



Business, Innovation and Skills Committee

Oral evidence: Business–University collaboration

HC 249–iii

Wednesday 18 June 2014

Ordered by the House of Commons to be published on 18 June 2014.

Witnesses and written evidence where submitted:

At 1.15pm

- Steve Yianni, Chief Executive, Transport Systems Catapult
- Dr Paul Zanelli, Chief Technology Officer, Transport Systems Catapult

At 2.00pm

- Professor Richard Jones, Pro-Vice Chancellor for Research and Innovation, [University of Sheffield](#)
- Professor Greg Marsden, Director of the Institute for Transport Studies, Leeds University
- Nigel Foster, Chair of Institute for Transport Studies External Advisory Board

Members present: Members present: Mr Adrian Bailey (Chair), Paul Blomfield, Ann McKechin, Mr Robin Walker

Questions 127 - 171

Witnesses: **Steve Yianni**, Chief Executive, Transport Systems Catapult, and **Dr Paul Zanelli**, Chief Technical Officer, Transport Systems Catapult gave evidence.

Q127 Chair: Good afternoon, and thank you for agreeing to speak to us. I do seem to remember that once there was a media furore about chairs of Committees talking to witnesses beforehand. On this occasion, I do not think we had much option. Anyway, thank you. We know who you are, but for voice transcription purposes and so that we can just check levels, if you could introduce yourselves, starting with you, Paul?

Dr Zanelli: I am Paul Zanelli. I am the Chief Technical Officer at the Transport Systems Catapult.

Steve Yianni: I am Steve Yianni. I am the Chief Executive Officer at the Transport Systems Catapult.

Chair: Thank you. Just a bit of advice: there are only two of you, so it is not normally a big problem with two people, but do not feel that you have to answer every question if the person who has spoken in front of you has said everything you want to; only if you wish to add to or subtract from what has been said. Some questions will be person-specific, but a lot will be general.

Q128 Chair: I will start off with a pretty basic question. Why did you choose Milton Keynes as your location for the Catapult?

Steve Yianni: I will take that one. Milton Keynes was selected through an open and transparent process of engagement with our wider stakeholder community. As the case was being developed for the formation of the Transport Systems Catapult, we reached out to the transport sectors, academia, and other stakeholder groups. That group assessed a series of criteria that they felt were important for choosing the location of the Transport Systems Catapult, and those criteria included things like access to skilled people, access to industry, access to universities, and access to the transport network.

With those criteria, an assessment was completed using government statistical data, and a ranking process was followed through, which highlighted a priority area in the belt from Birmingham down through Milton Keynes to London and stretching out to Reading. To further hone that search, we focused on three cities in that area, which were Reading, Milton Keynes and Birmingham. London was excluded for a couple of reasons: one is that rental costs are very high, and three other Catapults had already announced that they were going to create their facilities in London. The three-city selection was further refined and Milton Keynes came out top, and that is why Milton Keynes was chosen. The Science Minister announced the outcome of that, I believe, in July last year.

Q129 Chair: My next question is really on income and investment. You do depend for one-third of your revenue on, basically, R and D spending by industry, and as I see it, there are two issues there. First of all, in recent historical terms and currently, there is a relatively low level of R and D investment privately, and secondly, a lot of even that investment that we do have is concentrated abroad. Do you see that as a real problem for your future survival?

Steve Yianni: I will take that one again. You are quite right: a third, a third, a third is our model that we are aiming for as we mature as a business. In our five-year plan, we have said that by year five, we expect roughly equal income streams: a third core-funded work, a third commercial work that we win from industry, and a third collaborative research and development.

You are right, Chairman: the levels of investment in some of the sectors with whom we engage historically have been low. I will quote the McNulty report, which highlighted that the rail industry was investing about 0.5% of their turnover in research and development. That is very low. The UK norm, from the last data I have seen from the Engineering Council, was 1.7% average in the UK; the EC average is 3%, so we have very low levels. However, post-McNulty, that has been recognised in rail, and there are new

funding streams available in rail to stimulate higher levels of investment in the rail industry, as an example.

Is it a risk? Yes, it is a risk to our business model. Do I see it as a critical risk right now? No. The reason for that is that we are growing and developing as we come out of our start-up phase. Our plan did not show a third, a third, a third right now; we have just started year two. By the time we get to year five, I am confident that we will achieve those levels of income from commercial sources.

Q130 Mr Walker: Just to follow up, I think the point the Chairman was making was that a lot of the R and D that does take place is not necessarily UK domestic companies. We have got overseas companies that are investing in our transport system as well. From your perspective, does it make any difference whether the money being invested in R and D is coming from a UK company or elsewhere, so long as it is actually invested in the UK?

Steve Yianni: You are right: R and D can be conducted anywhere, really. You are right, also, that many of the companies we want to work with or are working with are global players, so they can decide where to make their R and D investments. Part of our mission is to make the UK an attractive place for those global companies to decide to invest that R and D here, and the way we have set up the business here is to try to encourage that to happen. We are in discussion with large, global automotive companies, for example, who have those choices, but we are trying to present the reasons as to why they should invest their R and D in the UK.

Much will spawn from that. If the R and D work is done in the UK, then the people are here and are more likely to stay, and manufacturing investment is an easier case to make if the knowledge base is here in the UK. That is part of the wider Catapult programme: to encourage R and D investment in the UK, and to attract not just that particular activity, but also the opportunity for creation of jobs and prosperity here in the UK.

Q131 Chair: You have obviously got a business plan. I realise it is incredibly early stages at the moment, but when do you think you will get some idea of whether you are actually meeting your targets on inward investment?

Steve Yianni: We have a target in year two to achieve roughly 20% of our income from either collaborative research and development or commercial work. In broad number terms, we are expecting to undertake activity in the order of £20 million this year, £2 million of which, roughly, is collaborative research and development, and £2 million of which is commercial work. We will get the signals as to whether that was too aggressive as a plan; it might be. In year one, our target was to have zero on both, and that was the way that it turned out, but year one for us was a partial year. We really got going as a business in the summer of last year, so we have been in operation for less than a year. Again, year two is quite aggressive, but we will get an indication from the performance indicators that we have that are traced back to our five-year delivery plan.

Q132 Paul Blomfield: One of the issues that we are interested in in relation to Catapults is SME engagement. I want to ask something a bit more generally, but I will start off with a very specific point that has been raised with us, which is cost as a barrier in terms

of fees for SMEs to use facilities. How are you setting charges here, and do you see that as an issue?

Steve Yianni: Paul Zanelli next to me may want to add to this. Again, I will condition everything by saying that we are really just getting going. We are working with SMEs; you have met some of them today. The relationship with RDM, if we take that as an example, and the LUTZ Pathfinder project and the autonomous pods, is one where they were awarded a contract that was won and bid for in a competitive, open and transparent process following normal procurement processes. In that case, they come here for meetings; we do not charge them for that. They have won a contract from us, so there will be a transaction, and that will be an income revenue stream for them. On a wider basis, you are right; we do want to engage with SMEs and attract SMEs into this environment. What is our model? We have not got to a stage where, say, a start-up needs to lean on us and use our facilities to get going, and as they develop and grow, we will need a charging mechanism. We have not had that situation yet. We have not been faced with that problem.

Q133 Paul Blomfield: Do you think it is likely to be a problem, in terms of being a barrier, and if so, have you had any thoughts in terms of how you are going to deal with it?

