we got to grips with the landscape in the industry, to find the right resources and the right people.

Dr Clare: I would agree. Complexity in the UK system, which is widely lauded around the world, is perhaps a symptom of its sophistication rather than a problem. I agree that there is a need to hide the wiring and explain it better to people who are coming to it new. Universities have all used HEIF funding to invest in people who can be single points of contact, who can explain it better, and I think will continue to work with UKRI, which will, hopefully, bring us simplification. I think the answer is yes. Slowly, it is becoming easier for people to get more concise explanations from universities and other organisations.

Q103 **Matt Warman:** You all mentioned UKRI in some form or other, I think. What does it need to do to improve the commercialisation of research?

Dr Clare: UKRI is an opportunity, but it presents challenges. It needs to be constructed in such a way that all the good things we already have are not accidentally discarded, and there is not a sort of turf war over which budget goes where because of internal discussions. It is more about how

we combine all these things to get a better output. The opportunity is to see the research and innovation system across the piece. We need not to be misled by the titles of the organisations going into it. Just because it is a higher education funding item does not mean that HEFCE needs to deal with it; just because it is about innovation, it does not mean it is an Innovate UK item. It is about recognising that all those organisations are responsible for research and innovation. Part of their job, I think, is to make best use of the world-class research infrastructure that we have in the UK and make it available for economic benefit.

Q104 **Matt Warman:** Can you give us any concrete examples of what that might mean? What you have basically said is that we want it to be better rather than worse, which is true, but I am struggling to find something concrete that UKRI could or should do that is not currently happening.

Dr Fernández: Can I give one example that has come into my head? This is not to say that we only have one line of spend. At present we have different funding agencies, funding the very early stage—proof of concept was mentioned earlier—the middle value of the thing, then the application and more commercialisation parts and finally the follow-on thing, so, say, four areas of funding that each of them is funding to some extent. One thing UKRI can do is not to have a single one, but each of them can tell which part of their funding is contributing to each of them. That will help all of us understand better how each of the agencies that will be within a single item are contributing to the landscape in this particular world. That is what I call better co-ordination. It does not have to be a shift of money from one agency to another, but it could potentially be each of them realising what they are doing in each of these areas, for example.

Q105 **Matt Warman:** You mean data sharing about what they are doing and how.

Dr Fernández: But also with us. Very often we do not understand what this thing is doing, and some of you were asking what the proof of concept is doing that other things are not doing. It is not just for them. I am pretty sure they have very clear reasons for their funding lines and spending lines, but sometimes we do not understand how they fit with each other. That definitely would help.

Q106 **Matt Warman:** On a similar theme, there is going to be an industrial strategy. What could an industrial strategy do that would help the kind of collaboration we are talking about today?

Dr Fernández: For me, it is very clear. Again, we are talking about things and we do not know what they are—one of the sweet spots in trying to find new collaborations or new ways of collaborating is the crossover between location and sector. A few times in the conversation today, we were talking about which sectors are more surprisingly collaborating or not and we also talked about the importance of location for SMEs, for example. The industrial strategy is poised to try to clarify

areas of potential new-born collaborators that are decidedly in that space—the interaction between location and sector, sectors in a particular location.

Dr Clare: I hope the industrial strategy will start by reiterating the importance of sustaining the science base in the UK. I think your predecessor Committee observed that the science budget in the UK is declining, and we need to invest if we are going to overtake Estonia and our competitors around the world. I think, therefore, we need to ensure that we keep putting fuel in the tank as well as tinkering with the engine, if I can put it like that. Building on top of that, we need to think about the opportunities that we have. I hope that the science and innovation audits, the work that is done around smart specialisation and the work that NCUB are doing will help to provide some data that will allow us to make sensible choices about where we see future competitive advantage in the UK. Things like quantum hubs are a very good example of the implementation of a strategic intent where you can see that we will marshal all the resources in the UK to deliver something that will allow us to be competitive in the future. Focusing on those sorts of initiatives will be helpful, but we also need to recognise that the big competitive advantage we have is the research base.

Q107 **Matt Warman:** Do you have anything to add?

Dr Basey-Fisher: I would look towards the Catapults as well and just how successful they are at the moment. It is early days for them, but they are certainly delivering a lot of impact to the highly focused areas of innovation where we can really excel as a nation. It is about identifying what we can excel at, and a lot of that comes back to having good, new innovative research to continue delivering world-leading industry for that space.

Q108 **Matt Warman:** Finally, on the minor matter of leaving the European Union, the Intellectual Property Office has already started talking about the new European copyright legislation that will be coming through. Have your organisations, your businesses, started to think about what the ramifications of leaving the EU are on commercialising and on intellectual property more generally, or is it too early to say, given that we do not know what the landscape is going to look like?

Dr Basey-Fisher: For us, it is too early to say. The only thing I have heard people talking about or being concerned about is that there is uncertainty, and with uncertainty and no clear decision being made at the moment, it lowers risk appetite because no one knows quite what is going to happen. The biggest impact is in the investment community, and I have heard them talking about this far more than any other industry at the moment, but in terms of what impact it will actually have, I could not comment.

Dr Fernández: I would link that to something Phil said earlier, which is that for us there will be probably some effects, but we know that the

biggest attractor of foreign direct investment to the UK is the quality of the science base, and we do not expect things to be very affected by Brexit if the types of resources that they have continue to be available for them, and that includes both the funding and the people. At present, the quality of the research base is not falling significantly, and we expect that for the time being it will continue to attract FDI for research.

Dr Clare: My vice-chancellor has spoken extensively on the possible effects on our own university and all universities, and I will defer to her on that matter. One opportunity that I hope may come to pass is that if there is an opportunity to look at VAT, which we currently cannot do, VAT regulations make it very difficult for universities to collaborate over shared services, and for universities to bring businesses into academic buildings and work alongside them, and that would be a huge opportunity to—

Q109 **Matt Warman:** Presumably, the same goes for intellectual property law itself. Once we are outside the European framework, we have, obviously, a vested interest in making sure we can still trade on equal terms, but we also have an opportunity to make our own legislation in a way that we did not before. Is that an opportunity as well?

Dr Clare: The landscape in which technology transfer operates is very much an international one. You cannot think any more about just filing a UK patent, for example. You have to be global.

Q110 **Matt Warman:** That is my point. There are global opportunities that may be available outside without being quite so tethered to the European Union.

Dr Clare: The attempt to produce globally consistent IP regulations far predates the existence of the EU, so we should continue to do our best to bring those things into harmonisation, if I can still use that word.

Matt Warman: Bigger harmony. Thank you very much.

Chair: Thank you all for your very insightful contributions this afternoon.