



HOUSE OF LORDS

Science and Technology Committee

Corrected oral evidence: Financing and scaling UK science and technology: innovation, investment, industry

Tuesday 10 June 2025

10.15 am

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Members present: Lord Mair (The Chair); Lord Berkeley; Lord Drayson; Lord Lucas; Baroness Neuberger; Baroness Neville Jones; Baroness Northover; Lord Ranger of Northwood; Viscount Stansgate; Lord Stern of Brentwood; Baroness Walmsley.

Evidence Session No. 11

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Questions 117 – 128

Witnesses

I: Dr Patrick P Rose, Innovation Manager at SPRIND (German Federal Agency for Breakthrough Innovation); Darja Isaksson, Director General at Vinnova (Sweden's innovation agency).

USE OF THE TRANSCRIPT

1. This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

Dr Patrick P Rose and Darja Isaksson.

Q117 The Chair: Good morning and welcome to this meeting of the Select Committee on Science and Technology. We are very pleased to have two witnesses, one joining us remotely, Dr Darja Isaksson from Sweden, and Dr Patrick Rose from Germany. We are very pleased to have you with us. As you know, this inquiry is very interested in the problem of how to finance and scale up science and technology companies in the UK and what our Government can do to assist such organisations. As part of this, we are very interested in international comparisons and what the UK can learn from other countries and their systems for innovation. By way of an opening statement, can each of you set out for us what your role is and what the purpose of your organisation is in serving the innovation system? How does it work, how does it encourage innovation and where does it fit within the overall innovation system in your country? We are also very interested to see how the UK is viewed internationally.

Darja Isaksson: Let me start with a warm thank you for this opportunity. We in Sweden are equally interested in learning and collaborating on these very important topics. I am Darja, and I am the director-general of Vinnova, the Swedish innovation agency. Since 2001, our mandate has been an instruction to promote sustainable growth through funding needs-driven research and developing effective innovation systems. We have an annual budget of approximately €300 million, typically matched by at least equal investment from industry, and we disburse these funds as competitive grants. We have offices in Stockholm, Brussels, Silicon Valley, Tel Aviv and Singapore to connect the Swedish innovation ecosystem to other leading ecosystems. We are responsible for connecting the Swedish ecosystem to Horizon Europe, particularly pillars 2 and 3, while pillar 1 is managed by our sister agency, the Research Council. We also manage bilateral innovation partnerships.

Within the Swedish national innovation system, we work very closely together with our key sister agencies such as the Swedish Research Council, funding basic science, Formas, funding sustainability research, the Energy Agency, which has a full-scale mandate; and the Swedish Agency for Economic and Regional Growth, which is also responsible for EU structural funds, for instance, which come into play not least in supporting incubators.

Vinnova has a number of different programmes. Just to mention a few of them, that includes the programme for advanced

digitalisation, whereby industry has the mandate to lead the dialogue on what priorities should direct the funds. The annual budget comes from government and is about €55 million, which is also matched by industry. Another programme worth mentioning that started last year is our programme for civil military synergies, which we co-programme together with the Swedish defence agency, to bridge start-ups with military needs and innovation, also connecting them to the NATO programmes. We have run for a long time something that we call strategic innovation programmes, which are now in their second generation. They are long-term mission-oriented programmes whereby academia and industry address societal challenges, building on national strengths in areas such as critical raw materials, the net-zero industry, water and mobility.

Nationally, we are the main funder of support programmes for start-ups and scale-ups, so we run the national incubator programme, which has been active since 2003 and which has been internationally benchmarked as one of the top-tier systems. We run the start-up and accelerator support schemes and, again, even here we collaborate with our sister agencies such as the EU SME support office. It is the national co-ordination node for Horizon Europe SME instruments, including the EIC Accelerator, which is highly appreciated by start-ups in Sweden.

The Chair: Thank you very much—that is a very helpful introduction.

Dr Patrick P Rose: Good morning and thank you very much for the opportunity to come and speak with you. Hello, Dr Isaksson. We just recently signed an MoU between our two organisations, which are working together, so we are certainly looking forward to that.

By my accent you will hear that I am not German—I am a German-American, a product of the Cold War. My father was a GI stationed in Germany who met a cute German girl. I say that because my pedigree is that I spent the last seven years before joining SPRIND, the German Federal Agency for Breakthrough Innovation, working for the United States Navy Office of Naval Research Global doing what I am doing now but just at a different scale.

SPRIND is a company created by the German Government in 2019 with the intent of translating more technology from the academic institutions to industry. As you know, Germany is very strong in basic research and one of the global leaders, along with the UK and others, in developing patents—but that translation to actually

creating companies is where there was a gap. That is where the urgency was fostered to create SPRIND in 2019.