Steve Yianni: We are very conscious of state aid rules, but again, we are here to create an environment where we are stimulating business. I think we will use a sensible approach: if people are coming here for a meeting for a day, I do not envisage that we would be charging people for that; if people are coming here and developing their business for many months, I would expect to be charging them for that service. As I say, at the moment, we have not reached that issue. Do you want to add anything?

Dr Zanelli: I advise a number of SMEs, and have spent part of my career working with SMEs. If we look at the capabilities that the Transport Systems Catapult will be developing, in our five-year plan we talk about our national transport systems modelling facility. That is a facility that will be about providing access to data and to standard ways of integrating models across the transport system. There are less costs and barriers to entry for accessing a capability such as that, as opposed to maybe some of the manufacturing capabilities, which is an SME that I work with that does a lot of work on composites and different types of integration, because there you have safety training and lots of other big issues before you can do things. There are more inherent costs, without subsidising. With us, we do not see that we would need to subsidise. A lot of the capabilities that we would be offering have fewer barriers to entry and fewer inherent costs for entry at a small scale.

Q134 Paul Blomfield: Do you see any other barriers for SME engagement? We could have a very long conversation about this. I do not want to divert it entirely, but it is an important issue for us.

Steve Yianni: Again, back to what we are trying to achieve: we are trying to achieve collaboration at all levels and stimulate the SME community, because quite often innovation is derived from those organisations. We need to present ourselves as being an attractive place for these small organisations to come to. Again, with very small start-up companies, we need to be offering something that is of value to them, because time is of

value and we need to be asking, “Why would they come here?” A rigid charging mechanism may be a barrier to that.

Q135 Paul Blomfield: Moving away for charging, are there other issues? I was trying to see if there were things that you were anticipating.

Steve Yianni: Aside from the charging, there are travel costs. If people are incurring costs just to come here to meet and to collaborate, that could be a barrier for them. I am not suggesting any solutions to that, but it could be.

Dr Zanelli: We are quite new as an organisation, and we are still developing our propositions. For an SME, clarity of proposition and making sure we are communicating and marketing what those clear propositions are to them are important. I do not see that as a long-term barrier, but in the short term, as a SME, you do not have all of the extra people in your organisation who do all of the searching of all of the things for you. You have to have quite a direct method of approach and communication, so there will be a barrier just in terms of maturity while we get running, but I do not see that as a long-term barrier; it is a short-term barrier while we get clear about our proposition to them.

Q136 Ann McKechin: We have had the pleasure, obviously, of visiting this brand-new Catapult Imovation Centre this morning. In fact, of course, all the Catapult centres across the UK are brand new, but some of the concern is about how we ensure that Catapult’s functions drive the design of its facilities and institutions, and not the other way around.

Dr Zanelli: If I understand the question, it is about how we make sure that what we are building out meets the need. One of the key ways we have done that is through the people we have got here in the business. We have got some great people in the business, and they come from the world of taking scientific knowledge and turning it into industrial capability. I have talked about my background, and I have done this; I spend a lot of time working at innovation centres and with SMEs. Throughout my career, I have done that, and the design of this has been driven by the knowledge of the people in the organisation who are experts in the UK at doing this.

Q137 Ann McKechin: You presumably have carried out some degree of scoping about where you actually think the demand is going to come from, as well as the people you have actually employed. Do you have some other vision about where you are going to be three or five years hence?

Dr Zanelli: Absolutely. In the gestation phase up to the start of the Catapult, there was a huge amount of consultation with the market from academia, SMEs and industry about what it was they were looking for from the Catapult. That went into deciding, as Steve has already said, where the Catapult was to be, through to what the Catapult was offering. We are now moving from that, and that is detailed in our five-year plan at a relatively high level. What we are now doing is actually building out the facilities and propositions to meet that high-level plan at a more detailed level.

Steve Yianni: I have spoken about the stakeholder community that we have and the engagement with them. I think we will get feedback from that community if we are not doing

the right things. So far, it is looking very positive. You will be aware that we have been undertaking a two-week launch festival. This is week two of the launch festival, and by the time we are completed, we will have had about 1,000 people through the facility, stakeholders from all different environments. The feedback so far is hugely positive, that we are doing the right things, but we will continue to test that, and that gives us a litmus test in the future if we are drifting away from what we are here to do.

Q138 Chair: Just before we go onto the next question, you have talked about your stakeholders, and you have had this launch period. I do not want you to go through all of them alphabetically, but could you just give us a flavour of the range of the stakeholders that you have got?

Steve Yianni: Shall I run through some of the events that we have had?

Chair: Yes, I think that would be helpful.

Steve Yianni: We had a formal launch day on 12 June. The Secretary of State for BIS came along and opened our facility. The invited guests there included senior representatives from the transport sectors that you would expect: marine, rail, road and aviation. We had local politicians and the local MPs; we had academia here, and that was reflected in the second event on that day, where we had the Parliamentary Under-Secretary of State for Transport, Robert Goodwill, here from the Department for Transport. Again, we had over 100 guests from that same broad stakeholder community.

We have held other events. We have had debating forums; there was one on Monday of this week, which we called “Brains to Business”. This was brains at universities connecting to business. We had a panel of speakers, half a dozen or so, which included entrepreneurs, myself, the Vice-Chancellor of Oxford University, and the Chairman of the Oxfordshire Local Enterprise Partnership, so, again, a broad range of speakers. The audience, again, was made up of representatives from academia and industry, and we had a lively debate about the potential issues facing us as we embark on our journey.

We have an event tomorrow: it is called the “Data Challenge.” There is a lot of debate about big data, and in the transport environment that is a very big potential opportunity for us. How do we convert that into useful information? I think we have got about 100 people coming tomorrow. Paul is actually leading that event for us. Does that give you an idea, Chairman, of the kinds of events that we have run and the kinds of communities that we are engaging with?

Chair: Yes.

Dr Zanelli: Can I add something? Steve has mentioned a lot of the communities there. A big one for us is, obviously, the academic community, which is an area that I lead. We announced during the festival our first academic university partner programme, under which we have got 14 universities through eight collaboration centres. The event tomorrow is a follow-up to a first event we had in November, where we invited the academic community to meet us so we could understand what they want. We released a report, and that report is published on our website; the event tomorrow is responding to that. They said data was one of the key issues for them; the challenge tomorrow is to get

the detail about what data is required and what we need to do in data. Obviously, at the first event, we said that we would invite them along to our launch, and we are inviting them along to our launch. Again, the outputs of that event tomorrow will also be published on our website.

Q139 Chair: Can I just raise an area that you have not mentioned? This is not to say that you have not involved them. I was actually thinking about trade unions that are involved in transport. Now, I accept that obviously the management of changes and so on will be up to the management of those companies implementing it, but given the somewhat chequered history of industrial relations in the transport sector, do you think that there is a potential role for at least apprising unions of the technological developments that are taking place, also because of the actual detailed information that they may be able to feed into some of the modelling that you do?

Dr Zanelli: As a Catapult, we want to engage as widely as possible, so I would see no reason why we would not want to engage with the unions. The people within the transport sector and their skills are key focuses for us. We are talking to the skills academies and the other Catapults about what we need to do. If we create the jobs, we need to fill the jobs, so as well as the union side and the people working in the transport sector, we are also then looking at how we represent the people who use transport and use mobility. The message there is that we are looking to engage as widely as possible.

Q140 Paul Blomfield: I would like to talk a little bit more about your approach. On your website, you say that a “systems approach” is the best way of identifying opportunities for more effective collaboration. Can you just explain to us what you mean by a systems approach?

Dr Zanelli: I am happy to take that one again. It is a subject that is close to my heart, and I spoke about it at a Battle of Ideas event last night. There is the INCOSE definition of “systems engineering”, but systems thinking was introduced in the latter half of the 20th century, coming from Bell Labs. It looks at how we manage complex systems, systems that are becoming more and more complex—how we implement and manage complex systems. One of the key principles is that you need to understand the requirement of the system; you need a methodology for how you capture that requirement; and you need a means of understanding the functions that the system needs to deliver to meet that customer requirement. That, to me, is a systems approach to doing things, which abstracts the requirement of the system from how you go implementing it in a whole-system way.

Steve Yianni: Can I add to that? As well as what Paul has said, we are Transport Systems. We are sometimes called the Transport Catapult, but we are not that: we are the Transport Systems Catapult, so we are not here to get involved in designing cars, aeroplanes or trains. We are here to look at the integrated transport system. We see a number of shifts: technology is developing, and some key areas of technology are ripe for development. The benefits are accrued on a much wider basis if you look at the whole system. The whole system, for me, in a transport context would be the integration of the road system, the rail system, the aviation system and the marine system. I would add in walking and cycling.

The shift we see coming is that whereas historically, transport has been fairly siloed into those industries and those industries do not take huge consideration of other parts of the transport system, we want to encourage that they do. However, rather than transport being done to people, what we see is that consumers are gaining more and more power through what is available to them through smartphones and mobile forms of data and information. Consumers are demanding more mobility, so they are looking for mobility solutions, and that connects with our theme of intelligent mobility, which you will have seen in our five-year plan. It is our overriding direction and strategy. There is this huge emerging market that we refer to—£900 billion per annum globally by 2025—and our role is to help UK-based companies capture a large share of that. We are talking 10%, so £90 billion of new market opportunity for UK-based companies. It is huge.

As I have said, the provision, availability and deployment of these new technologies of autonomous systems, real-time data provision, real-time information provision, smart infrastructure, resilience, and looking at the customer experience and the journey experience of the end-to-end journey are themes that we see emerging, which will make up that huge market.

Q141 Paul Blomfield: I wonder if I could ask a question that spins out from your answer there, Steve, in terms of silos? It is a more general issue about Catapults. A great strength of Catapults is that they are focused on specific sectors and specific technologies. That can be a weakness, as well, in that pulling together a critical mass with a narrow focus might drive people into silos. Certainly, some of the evidence we have had suggests concern about that. How do you make sure that does not happen? How do you develop effective cross-sectoral working?

Steve Yianni: A large part of the way that we are aiming to deal with that, and are dealing with it, is through collaboration, again: engagement with people and with wide communities, many of whom are involved in other activities.

I will give you an example: there are seven Catapults. There are quite a number of projects where we are collaborating with other Catapults, such as the Connected Digital Economy Catapult. We have a live project running with them; we call it Instant Weather. It is a partnership between us, Connected Digital Economy Catapult, the Met Office, and Sunderland Software City. That itself is a grouping of about 1,400 SMEs in the Sunderland/North-East area of England.

The objective of the project is to provide much more accurate and targeted information, which in our context is useful in a transport environment, but it also has interest, of course, in terms of Connected Digital. That is an example of where we are considering the risks that you have highlighted, and recognising that there are areas of overlap and opportunities for us to collaborate further so that we do not become siloed. We are thinking much broader, even, than our Transport Systems broad view, and there are other examples, as well.

Dr Zanelli: Can I add to that? The Catapults are market-focused, but many of the technologies that you need to exploit in those markets, as you go down the technology layer, are shared between those markets. We have a lot of activities across the Catapults to identify those areas that have commonality at a technology level where we can have synergies before we each take them into our own vertical markets to exploit. I will give a

couple of examples: open data is a key driver for a number of Catapults—CDEC, Future Cities, Satellite Applications and Transport Systems, just to name a few—and we are actively collaborating through a technical liaison group to develop a common approach to how we go about developing our strategy for open data.

In another area, modelling and simulation, we are looking to collaborate with the new Energy Systems Catapult. Again, there are a number of cross-Catapult meetings where these potential areas of collaboration are highlighted, and then we have a plan. We are also looking to develop at a technology level road-maps linked through to the market, so we can demonstrate to the outside world where these potential areas of collaboration are.

The final example I will give is that through our university collaborations, we again are looking to make sure that we collaborate at the technology and research level. One of the partnerships we have just announced is with Nottingham and Leicester, through our partnership agreement, and Satellite Applications also have an agreement there. They are looking at positioning systems, which are obviously highly relevant to transport systems, and we are working in collaboration to make sure our programmes are fully aligned.

Q142 Chair: Before moving on, could I just raise this issue of collaboration? How do you guard against duplication?

Steve Yianni: You are right, Chair, that that is another risk. Our approach to doing business is one of openness and transparency and communicating effectively. I think we have been doing a lot of that; I would claim that we are doing a lot of that. Have we seen areas of duplication directly, in terms of what we are doing? None that I can think of right now. It is more the case that we try to find potential areas of overlapping interest where we can work together. I accept that it is a risk, but being open and transparent and communicating effectively is a pretty good approach to avoiding duplication.

Q143 Chair: Do you feel that you are ahead of the game worldwide, or is there a danger of you investing a lot of time in projects where, basically, you find that you are beaten to it by some organisation elsewhere?

Steve Yianni: We have taken a scan of what is going on in other parts of the world in this area. In fact, that was a question that we had at the presentation of our five-year delivery plan to the Technology Strategy Board governing board. That was the group that needed to approve our five-year plan to allow the process to be followed to unlock our core funding from TSB, and their challenge was, “Who else in the world is doing this stuff?”

We have some knowledge of that, and we gained further knowledge through the request that we got from that forum back in October of last year. We know that there is a Fraunhofer in Germany that works on integrated transport, in Dresden. Paul has been over there. That created more dialogue and more opportunities for overlapping interests. Their approach was not so much on intelligent mobility; rather, it was just integrating. Paul can say more about that, as he had it first-hand. There is some activity in the States and in

Singapore, and we want to reach out to those communities to learn from what they have done, so that we are not duplicating effort that has been developed elsewhere in the world.

Where are we on a scale of international development in this area? I think we are at the forefront of it, so for intelligent mobility and creating the environment where the UK can capitalise on this huge growing market, I think we are at the forefront. As we think broader, thinking about the developed world—the UK included within that—how are we going to earn a living in the future? Technology and innovation is probably the best way to secure our long-term sustainability for a prosperous economy, and it feels to me like this area of intelligent mobility is a bit of a race.

What I hope you have picked up in your tour today is that we really want to get on with things. We are really excited about what we want to do. We are acting with a sense of urgency, so we have created what you have seen in nine months, pretty much from a standing start. When I took office in August, we had a room—a Regus office, just up the road here—and I had a mobile phone, and that was pretty much it. I focused on developing the team, recruiting really good people, and finding somewhere that we can operate from—which is now this facility—and having a plan that was approved, which happened in October of last year.