What attracted me to SPRIND is that it is a very unique organisation. As a company we have the flexibility and agility to be able to operate and execute. We have the execution power of a company. We are backed by the German Government so we use taxpayer money to invest in various activities. How we do that is as follows.

On one hand, we run competitions, which we call “challenges”, which last three years, or “sparks”, which is “funken” in German, which last less than 14 months. The idea is to think about lofty goals and see how far the technology can go, to pull and push individuals who have developed proof of concepts out of their laboratories and into the market by giving them the opportunity to create something, especially companies.

We think about things such as new computing architectures and broad spectrum antivirals. My personal favourite, which I am currently managing, is building the “Star Trek” replicator, for any of you who are “Star Trek” fans, in terms of trying to figure out what is in the realm of the possible and what we are capable of translating from science fiction to reality.

We run these competitions very competitively, across all of Europe, so we are open to teams from the European Union. The European free trade zone, the UK and Israel are the primes from where we will accept applications. In fact, we just closed an application last night on fully autonomous flight in which we have more than 71 applications from across Europe competing. These competitions run over multiple stages, so we use the precommercial procurement contract vehicle of the European Union. That allows us to go from yesterday, closing our competition on fully autonomous flight, to within the next 11 days having all contracts signed and everybody paid their first instalment by day 12. We are able to do that because we publish the contract along with the application, and it is a non-negotiable contract with all the preferences for the innovators and creators and what they will be able to do.

So we run these challenges, and we are quite excited about moving the technology space forward on that. On the other side, we act like an investor. Our version of due diligence is that we will go academic teams, start-ups and companies and they will pitch us a very creative and unique idea. We will give them an R&D contract for up to €220,000, which we can sole-source to them—again, anywhere across Europe. They will demonstrate the capabilities of

their technology and demonstrate what kind of proof of concept and what the market commercialisation is like.

If we can build an investment case around that, we have four unique tools that I believe make us globally unique in our ability to interact with the companies. One is that we can give them a founding grant of up to €1 million to really start the company if it is less than five years old. The second thing is that this time we can give it an R&D grant of up to €35 million to really scale the technology that it has developed. It has to contribute under European state aid laws about 25% of in-kind cash to match our investment.

The other thing that we can do is to involve equity. We can give the company equity up to €100 million, which again under state aid law means that it is required to contribute 30% of fresh cash injection from a new investor to come alongside us, to really scale up. What also makes us unique is that we can also create companies. Because we are a company, we can create subsidiaries. At the moment, we have 12 subsidiaries, where we believe in the technology and the future vision of these start-ups.

However, the market is nowhere near that capability at the moment; the investors are not ready for this technology. One example is laser-induced fusion—being able to produce energy through fusion. We are excited about that, and we created a company around it called Pulsed Light Technologies, which is one of our subsidiaries. Then we collaborate with a number of start-up companies that have ground-breaking technology and bring the human and intellectual capital into our subsidiary. We provide them with a loan of up to €100 million so they can develop the technology without the pressure of the market.

How does this fit into the ecosystem? As I mentioned to you, the academic side is very strong and we have a very strong landscape of patents. However, translating it into the market is a struggle. Our return on investment is driven by societal impact, not by financial gain. Our investment hypothesis is based on: the higher the risk and the higher the likelihood of failure, the more likely we are to invest in it. So we will not get involved in projects where we believe that the market or investors will actually push this technology forward. We empower the creative and unconventional thinkers—the more crazy, if you like—to pursue their ideas where they would otherwise never have a chance.

One example is that we had a broad-spectrum antivirals competition. One of the scientists applying was a physicist who, by any stretch of the imagination, had nothing to do with infectious

diseases. However, he was an expert in DNA origami and came up with a unique concept to use DNA origami to create cages to capture viruses. Imagine getting on a plane and just having to inhale this broad-spectrum antiviral that can capture up to 12 different viruses at the moment without needing a vaccine or having to worry about changes, mutations or a variation in the virus. A physicist like that would probably never have a chance to go through normal rounds of financing, investments or funding because he may not have the pedigree to say, "I know what I'm talking about when it comes to infectious diseases". We are the ones who try to empower those types of innovations.

How do we fit into the scheme? We want to be a partner of choice and a trusted partner across Europe with organisations such as Vinnova as well as for the creators. We believe that a stronger Europe is focused on doing things together, and that includes the UK as well as all our other allies and partners, so we engage with them, work with them and enable them to move this forward. We have a number of different investments, even here in the UK, where we believe in the technology and in the individuals, and we empower them to do something great with our investment. We celebrate failure. We help them to scale up and we bring them the investment we believe they deserve.