We have built the team now to 100 strong. Why is that important? It is important because we need to be credible partners for those with whom we want to collaborate. We have a presence; we have a capability now. We are good partners to have to join forces with other organisations and jointly develop programme activity in this area. It does, to me, feel very much like an international race. This is an area where the UK has the ingredients to really succeed, and part of our role is to make that happen. I want to get on with it.

Q144 Chair: Paul, do you have anything you want to add to that?

Dr Zanelli: Yes. A core function that we provide at the Catapult is to continually examine the market for intelligent mobility: the movement of that market, and where the opportunities are. We continually assess where the UK has competence and capability, so the opportunities we are going after are the ones where the UK can truly succeed on a world stage. We are not going to go after everything; we are going to go after where those opportunities exist.

In the UK, we have some core capabilities in data. When I was over in Germany, they look at the UK as having a relatively liberal approach to data and data regulation, and see it as a key differentiator for us. They have some constitutional issues in terms of being able to open up data, whereas they see we have a more open debate on that at the moment. Truly understanding the market, down through capabilities and competencies, down to where we are good in our science base, and into our technology to identify the opportunities is how we make sure that we focus on the right areas where we have the opportunity to be the best, and the best on the world stage.

Q145 Chair: Just before I move on, Steve, you mentioned that Germany have basically a Fraunhofer. Could you envisage a situation where you may actually have international collaboration between yourselves and others?

Steve Yianni: Yes, if it is of joint benefit for us to collaborate with international partners. In fact, we spoke earlier about the “a third, a third, a third” model. Much of the collaborative research and development is funded through European research mechanisms. I was in Brussels yesterday, starting that process and building those relationships so that we have access to huge research funding opportunities in the Horizon 2020 programme. That will probably involve collaborating with other European organisations.

Chair: Interesting.

Q146 Mr Walker: Talking about the £900 billion market you have identified, that is a huge area. Have you broken that down in terms of what proportion of that is actually IT—clearly, that is a major component—and what proportion is more on the physical and transport side?

Steve Yianni: Yes, we have. You may remember the bubbles that we showed. That is our fairly high-level assessment of how that market is made up. There is a lot of information that is part of that, so the IT bit, and again, it comes back to one of our themes of providing relevant real-time information to consumers, which provides a market opportunity. It involves the opportunity of vehicles of whatever type—vehicles being a train or a car—being connected to each other and to the infrastructure, which creates huge opportunities.

If I run through a scenario, a typical car out there right now has about 5,000 sensors on it, and it is sensing everything for the car itself. If that car is internet-connected, that information can be made available. You need a system operator of some sort, but let us say the car is detecting a bump on a road. That can be detected; its location can be detected; the time at which it happens can be detected. That is useful information for a local authority, because they might be spotting a pothole. That avoids the cost of crews of people going out and inspecting the roads. You still need to fix it, of course, but that information is valuable. It is a matter of identifying who sees a value in that particular piece of information, and that creates a market opportunity. All of those are ingredients of the £900 billion. Does that answer your question?

Q147 Mr Walker: Partly. I guess what I am interested in is that there is an element of that market that is about transport systems-specific expertise. There is another large element of it, I would guess, in terms of what sits behind it, which is actually about software and data management, which may or may not be related to transport systems. How do you make sure that you have got the expertise to support that, or is that a question of working with the other relevant Catapults?

Steve Yianni: I think it is just that. We are building ourselves to have some modelling capability, which will include software coding. If there is an area that needs exploiting and we find that we do not have that knowledge or capability, we have options. We have the option to collaborate with people who do, or we can recruit some of that resource ourselves, or train that resource ourselves. Paul, do you want to add to that?

Dr Zanelli: The £900 billion is not all of transport. We have taken a huge number of market studies and a huge amount of detailed work on this, and we have looked at the proportion of the transport market that is intelligent mobility, and then we have also looked at how the intelligent mobility market is going to grow into 2025, which will also start to include things outside of what is currently referred to as transport.

Data, information and IT are key constituents of that market. Data, data integration, and modelling: all of these areas are absolutely core to what we do here, and, as I think Steve mentioned earlier on, it is not necessarily the traditional, mechanical or infrastructure side; it is the better use of that through new technology. Intelligent infrastructure is one of our themes that we are bringing through, and that is all about how you better manage your system through understanding data and prognosis of the health of your system through analysis of data.

Q148 Mr Walker: I can understand the value of holding together the whole system and dealing with the transfers, but equally, understanding a system does require knowledge of the individual transport modes. History is littered with transport modes that have looked like the technology of the future and then disappeared: think of airships in the 1930s, or the Sinclair C5s, or the Segway people-transporters more recently, which proved to be dead ends. How do you make sure that you do not get taken down those dead ends?

Steve Yianni: It is a great point. As we work on a large number of projects, which is our aspiration—I will call it a portfolio of projects—given that we are pushing the envelope of technology and innovation, it is probably the case that some of the things we work on will not work; they will fail, but rather than use the word “fail”, I would like to see those as learning opportunities that we can rebuild from. A debate that we are having internally is that we will learn fast. We will undertake these projects; if they do not work, actually, that is fine, but we can learn from it, and we can use that learning to develop further.

If you look into history and inventors of the past, and look at how many experiments were conducted for the one success that they are now famous for, that is pretty much the model: you learn, you learn, you learn, you learn; or, as some people might say, you fail, you fail, and then you succeed, and what succeeds really pays for the rest and moreover. I would expect there to be some element of failure. Clearly, we are not setting out to fail, but if we are pushing the envelope of technology and innovation, it is realistic to assume that some things are not going to work. The important thing is to close them down, learn from it, and move on.

You are probably aware that Hermann Hauser has been asked by the Secretary of State to look into the Catapult programme following his report four years ago. We recently had our review, and that was a debate that we had: he was talking about failure and needing to learn from it. It was his quote, actually—I have stolen his quote—that if you are not having some projects within your portfolio fail, you are probably not pushing hard enough. Again, it is about doing that quickly, learning from that, rebuilding, and moving on.

Chair: Could I just intervene at this moment? We need to conclude this session at 2.00. Actually, I have probably been the worst culprit in terms of using up the time. If we could just make questions and answers very brief, that would be helpful.

Q149 Mr Walker: Perhaps returning to questions of partnership that we were discussing earlier, what are your university partners so far, and how were they selected? You mentioned that you had a process.

Steve Yianni: We have had a very open process of connecting with universities. We had a strong response. It is open and transparent. There is a small amount of Catapult funding, but it is very small, and it is there, really, to help enable some people from universities who have knowledge to work on our industry-led projects, via secondments or various other routes. Actually, we get more leverage on the Catapult funding that is involved. We went out, and we now have announced—as Paul said earlier—the successful university partners.

There are 14 universities, I think, in eight clustered areas. There are examples of universities collaborating with each other to create a regional presence: an example would be that Heriot-Watt and Aberdeen have grouped together and said, “Right, we will be the Scotland regional university centre for you.” That is the most visible form of university engagement. As we transact, again, there is knowledge in universities. Going through the LUTZ Pathfinder project, I have mentioned that we have transacted with the University of Oxford for their control system on the autonomous pod, and other examples would be that we have an ambassador programme to help us reach out to new communities. Some of our ambassadors are university professors. Paul, do you want to add to that? This is your field, really.