We also empower them by putting them in front of people on stage. Our flagship event this year recruited about 180 investors where we showcased exclusively our investments. We said, "Look, we believe in this technology and we're derisking it. If we fail, we're happy to accept that failure. However, if you invest in this technology, we believe that we can make a huge difference in it. It's not going to happen tomorrow and it might not happen in the next three or four years, but it will happen in the next decade if this technology can be moved forward".

Q118 Viscount Stansgate: My question arises from something you have just said. We are interested to know what particular success stories you have to tell us about—policies or innovations that you would like to share with us. You have given us just a couple of examples, such as the origami cage, but we would all be interested in other examples that you might like to give us now and the reasons that you think led to their success.

Darja Isaksson: It depends how far back in history you want to go.

Viscount Stansgate: As far as you like.

Darja Isaksson: Then I have a few reflections. With only 10 million people, Sweden is so small that I would regard us as a city rather than a nation, yet we outperform expectations in start-up formation. We are now number one in Europe, measured in unicorns per capita. The reasons for this, looking back, are some good early decisions on investments in infrastructure; early capital market development; and making sure that both Nasdaq Stockholm and Swedish pension funds have gradually expanded allocations to venture and private equity. We have continuously invested in collaboration and open technology infrastructure in biotech and advanced therapeutics among other things. Our world-class start-up infrastructure, the national incubator programme, has been essential, systematically matching start-ups with needs in industry and society. Ignite Sweden is a national matchmaking programme that has been running since 2017, resulting in thousands of business deals between start-ups and companies.

To come back to what we heard from SPRIND, I want to highlight that we are very happy about the MoU with SPRIND because the advanced start-ups that Europe needs require speed, access to expertise, industry know-how, investment and customers. We as a government agency address these needs through various instruments already, but there are a few things that we notice. First, in terms of grants, we abide by state aid rules. The SPRIND model is very attractive for start-ups, as well as providing opportunities to blend public and private funding and allowing for speed. Looking ahead, I think the needs can be addressed in various ways but that needs to be done in the optimal way to provide speed and scale in opportunity.

Dr Patrick P Rose: We certainly cannot hold a candle to the legacy of what Vinnova has already built. It is an inspiration for us, and I can confirm, having travelled quite a bit around the world, that Vinnova is doing an amazing job in Sweden. We are fairly new; we have been on the ground and operational since 2019 and only really had our shackles released in 2023, when our Government passed the SPRIND freedom law that allowed us to be even more flexible than we were before.

I shall give you some examples of what we are doing. We are building the world's largest wind tower, at 300 metres tall. You might ask why that is relevant and say that it seems kind of pedantic, but it is an exciting project. No one has ever built a wind tower that tall. The engineer, its innovator, was a 92 year-old gentleman who had the crazy idea to build a wind tower of that height to demonstrate that you can get three times more wind and have consistent and reliable energy. We are building that tower,

and it will be supplying a town for the next couple of years to demonstrate that it works and you can have consistent energy production.

Here in the UK, you have a fantastic company in Stockport called C3 Biotech. It leverages the power of synthetic biology to convert biological components into attractive materials such as acrylates and different polymers but, even more excitingly, a synthetic alternative fuel that has all the benefits that we look for when moving away from the kerosene that we produce at the moment. I have already mentioned the DNA origami and our laser-induced fusion companies. Those are just some examples of where we are pushing the envelope in technologies and capabilities at the moment.

We have many more; we have over 260 validation projects that we are moving forward. These are the original investments that we make. We do not carry all those on to the next level where we make large investments, but we believe that even creating that spark, that ability for them to demonstrate their capabilities to the market in front of investors, is a statement that allows them to catalyse their capabilities. The Government should not always finance everything from start to finish, but they should attract investment by taking the risk and then allowing other investors or the market to drive that forward. That is what we are trying to enable in the different areas that I have just mentioned.

Viscount Stansgate: Conversely, what would you say are the major challenges that your scientists and entrepreneurs face in commercialising their technology, and where do you think you have more to do?

Darja Isaksson: There are challenges along the whole journey. At the very general level, we need to make it as easy and attractive as possible and to aim to make an impact through innovation. That means they need access to problems to solve. Think about military problems; the challenge is to be open enough about what the challenges are. That requires a culture where that can happen and the opportunity to meet the people with knowledge about these problems, and then you need to connect them systematically to the networks of expertise and capital that various industries need.

In Sweden we still have professor's privilege, and that might be good at attracting certain talent. It certainly rewards the entrepreneurially minded researcher, but it is also a challenge to align incentives for commercialisation, making it kind of negotiation-heavy.

Since we are a small country, all our start-ups aim for international markets from the beginning. That is a good thing in a way because they have the right mindset, but it is also a challenge. Many of the challenges we see where we need to move forward are ones that we share with Europe in terms of closing the innovation gap, especially for deep-tech companies. For deep-tech regulatory fragmentation and red tape, regulatory sandboxes are often mentioned as a solution. They can be if they drive simplification and harmonisation at scale; so far, I have yet to see how that is really going to fly at the European scale, but let us try. We can all learn from Singapore.

We are also part of a Europe that really needs late-stage venture capital for these companies, as well as to be an attractive exit market. These are challenges that I do not see Sweden solving alone; rather, we need to do so together.

Another vulnerability—it is not noticeable as a challenge yet, but I think that we will see it because of the wave of AI start-ups right now—is that, basically, all of these start-ups are being built on US platforms. Many of these ideas are not deep tech but there are so many opportunities right now. The question is: how unique can they be in the long term? Clearly, there is a lot of whole-industry disruption and opportunity there right now; this is something that I think we will need to address. The main challenges that we see have to do with these things.

Q119 Baroness Walmsley: Something that Dr Rose just said pricked my interest. Many of these innovations, when they are implemented, come in a regional or local context. You talked about the enormously high wind turbine, which is obviously being put somewhere. It put me in mind of a situation near where I live. There was to be an onshore wind farm, so there was a local meeting. My neighbour, who is a civil engineer, was very interested. We asked him why he was not going to go along. He said that it was because he thought that it was not big enough and that he would be rather unpopular locally because of that opinion. My question is: do you feel that it is any part of your role to help the company doing things such as this to explain the benefits—and, maybe, the drawbacks—to the local community where the work is going to be done?

Dr Patrick P Rose: Thank you for that question. Absolutely—we, as organisations that represent the Government, are very important in explaining to the community why we do these things. We constantly get questions such as, “Why are you throwing my tax money out the window?” With a concept like the one you are talking about, we celebrate failure. Nine out of the 10 projects that

we might invest in might fail, but we try not to regret having tried something in the first place. That is a difficult discussion to have. Hopefully, in the future, 80 or 90 years down the line, it will be successful.

When you look at Vinnova, there are plenty of examples of why this has been successful and why this has worked, but it requires lots of grass-roots activism in talking to the community and explaining to it why this is important. It is about demonstrating to people how this can work, but also having a bit of arrogance and naivety in saying, "We're going to do this regardless of whether people think it's a good idea or not. We are going to try. When it works, great; if it does not work, we will have learned something from it, and we will certainly have provided new technological innovation".

Q120 Baroness Neville-Jones: I just want to ask you something. When you talk about public money, is this federal money or Land money? Is it aufbauen money?

Dr Patrick P Rose: It is federal money. We were created under the auspices of the Ministries of Economic Affairs and Science and Education; they keep changing their name but that is what they were originally called at the time. So it is federal money that is provided to us.

Baroness Neville-Jones: What sort of size of budget are we talking about?

Dr Patrick P Rose: I apologise for not mentioning that earlier. Originally, our mandate was €1 billion over 10 years. This year alone, we have received €250 million. Last year, we received €220 million. We expect that to go up next year because of our execution power. It is not just these two ministries; other ministries are attracted to working with us in allowing us to execute on their projects, such as a digital wallet programme or new education system. Different ministries have now added to the pot of money for us.

Baroness Neville-Jones: Does any other money come in as a result of that from any other source?

Dr Patrick P Rose: With equity investments, we require fresh capital from the investment community to come in; that is a requirement under European state aid laws. When we provide the R&D grant to the teams, the companies have to find in-kind cash up to 25%. They are going out to the open market and trying to find the money; that is a European state aid law requirement to drive competitiveness and commercialisation. This is primarily where additional funds are coming from.

Baroness Neville-Jones: So, at any given moment, you are not bearing the whole of the risk?

Dr Patrick P Rose: Initially, we will bear the majority of the risk. With an equity investment, we can take up to 70% of the investment, which is a significant risk. However, because we are not driven by financial gain, we take a different approach to that. It is really about trying many different things and not regretting having tried them in the first place. Because we are federally funded, that allows us to take this approach. That makes it attractive for investors because we are derisking a lot of competencies and capabilities that they would not see otherwise.

Q121 **Baroness Walmsley:** My question is about the joining up of government policies and government agencies. Obviously, we have heard from witnesses that a healthy science and tech system requires support at every step, as does the pipeline. We know that some agencies deal with early-stage support and that some deal with middle-stage or later-stage finance. Both of you mentioned in your introductory comments the various other agencies that exist in your countries. Can you say a little more about how you work with the other agencies to make quite sure that there is co-ordination right across the piece? For example, I know that Vinnova has a role in co-ordinating the European Union's funding. Dr Rose, you have mentioned a lot about European projects; perhaps you could also mention something about how you co-ordinate with the wider EU.