Dr Zanelli: Through the university partner programme, the key message for us is that it was a call for open, innovative proposals. It was not about funding research; we were very open about that from the start, and we had a big event last November that was very well-attended, where we were clear about that. Also, those partnerships include access to the existing local networks that those universities have through the LEPs, their local innovation organisations, SME organisations, funding bodies, and large corporates, all of which have provided letters of support through that programme.

Q150 Ann McKechin: You are not academically based in the way that the Fraunhofer institutes are. I just wondered to what extent your university partners are involved in your strategic direction and priorities?

Dr Zanelli: A key part of the programme, as well as the movement of people, is to get engaged in the thought leadership: how do we engage through that programme of looking at what our future strategy is? It goes two ways: what technology and science is coming up, and what are the market requirements being pushed back down? Steve also mentioned an ambassador programme, where we have some leading individuals from across academia, SMEs, finance, and marketing and communications, all of whom will act as an independent reviewer and a panel that we can use to test our strategy and our programme.

Q151 Ann McKechin: So they are not involved in the direct management, but you do consult with them about your direction? Is that what you are saying?

Dr Zanelli: Absolutely.

Q152 Ann McKechin: Both business and academia require highly-skilled staff. Do you think there is any role for the Catapults in brokering the exchange of skills between industry and academia?

Steve Yianni: The short answer would be yes. Examples of that that we have done here include secondments. We have had people from universities who have had periods of time here. People exchange and knowledge exchange is an important part of it, yes.

Dr Zanelli: We are actively engaged in the whole skills debate. If we are going to create the jobs in the UK, we need to also have an active role in making sure that those jobs are going to be filled by the right skilled people, so that is absolutely part of our ongoing strategy. We are talking to the skills academies, some of the skills councils, and to the universities, and that is one of the key themes from our university partner programme.

Q153 Ann McKechin: It just occurred to me as well that as well as university and postgraduate research—people working with you, and secondments—there is also the issue about technical support and the level of skill that is required. I just wondered whether you had had any contact at all with the college sector, or with those dealing with apprenticeships.

Dr Zanelli: We have, again through a cross-Catapult programme. Obviously, the Manufacturing Technology Centre is looking at apprenticeships. We have started that; we have not got a complete strategy, but absolutely, it is a key part of what we are looking at.

Steve Yianni: As we integrate into the local community, we have got a strong relationship with Milton Keynes College, who have helped us, actually, in our formative stage. As we have been growing, we have been leaning on them for facilities, and we are in discussion about a programme of skills development with them.

Chair: Thank you. That concludes our questions. You have been commendably concise in your answers, but I would say that if you feel that we should have asked you a question that we did not, and that you would like to answer the question that we did not ask you, please feel free to submit a response in further supplementary evidence; we will be very happy to receive it. Similarly, of course, if we feel in retrospect that we should have asked you a question that we did not, we would be grateful if you would respond to it in written form. Thank you very much.

Examination of Witnesses

Witnesses: **Professor Richard Jones**, Pro-Vice Chancellor for Research and Innovation, University of Sheffield, **Professor Greg Marsden**, Director, Institute for Transport Studies, University of Leeds, and **Nigel Foster**, Chair, External Advisory Board, Institute for Transport Studies, University of Leeds, gave evidence.

Q154 Chair: Thank you. You have been sitting and listening patiently. I will start by asking you to introduce yourself, again in case we have any problems with voice transcription, starting with you, Nigel.

Nigel Foster: My name is Nigel Foster, and I am a founder and part-owner of an SME. I may be able to answer some of your questions on SMEs. I was formerly Head of Transport Consultancy at Ove Arup & Partners. I am also the President of the Chamber, and I am Chair of the Advisory Board at the Institute for Transport Studies at the University of Leeds.

Professor Marsden: I am Greg Marsden, Director of the Institute for Transport Studies at the University of Leeds, which is part of the university partner programme here at the Catapult.

Professor Jones: I am Richard Jones. I am Pro-Vice Chancellor for Research and Innovation at the University of Sheffield, and I am also a council member of EPSRC.

Q155 Chair: Thank you. I will start with a fairly general question—almost philosophical, indeed. There are differing views as to whether increasing the impact element of research assessment will strengthen business-university collaboration. We had one witness who said it would “pull universities out of shape”. What are your views? Who would like to lead on that?

Professor Jones: I would start by saying that “impact” is a word that has a number of meanings. In HE policy-speak, it has two dimensions. One is the use of retrospective assessments of impact in the research excellence framework, and the other is in the way that the research councils think about it, in terms of enhancing the potential for future impact.

I think that the inclusion of impact in the REF has been really pretty positive. Universities have responded across the disciplines. Different disciplines had various misgivings about it; I think disciplines have responded very imaginatively to it, and when those results are published in December, I think you will be really rather impressed with the very wide range of different kinds of impacts that there are. Also, it will change the way that universities will think about these things in the future. I think it has been positive. It has been a big change; I would probably suggest that it might be a good moment to let those changes work through. I would not think it was a good idea to hugely increase the weighting of impact more than it currently is until one has seen how that is assessed and how it shapes up. It would be worth waiting to see.

In terms of whether it pulls universities out of shape, that, of course, assumes that universities have some ideal shape in the first place. Universities have been around a long time, and they have adapted to changes to their environment. Some 200 years ago, research was not part of the main mission of universities; research entered to be a core part of the universities’ mission some time in the late 19th century. Universities constantly adapt, and they do need to adapt to the circumstances that we find ourselves in, where we need to do more work to get the fruits of innovation and solve big problems that we have got, and lead to the kind of economic growth that has been lacking.

To speak for my own university, the University of Sheffield, we have been involved very closely with the High Value Manufacturing Catapult. We have developed

an advanced manufacturing research centre that has changed the shape of the university. It has made us think much more about downstream applications; it has brought us into contact with big companies, little companies, supply chains, and in very concrete terms, we have 180 apprentices starting on our site who are associated with the university.

I think universities should change; I think they will change. Of course, in any kind of change, you want to make sure that you hold on to the outstanding characteristics that universities have already. The strength of our pure—I will not say “pure”; I do not really believe in that term. The strength of our basic research base is very impressive, and we ought to hang on to that. It is slightly at risk from decaying funding, but if we can hold onto the things that we are really good at and expand into new areas as society demands, that is positive.

Q156 Chair: Have you anything to add or subtract to that?

Professor Marsden: I would just add a little bit in brief. I thought that was a very clear and good summary of my view of where things are. Transportation studies is a fairly applied field, and in actual fact, a good proportion of the work we do, for example, has been for Government Departments. Often the reports are quite sensitive; they take a while to come out, and do not necessarily go through the same academic route that some of our other work does, so actually, for us, the impact agenda has been hugely positive in terms of recognising this kind of work that has been done. There are difficulties in understanding impact across the full range of different disciplines, but again, I would say it has significantly improved the quality of some of the applied research, because it is really making people think about how they engage with the end-user communities at the design stage of the research; previously, that could be left a little bit to the end, and things fall a little bit fallow. There are some positive sides to it.

Q157 Chair: Do you want to say anything? Do not feel obliged to.