Darja Isaksson: First, I would like to say that close to 70% of the investment in research and innovation in Sweden is done by the private sector. Fundamental research is also funded by the private sector—most notably through the Knut och Alice Wallenbergs Stiftelse, which is a Wallenberg Foundation. We do not formally co-ordinate with it but we have informal, continuous dialogue. That is the first thing to mention.

We have many formalised connections with the other government funders that we use for co-ordination. We have a long-term, established function of co-ordinating with the EU programmes—there is even a name—with all state funders involved. We also co-fund various things, such as the EU SME support office.

Most importantly, we share the practice of collaboration. The things that have really built that capability include running programmes together. For instance, Vinnova works very closely with something that we are now going to fund. It is called the Excellence Cluster; it was just announced in the recent Bill. We will do that together with the Swedish Research Council.

We also have these impact programmes, which I mentioned before. They have been running for 12 years now; we run them together with Formas and the Energy Agency. Let me give you an example of what happens. We have a programme called Viable Cities. It provides a platform for 48 municipalities to achieve climate-neutral status by 2030, co-ordinating their R&D, their deployment and their work on policy. I come back to the question of how to engage the local communities. This programme functions as a platform for that. The Stockholm Resilience Centre has been present, helping them develop these citizen dialogue formats.

When we do that, we also look into how these different opportunities can scale. There are partnerships. We now see that even the way of working has scaled through Europe, such as in Portugal and in Spain, meaning that the municipalities that have been using this platform now align with the EU's "100 climate-neutral cities" mission. This means that they are overachieving in terms of impact and benefiting from the "driving urban transitions" and "climate-neutral cities" EU programmes. I just give you that as an example.

The co-ordination is both formal and built over time through running different programmes together. It is also about leadership and culture. I would honour the Ministry of Finance which chooses who gets to be DG. Over the last couple of years, we have seen an increased focus on systems, perspectives and the ability to take joint responsibility for what falls between these different organisational silos—if you will. It takes time, but I would say it is formal and informal.

Dr Patrick P Rose: We are the new kid on the block and it is a little bit harder to break in and connect with others. So that is why we are really excited to have this formal relationship with Vinnova, one of our first partners. We have been gathering our legs underground to be able to really understand how we can operate most effectively within the scope of things.

We sit differently from basic research funding agencies: we do not fund basic research; we generally start around technology readiness level 4 and go upwards to about level 7. This is the gap where other organisations do not have the financial capabilities at the moment.

The second thing that we have been trying to do is learn how we can leverage the European financial tools to be able effectively to have the execution power to do the work that we are doing. As I mentioned earlier, we are one of the few that is leveraging this tool

to be able to turn an award into a contract within 12 days and have money on account.

So we are spending a lot of time at the European Commission's European Innovation Council, to co-ordinate with it to try to figure out how we can work together. But as Ms Isaksson mentioned, we are creating an organic ecosystem where we are identifying our important role to play and then leveraging everybody else to bring them together, and finding partners such as Vinnova to work together and do joint activities such as challenges, for example.

Interestingly enough, our most formal and advanced activity is with the United States National Science Foundation, which is focused on academic research, and has the same issue whereby it is not translating enough over into industry. The foundation came to us a couple years ago and asked us to partner with it so that it could learn from our process. Now we are building a joint challenge with it in the next couple of years, and we expect to do the same with Vinnova in the next couple of months. So we are in tune with the different communities and trying to understand what they are doing. It is a little difficult for us to fit into them sometimes because we have a different perspective and a different risk tolerance, in what we are trying to do.

We also do not approach things such as peer-reviewed evaluation of the projects. It is important for us, when we are trying to drive translation to the markets, to bring in investors and company creators as well as technical experts. Just as much as the technical aspects are important, the intuitions of an investor or a company creator are important in making decisions on whether this is something we are going to invest in. That is a little different to the way in which most organisations operate. We complement what they are doing and try to translate it. We have been working with the Volkswagen Foundation in exchanging ideas and understanding what it is doing. For innovation managers like myself, it is critical to understand the landscape, who has been investing where and the lessons learned from that. That then informs what we are doing, but that has not necessarily led yet to formal collaborations in terms of doing things together.

Baroness Walmsley: You seem to be in a hurry and keen to do things at speed. Is the fact that you put the contract on the table at the same time as the challenge influential in enabling you to get things moving quickly, if they are successful?