Nigel Foster: I was just going to add a couple of points. We need to understand that the research spectrum goes quite a long way from pure—as Richard was saying—to applied, and there is a gestation period. It was said in the previous questions for the previous panel that sometimes you do not succeed in the research, so there is a need to understand that. One of the examples that we have used with the University of Leeds and with the Institute for Transport Studies is taking pure research around emissions, and how they are measured, assessed and evaluated, and then applying those into real-life applications with local authorities to understand where their emission hotspots might be and what sort of policies they can introduce to manage those better.

Q158 Chair: Can I just take it a bit further? This is quite a tricky question: do you think policy-makers should themselves drive the innovation agenda with universities, or should they seek to create, if you like, the business-led demand to which universities respond? Where do you think the balance lies?

Professor Jones: This is a very interesting question, and I have been thinking about it a lot. The emphasis of innovation policy has been about addressing the supply side; it has been about making sure that we have got a strong research base, making sure that we have got skilled people, and increasing the connections between universities and

industry. There has been a “push” element to innovation policy so far, and that has produced great benefits; it has led us to have a very strong research base, and we ought to be proud about how close the connections between universities and business are. If you look at the HEFCE numbers, there is a story of steadily increasing contract research income and collaborative research. It is actually a fantastic story, and we can be really proud of the way our universities will link with industry.

However, it has got to the point where if we look at the innovation system, frankly, we have to say that the place where the weak link is in industrial R and D. You will know the figures for the intensity of industrial R and D in the UK. They have been falling steadily for 30 years. The number in my head is 1.09% of GDP; for countries like Germany, that is more like 1.8%, and then if we go to recently industrialised countries like Korea and Japan, in Korea, I think, it is over 3%. Something is really not working for us there.

Again, we look to China. A big date that ought to be etched in all of our minds is 2009. That was the date when Chinese industrial R and D intensity surpassed ours. It is now at about 1.4%, so industrial R and D intensity is about as much in China now as it is in France. I would say that we have done a lot of work on pushing the supply end of the innovation system; I do think we need to face the fact that there is a serious issue at the demand end about who is in a position to take up innovation and convert it into jobs and growth.

Q159 Chair: I will invite Nigel or Greg to answer.

Nigel Foster: I, too, think it is a very interesting question. It is interesting to know where you actually break into that particular cycle. I sat on a BIS working group on low-carbon vehicles a few years ago, and I think that influenced the emerging policy and interventions around the low-carbon vehicle programme. What seems to happen is that universities will generate leading research to say, “Here are a set of problems that are emerging within the world, or within a particular area, and we need to do something about it”. Government will then perhaps follow with policies about how we try to tackle that, which stimulates a set of further research into particular solutions that might be used in an applied way to address those policy problems that we are facing. It requires closer working between business and universities, business and Government, and Government and universities or academia to try to improve on that process, but I do think there is a need to promote pure research to understand what the issues are, and then follow that with applied research to find out what the solutions are.

Q160 Ann McKechin: Can I just follow on from that, on the issue about career structures? We have heard that the move from academia to industry is at times seen as less prestigious within universities. I am not saying that this is true for your own universities, but it is a feature within the sector, and it is often viewed as a one-way move. Do you agree, or do you think that that sentiment is now beginning to change?

Professor Marsden: I would start by talking about the experience in our department. If you were to look back 10 years, I do not think we would have had any joint industry/academic posts. We now have various secondments in place; we have an industry-funded post, and I think we should be aspiring to have more of those in the next

five to 10 years. To get real value out of the industry/academia space, you have to build up an understanding of what the problems are and the focus of the business, and build up long-term trust about the value that the two parties add to the relationship.

I think, in a sense, that secondments and jointly-funded posts are an outcome of you being successful in doing that. It is difficult, though. We went through a recruitment process a couple of years ago, and it was a difficult decision about whether or not to bring an industrialist into academia, because they have a very different portfolio and track record. There is a very different risk analysis that you do when you are making that appointment decision.

Nigel Foster: I would take it further. I think that the relationship between business and academia needs to be much broader. You are right; it is both ways. It is difficult to get businesspeople to go into academia for all sorts of reasons, and equally, as Greg said, it is difficult for them to fit sometimes. It needs to be across a much broader way: “How do we actually make the relationship between business and academia much stronger?” That could be about the recruitment of people and their development; it could be the role that businesses play in terms of mentoring and developing employability in students; it could be around research, or joint positions. The more we can find that working-together, the stronger the outcomes for research and practical applications will be.

Professor Jones: I agree with all those things. We do have structural problems, in the sense of the reward systems that are imposed on us. The fact is that we submit people to the REF, and they have to have four good publications, and if someone has just come from an industry background, they will have been doing undoubtedly outstanding research, but they will not have published it. That is an issue. Having said that, where we have had the self-confidence to appoint people from an industrial background, it has been enormously successful, and I can point to people in our university in quite a few departments who have brought a really important, different perspective; very important both on the research side and in connecting with industries, but we should not forget the teaching side, too. It is important for our students to see these sorts of things.

The other point I would make is that one of the things that we have tried to do, using various bits of money that have come to us, is to get more temporary secondment transfers between the university and industry. The biggest disappointment we have had is that it actually quite difficult to get people from industry to come in for a six-month secondment; by the time they go back, the entire place has been re-organised and everybody has forgotten about them. That is an issue. There is a lot of willingness and a lot of understanding that there can be very positive learning both ways, but there are structural issues that stand in the way.

Q161 Ann McKechin: You have just covered my second question, which is the issue about rewards and the feeling that there are insufficient rewards, or the risk that moving from one sector to the next could damage a return back to the career that you came from. If the problem has been identified, and you say people are talking about it, but yet you have mentioned this issue about publication of papers being a criterion set, why is there not now a much more active discussion within academia that that criterion need to change if you are going to have that level of business interaction that all three of you have said needs to happen?

Professor Jones: That is a question that we should take up with HEFCE, perhaps, as the people who generally impose these structures on us.

Professor Marsden: I would say, internally, if you look at our promotion criteria now, you can make it right to the top of the university on a knowledge transfer and industrial engagement ticket, rather than necessarily being a global research leader. I think that there are more opportunities within the university space.

Q162 Ann McKechin: Can I just ask about the secondments? It strikes me that that is something that may happen when people are at a relatively junior level of their career. To what extent are we having secondments from people, particularly from business, at a more senior level to come in? If you are at a managerial level, is there in reality an option for you to come into academia; or, vice-versa, for someone in your position as a head of department to go and spend time in industry?

Professor Marsden: Taking myself as an example, I will be spending a couple of weeks with Transport for London in the autumn, working with them on their energy research strategy linked to a research centre that I am involved in. It is certainly challenging to carve that amount of time out, and one of the reasons I am going is because I think organisations are quite thinly-resourced. It is a real problem that you are pointing to there; just getting time enough for them to engage in a research-funded programme where we have jointly-funded research ideas is challenging. Getting them to come out to the university is surely challenging.

Nigel Foster: I think we are in a period of transition. Historically, universities have concentrated more on research and teaching. Now, there is a growing recognition of the importance of the relationship with business. We are in that period, but it is difficult. From an SME's point of view, you can have more flexibility but perhaps less capacity; for a larger company, you have more capacity, but you perhaps need to understand how it fits within the wider structures. It is not unique to academia, however: this applies in business as well. Individuals can go down a specialist stream and be an expert within their area, or they can go down a more general business-led stream. It is a matter of trying to match them up where, actually, the university succeeds and the business succeeds from that relationship. It requires that long-term relationship developing.