Dr Patrick P Rose: Absolutely. We are in a hurry because if you look back in time, a sense of urgency came around conflict or geopolitical instability. When SPRIND was created in 2019, the

question was why we have to wait for those types of scenarios, which we are in again, to drive innovation, because those times around the Second World War were some of the most innovative. That is where that sense of urgency came in, by saying, "How can we streamline this process and be able to execute quickly?" The biggest challenge is execution power in Europe.

I come back to another question: what are the biggest hurdles at the moment? One is creating companies and failing at them. So, in Europe you are almost considered a criminal if you fail or go insolvent with a company; whereas in the United States, if you go to Silicon Valley and have that on your résumé, you will find a job within less than five minutes. The contradiction is pretty stark.

The second thing is regulation: how long it takes for me to create a company in Germany or in many parts of Europe, versus in the United States. It is that execution power that we are really trying to drive forward and that is motivating us to be faster.

Darja Isaksson: This is just a reflection of when I appreciate when the Government does even more. What you want is the overall effect of a "no wrong door" approach, whereby all the government agencies work for the benefit of the bigger whole, investing the time it takes to streamline or to reduce barriers.

I will give you a concrete example. It is very easy to implement state aid rules in slightly different ways, creating fragmentation and barriers. When the Government really listen to the experience of the entrepreneurs and follow up on us as government agencies, together across ministries, there is focus on creating incentives because what it often takes is investing in your own IT, practices and policies. So the Government can make a big difference with small signals.

Baroness Neville-Jones: Briefly, on money again, you said that you are operating in TRL 4 to 7. Do you find, as a result, that you are further up the developmental ladder as a public body operating in funding than most publicly funded bodies? It sounded like it to me.

Dr Patrick P Rose: Yes, that is mostly correct. The European Innovation Council has some similar efforts to scale at that level.

Baroness Neville-Jones: That is obviously a deliberate decision.

Dr Patrick P Rose: That is correct.

Baroness Neville-Jones: What is the comparative advantage of intervening at that stage?

Dr Patrick P Rose: Universities are great at creating patents and exploring different ideas. They are absolutely horrible at translating those into companies. They make it extremely difficult to translate those capabilities into opportunities. We have had experience here in the UK with several universities where they will say, "We want 30% of the company, royalties and licensing fees". That company is dead on arrival. That is also true in Germany and other European countries.

My favourite example here in the UK is Harry Destecroix in Bristol, an amazing and brilliant guy who made his own way and said, "I refuse to accept what the tech transfer office tells me at the University of Bristol, and I am going to learn and figure out how to do this". As an individual he is a unicorn and super successful. He sold his technology then to a pharmaceutical company for over £800 million. But nobody has the energy like he does to really tackle that.

We generate a pull by being in the position that we are in at the moment when we say, "We believe that this is a really exciting technology. This is a really interesting capability. We want to help you create a company around this", and we put pressure on the universities to say that the conditions that they are requiring now will kill this company and idea up front: "There is no chance that it is going to survive. No investors in their right mind are going to do this".

So we are moving forward, for example, with a new IP strategy across Germany. That is why we are in that position because we can use it to say, "Look, we could give you lots of money. We could help you scale the technology. We will bring in the investors. We will put you in front of 180 investors. But the conditions that you are providing are impossible for these creative individuals to survive". That is one of the deliberate things whereby we are able to work from the position we are in, and that is why we were created.

Lord Stern of Brentford: Thank you both very much for your fascinating contributions. I have a big-picture question on how this fits in with overall EU strategy on productivity, but I just want to check on one thing. You both have clout and coherence in your systems: Ms Isaksson, you mentioned the support of the Ministry of Finance; and Dr Rose, you mentioned that you had the original support of the Ministry of Economic Affairs. Does support from those two sources give you extra clout? I mean, people have to listen to you for some reason. They will listen to you because they think you offer a very good thing, I am sure, but they also listen to

you because of who is behind you.

Darja Isaksson: Since we have been around for a while, it is clear that our strongest supporters are in industry and the start-up sector. They are the ones we are for. So, when there are discussions about budgets and what-not, the ones who come to explain the main value of this to our politicians, for instance, are the ones with the actual experience of benefiting from these programmes and building their own competitiveness—both multinationals and start-ups. Of course, in terms of numbers, you come back to the actual track record of these incubator and start-up programmes. So that is where the data is, and the main clout comes from there. We have made an effort to continue having a culture where we care much more about what these people tell us—and how we can improve their ability to be successful—than whatever we have done before. That is more of a cultural thing.

Coming back to what we heard before, we do the same thing. There is a journey, for instance, not only for the public sector as a first customer but for big companies as well, in understanding what it means to be a good first customer for a new company. It has to do with speed, with what kind of contracts you provide and with how you manage IP. Essentially, nobody will invest in a company if somebody took the IP—you cannot do it. So we also do that: we act proactively and educate the system on what it takes to build successful collaborations and nurture this kind of ecosystem.

Dr Patrick P Rose: Again, we were the new kid on the block and, when we were created, within the ecosystem in Germany they were asking why we were creating a new agency when there was the Fraunhofer, the Max Planck Institutes, the Helmholtz Institutes and many other things.

In the past five years, we have been able to demonstrate that, with our perspective, investments and learnings, we have a unique approach and a unique vantage point to think about things. We have been a bit arrogant about it, saying, “We’re going to put out position papers about where we believe things need to be changed. We’re going to call out the community and say that we are looking for more risk tolerance, that we are looking for more execution power and so on”. At first, people were not necessarily taking it seriously, but we can now say that we have informed the European Chips Act version 1.0 and are helping to write the European Chips Act version 2.0, which is currently being done. Similarly, we have put out position papers on biotechnology where we are really trying to drive the conversation.

Another thing is that I am currently tasked with building a military version of SPRIND to focus on offensive and defensive weapon systems, because we have the execution power to translate that, with that sense of urgency and speed to be able to do things. That is because we are gaining traction among individuals within the ministries; across government we are understanding what we are capable of doing and recognising how we can be a tool within the system to move forward. So, although there will always be some consternation, our independence is extremely important for us as an organisation. We are not driven by the political will of the Government or the ministries, and there was a testament to that when the freedom law was passed in 2023: all parties in parliament unanimously voted in favour of SPRIND and the SPRIND freedom law. That is a vote of confidence that we now have to live up to, but it demonstrates that we have something to contribute and that we are contributing.

It is extremely important—this goes to the benefit of our managing directors—that they came in and said that we have to be independent and think outside the box, and we cannot be informed by political will or the strategies of the Government. Otherwise, we will just become another bureaucratic agency and not do much at all.

Q122 Lord Stern of Brentford: That was a preliminary based on the discussion, but I now have a big-picture question, although I have to ask you to be brief because we are short of time. Europe has not done very well on productivity and growth in the last couple of decades, and the UK has arguably done even worse, which is one of the reasons that we have this story. Mario Draghi was charged with having a big-picture look at that whole story, and the summary, in terms of Ursula von der Leyen, would be in three areas: we have to integrate our capital markets across Europe so that they work better and we invest more in Europe; we have to simplify and, in particular, co-ordinate our regulation across the countries; and we have to integrate the energy markets. Do you recognise obstacles to what you have been doing in those three areas?

Dr Patrick P Rose: Yes, absolutely—Mario Draghi and the report also mentioned that they need a European SPRIND.

Darja Isaksson: Yes, and it gives us hope that we are now acknowledging the main challenge. Europe needs more companies to be born and grow in Europe, and for that we need to act differently.

Q123 Lord Ranger of Northwood: Thank you for your time today; it

has been truly interesting. Dr Rose, I will pick up “Star Trek” and where you are. I would be keen to see whether the warp drive comes through—forget the teleportation thing. It is fascinating to hear where you are. I say this from my personal perspective: I looked to set up the digital office for London in 2010, for the Mayor of London. Sweden has 10 million people and London has about 10 million people. We were seeing the emergence of that start-up world back then; it was exciting and it was moving fast. I really like what I hear from you, Ms Isaksson, about how the structures have developed in Sweden. Unfortunately, London has not quite taken that view, and maybe the UK has not, on helping tech hubs to develop.

This week is a seminal week for London, the UK and the tech environment. I am sure you know that it is London Tech Week. A vast amount of companies, corporations, start-ups and scale-ups are pitching themselves in London and showing their wares. One of the things that they are all trying to do—I now advise a lot of tech businesses, especially start-ups—is to get that governmental label that says they have done some procurement with government. You have been touching on this.

Ms Isaksson, you mentioned understanding what it means to be a good first customer, and government is generally not very good at that. So what can we do, based on what is happening in your environments? What can we look at? Government is still trying to be the first customer to these start-ups to get them to scale up but, actually, investors also look for that label or badge as well. They say, “Oh, you’ve got some government procurement—tick. We’ll take you on”. But, from the other side, that does not necessarily work for those businesses. They get frustrated and mired in bureaucracy. I actually actively advise them not to take that approach unless it is really easy. So what could be done better to make that work, if that is the route they should take?

Darja Isaksson: I agree that we are not where we should be. I am happy to see that investors here notice start-ups that got support from Vinnova and see that as a sign of excellence. That is nice to know and hear, and we work really hard to continue being there. However, in terms of a good first customer in the public sector, for instance, I would say: yes, it happens, but not at the right scale and not with the right risk appetite. This is one of the main reasons why we are so eager to have this MoU and work together with SPRIND because, where we have seen international experience in driving this, it is in this challenge-driven approach. We have been running this type of challenge.