Q163 Mr Walker: Just following up on that point, Nigel, we have had some submissions from the business perspective, arguing that the research base is so complex and difficult to navigate that businesses, and particularly SMEs, are deterred from investigating it in the first place. Do you think some universities need to think again about how they present themselves to the business world in order to counteract that?

Nigel Foster: Yes, I think they do. I think they are. With SMEs, it is particularly complicated. For example, in the Leeds city region, we have a really good working partnership with the universities. We also have the Yorkshire Universities group, but just within Leeds City Region, we have over 100,000 businesses. Now, some of those will be very small. They will perhaps be businesses that are not interested in research at all, but there will be others as well.

There is a company that I am working with called Omnicom, which is a specialist imaging business within the rail industry. They are leading-edge—world-leading in some

areas—but want to work, and do work, with a number of universities. It is about how the universities present themselves and who the partners they could work with are. For example, I am very fortunate in Leeds that both of the main universities—we have three, but the two main ones are Leeds Met and the University of Leeds—are working very closely with the Chamber to provide access to those smaller enterprises. So they do; there are good examples of how they do that, but I think it probably needs a bit more effort on both sides.

Q164 Mr Walker: The Witty review recommended that they could have a single point of entry for SMEs at every university. Is that something that you see mileage in? From what you were just saying, it seems to me that there are other organisations, such as Chambers or LEPs or so on and so forth, which universities can work through in order to make themselves more accessible to SMEs.

Nigel Foster: Obviously, that is very clear from the Witty review. I think a single point of entry is a difficult area. What I would encourage is working through some intermediaries. You have heard about the Transport Systems Catapult here; that is one option. The Chambers are other options for doing that, but also, I would say that you need each of the faculties or schools to have individuals within those departments making the relationships with particular businesses. For example, we have over 25 businesses as part of the advisory group at the Institute for Transport Studies, but individuals will work with specific businesses. We will have people working with Jaguar Land Rover, but we will have other people working with FirstGroup or Network Rail. It is incumbent on encouraging the academics and giving them the support for them to make the engagement as well.

Professor Jones: Absolutely, it is difficult, and it is something that I have spent a lot of time thinking about and changing structures in Sheffield over the last few years. The first thing that we had to do was to try to find a way of getting beyond the Byzantine internal structure of the university and presenting a face that made sense, and that mapped onto external sectors, so someone in the healthcare technology area would be able to find someone without having to know whether they have to look in material science or cardiovascular or whatever. We have set up a series of gateways that face towards those sectors. I should mention that the HEIF money has been very valuable for us to do this. That has been a very valuable resource that has allowed us to do that. I think that has improved the situation.

Of course, in our own special place where we have such strong links to the High Value Manufacturing Catapult, that has been very important for us too. There, of course, the big thing for us has been the way in which large companies can bring small companies behind them. By involving Rolls-Royce and Boeing as major tier one companies, with lots of SMEs that want to supply to those companies, they will be our salesmen; they will say that Sheffield can help you with the skills and innovation that you need to come and sell to us. That has been important. We have had a lot of discussions with the LEP, and have been thinking through the Witty report over the last few months, and the thing that strikes me is how many SMEs there are in the Sheffield City Region. Paul will remember the figure better than me: 50,000, or 55,000?

Paul Blomfield: Some 40,000 to 50,000, yes.

Professor Jones: There are a lot, and it is clear that many of these companies are fine as they are. They are not in a position to benefit from what the university can give; they are not really going to be the high-growth companies that we can do something with. We have been talking to the LEP and to Sheffield Hallam; this is an area where universities ought to collaborate together in their local region. The two universities have actually committed to work with the LEP, to find a way of being more proactive.

It is a question of identifying who the SMEs are that we really want to work with, and then working with them in quite an engaged way. I do not think it is good enough just to say, "Okay, we will put up a website that says, 'If you need us, this is the telephone number to ring.'" We need to actually understand how we can help, and in some places it could be research, but a lot of universities are deep institutions. Maybe, because we have got a Korean speaker, we could help them find some new export markets. There are many different things.

That is the way we are thinking about it, and as I say, this is something that we are actively developing at the moment. I think that kind of selective approach is going to be something that is worth trying. We have not got a single point of contact, but I hope we have now got a set of reasonably sector-based gateways that can help; if people want to come and look to us, they have got those. The next stage is for us to go out a bit more, and find out how we can help and what the best way is that we can do that.

Q165 Mr Walker: I think the point you made was very interesting around SMEs: there are many SMEs that might not want to engage, and might not necessarily benefit from collaboration. Targeting the right ones, and being able to reach out to the right ones, is important. Government procurement is also an area where, in terms of encouraging innovation, it is sometimes seen as a potential tool for doing that. Do you think that has a role to play in this, and in potentially incentivising SMEs to go down innovative routes?

Professor Jones: Of course, people look at the United States a lot, and things like the small business initiative. One has to remember that when the United States procure stuff from small businesses, actually, what they often procure is research, and the thing that keeps lots of high-tech American SMEs afloat is direct research contracts from the Government. That is an important feature that perhaps needs to be understood.

There is a tension in procurement, for obvious reasons, between being innovative and getting best value. If you are a cash-strapped NHS Trust that needs to get a bunch of equipment in, it is going to be hard to say, "Well, I am not going to get this cheap model, because maybe we ought to keep afloat this company that is producing this slightly more expensive one." Part of the reason for the fact that people have talked about this for many years and it has not really worked terribly well is because people have not really confronted that tension between value for money and the prospect of future innovation. They do not sit naturally together.

Obviously, where the Government can be a massive help is in procuring really quite big things. In our Nuclear AMRC, which is the other bit of the High Value Manufacturing Catapult, we have been thinking a lot about new technologies like small modular reactors, and if the Government wanted to accelerate the development of an indigenous technology for small modular reactors, the best way to do it would be to place an order for a couple of them.

Mr Walker: It has been in the nuclear industry for a long time.

Professor Jones: Yes.

Professor Marsden: Although it does not solve the problem, initiatives like the Transport Systems Catapult actually provide a meaningful meeting-place with a set of resources that do offer the opportunity to lubricate the system. It does not help to engage everyone, but from my observation of the types of people who have been attending the events I have been at in the last two weeks, there is a different set of actors and stakeholders engaged here, and a lot more smaller businesses, looking to exploit innovative business models around intelligent mobility where you do not need large investment in kit; you need good ideas about integration. This does, at least, offer an additional stimulus that I do not think you would create in any one individual university.

Nigel Foster: All I would add to that is also to ensure that the procurement criteria facilitate engagement by businesses at different levels and in different ways, so to enable smaller businesses to collaborate in a consortium that might deliver a solution. Quite often, the requirements are in favour of well-established, large businesses that do not always deliver, and there was a very interesting discussion on Radio 4's *Today* programme, which you may be able to still podcast, by the founder of Confused.com about tagging devices between her company and some major companies that would also provide them, but perhaps had not done so successfully.

Q166 Paul Blomfield: Richard, I would like to return to some of the points you were touching on earlier, and cover much more extensively in your paper for SPERI, on the innovation deficit. You mentioned earlier that the point at which Chinese investment in R and D overtook ours was a significant date. What I thought was much more striking from your paper was that over the last 30-year period, we have not only fallen down in terms of private sector investment in relation to emerging economies, but also in relation to our traditional competitors. I think I am covering what you have covered in there accurately by saying that we are probably the only advanced industrial economy that is now at a lower level of private sector investment in R and D today than we were 30 years ago.

Professor Jones: Certainly for the large countries that were on my graph, I think that is right, yes.

Q167 Paul Blomfield: In terms of our major competitors—Germany, France, United States—it is quite extraordinary, is it not, that we have slipped behind all of those competitor countries?

Professor Jones: Yes, it is extraordinary.

Q168 Paul Blomfield: What is the reason for it, in your view?

Professor Jones: I think that this is connected to bigger issues about the particular model of capitalism that we have chosen to use. It is connected to the bigger issues about short-termism that were written about by Kay in the Kay review for BIS, which was an excellent summary of the bigger picture of the stuff that Andrew Haldane has been writing in his time at the Bank of England. The emphasis on shareholder value to be realised in the very short term is something that really militates against long-term R and D.

We have seen it in the two examples I have talked about in the paper—ICI and GEC. Both of them were very large industrial companies that employed many, many people with a very large innovative base. Many things about those companies were not perfect—you can find many things that were not great about them—but the fact is that both of those companies are no longer with us. ICI finally expired with the final sale of the paints bit of it, which was sold to AkzoNobel about five years ago, was it not? The last bit of GEC was Marconi, which was finally sold, again, about 10 years ago. If you look at this, what you see is a pattern of management in which the emphasis was on doing deals, buying and selling companies. The idea was that the manager of an industrial conglomerate was a kind of meta-fund manager, rather than someone who has built a business, found new business opportunities, and put in the R and D and development to create new businesses. I think that is part of the problem.

The inverse problem, of course, is that we had a bunch of old companies that died; you might say that that is not a problem if we have a bunch of new companies that came up to replace them, but of course, that has not really happened. It has been difficult. We cannot really point to a lot of new companies that have been able to grow. We have been very successful at producing spin-outs; we have lots of spin-outs, and the classic pattern is for the spin-outs to be sold in trade sales, typically, when they get to a value of £50 million or £100 million. I think that that is a problem. Again, we have to look at what in the nature of our capital markets leads to that happening.

A figure that stuck in my mind, because it quite shocked me, was that if we look at venture capital, the total amount of venture capital that was put into the pharma and biotech industry in 2012 was £46 million. The number you have to compare that with is £751 million, which was the decrease in the overall expenditure in R and D in the pharma industry in the same year. The amount of money that venture capital was putting into this industry was one-fifteenth of the decrease in the research of the whole industry. It is not even on the same page, in terms of growing those businesses. It is just not doing that.

If we ask ourselves why that is, it is partly because those are actually quite difficult businesses and the returns are not particularly good. One needs to look into the structural reasons for why that is the case, but also in the whole venture capital/private equity space, people have a choice about where they put their money. The venture capital bit of it is really overshadowed by private equity, because it proves to be much more reliably lucrative to go and run a management buy-out of a retail chain or something like that. Those are the kinds of deals that provide the returns, so that is the answer. That is why we have not been able to grow those new innovative technology-based companies.

Nigel Foster: Just to add to what Richard has said, I think there is an opportunity here, as well. I guess that that is part of why you have these panels; you are looking for opportunities. I do think that with companies cutting back on their own in-house research—which they particularly did during the recession—there is a real opportunity for Government, working with academia and universities, to stimulate research. That might be done between universities and business, rather than business doing them or universities doing them, but the government can encourage much closer working between the two, which I think is part of the questions you are asking. There is a real opportunity for Government to stimulate that relationship by making sure that the research funding has a strong element of academic and business collaboration around leading research.

Q169 Paul Blomfield: Thanks very much, Nigel. I just wanted to push Richard a little further, if that is okay, because your paper was entitled, “The UK’s Innovation Deficit and How to Repair it”. I would like to talk a little bit more about the repair side of it.

Chair: If I could just intervene: we have got another five minutes, if we could make it brief.

Professor Jones: We need to look at what is good. We have got a really good research base. There are many excellent companies around. If we look at Rolls-Royce, it is a fantastic, world-beating company; we just wish there were another five of them. The point is that we need to use the excellent research base that we have got, and build on the fact that the culture in universities has changed: we are very effective at working in partnership. TSB has been an effective organisation. The Catapults have great potential. Government just needs to have that mindset that, actually, it does need to help build some new capacity. It is not just about connecting existing businesses; we really need to have a positive aim that we are going to grow some major new industries that can contribute to growth and wealth.

If you ask, “Where are they going to be?” it is obvious where they are going to be: they are the things that we need to do. We need to make low-carbon energy cheap enough that you do not have to massively subsidise it anymore. That is one obvious area. We have to make sure that we can afford to run the NHS in 30 years when the number of old people is much greater than it is now, and problems like dementia will be really serious. I do not think it is a mystery. We have to look at what the really big problems are that society is facing. I say this as an academic physicist: solving them is not just about new science, but it is also about the work that needs to go into developing products and services. That goes well beyond what we do in the research space. It needs intermediary organisations like Catapults, and it needs us to build new companies that can take those opportunities. Government just needs to be a little bit more assertive about realising that it has to contribute to building that capacity.

Q170 Paul Blomfield: Following on from that, much of the conversation is about what Government can do to encourage innovation, which is great, and a huge focus of what we are talking about. You were talking earlier about demand and supply-side initiatives, and last week, when we were talking to Will Hutton and Alan Hughes, we were looking at what initiatives there might be to suppress barriers to innovation as well. I wondered what thoughts you might have on that.

Professor Jones: This is difficult, because many of the barriers to innovation are incumbents who would lose their business if you innovate past them. This makes life slightly awkward.

Paul Blomfield: I guess I am pushing a little bit on the point you made earlier about short-termism, which we have touched on today, but certainly was also a feature of previous inquiries that we have done, not least on the Kay review.

Professor Jones: On barriers to innovation, you need to be very careful about the kind of tax structures and incentives that you set up. Some of those things can lead to unintended consequences. You were, a few weeks ago, talking to people from Pfizer and AstraZeneca about an initiative that would have undoubtedly been damaging for

innovation in the UK. A very large part of its driving force was the way that tax law had been constructed on either side of the Atlantic. Those are the sorts of things.

Q171 Chair: I am going to finish up with a question on tax treatment. In fact, we do need to be off in a second, not least because we have got trains to catch. I am going to outline a question; I would be very grateful if you could submit a response in written evidence to the Committee subsequently. My question was going to basically be in three parts: collaboration with industry is seen as part of the university's "third mission" of wealth creation. Do decision-makers in universities seek collaboration as a primary purpose? That is, if you like, the core question.

Arising from that, is there a case for Government to look at tax treatment of universities engaged in third-mission activities? Lastly, if there is, could you outline the case that you think should be made? I am happy to send you that question subsequently, just to refresh your memories, but if you could submit any evidence you have in a written form, that would be very helpful.

Professor Jones: I suspect if I go back, I will get some briefing about what I need to say about state aid, which is a complicated issue that does get in our way.

Chair: At the end of the day, it has got to be workable within the context of European regulation. Thank you very much. That was very helpful. I think we could have gone on for at least another half-hour; unfortunately, we have got other pressures. We do appreciate your contributions, and more generally, if there is anything that you feel you did not say but would like to, please feel free to submit it in the form of supplementary evidence. Thank you.