It also provides opportunities for, say, demand mechanisms. I could see defence and the MSB—the FEMA of Sweden—sharing challenges in order to combine various potential customers in that way and then, in a structured way, build that ability. I would love to hear more. I will give the floor to SPRIND, because that is one of the main reasons why we are quite keen on this, even though we have a lot of experience in innovation-friendly procurement et cetera.

Dr Patrick P Rose: The first thing, as you recognise, is that government is no longer the biggest buyer of anything. That is also true for militaries. If you are looking for military innovation, a company will no longer be able to survive if the military is its only customer. The same is true if we are looking for pandemic preparedness. If you recall, in 2001 the United States built six vaccine production facilities in anticipation of something like a pandemic happening again, but none of those facilities were up and running any more by the time we needed them because the Government cannot afford to do it, and they are just not the biggest buyer of things.

Forgive me for the next statement—I have been a very thankful guest living in your country for the past nine years—but I am totally fascinated, having worked with your Government at various levels, that while your planning and your strategies are bar none across Europe, your execution power is rubbish. That is the key aspect—being able to go to companies and enable them to drive technologies and scale them. One of the powerful tools that we have is, as I mentioned, to put €100 million into laser-induced fusion and say, “Let’s build this. Let’s move this, scale it up and build infrastructure around it”, or, “Let’s build this wind tower and put €50 million to €60 million behind it”. That is what is needed to really drive this forward.

We are not the customer. We are not buying this technology. We are just enabling them to scale it to a level that is going to be attractive. The pharmaceutical industry is always looking at something that has passed phase 3 clinical trials because the risk is then so small that its return on investment is going to be tremendous. Before then, no one jumps in, right? Government will always have a role to push these technologies forward, but you have to do it with execution power and with a volume that makes sense. For example, we put €40 million to €60 million behind our challenges. Teams can gather up to €6 million equity free from us—no debt, nothing—to be able to drive the technology forward, and they do not have to deliver anything other than a report to us. That

drives innovation forward, to be able to drive that to the next level where investors then can come into it. That is critical.

Q124 **Baroness Neville-Jones:** Another effort that is being made in this country, talking about finding investors, is to try to get the companies in our pension industry, which is very fragmented, first to consolidate and then to become a less risk-averse and more imaginative investor and to start reinvesting in the United Kingdom and in UK companies. Is there a comparable scenario in Germany? Is there a reluctance of German money to invest in Germany, or is this a uniquely British problem?

Dr Patrick P Rose: No, it is not a uniquely British problem. We too are advocating to have pension funds invest directly because there is so much equity in them. We have seen through case studies, such as the United States, how much that can contribute to the ecosystem and how much return on investment it gives to the pension funds as well. Germans are reticent about investing because they are risk averse. We do not have the culture, like in the US, where you give back when you are successful. You see many universities with enormous endowments because the people who are successful want to give back. We do not have that in Germany either. Those are some of the cultural changes that have to happen.

Darja Isaksson: That is perhaps one of the things that have been very valuable for Sweden; we had that culture change early on with the first and second waves of entrepreneurs who, ever since, have been reinvesting. We see successful ecosystems of new start-ups coming from early employees and founders of companies such as Klarna and Spotify. We made some reforms in capital markets early to provide growth capital, with Industrifonden being funded and then Nasdaq Stockholm, and our pension funds have gradually expanded their allocations to venture and private equity. That said, they could absolutely do more. We are curious about the European response because we know there is also a lot of private capital in families that could be incentivised.

Baroness Neville-Jones: Do you mean the private market? That is a debate in the UK too.

Darja Isaksson: If we mean it that we want to take on this innovation gap then we need to address the capital markets.

Q125 **Lord Drayson:** My question is about the ownership of these companies that have resulted from the investments and policies that your organisations have pursued successfully. What is the cultural view in Germany and Sweden towards such companies, at

the point of scaling up, being bought by companies from, for example, the United States? Is that seen as a win or a loss?

Darja Isaksson: We are a small country and acutely aware of the value of open trade, so open globalisation runs in our DNA. Even our unions say we are not afraid of tech, just old tech. Yes, we have seen many of our scale-ups being bought by the US at various stages, yet we have also seen that the skilled people often stay and start new companies, and that has always been more important for us. That said, in a more regionalised world with a high demand and need for economic security and resilience, these issues might be high on the priority list anyway. That is where we see European collaboration, and collaboration with our partners around the world, as important, but the natural inclination in Sweden would be to compete with the world and just be good enough to be competitive, rather than being protective. In terms of ownership, I do not think any of us support the idea that the public sector should ever be the owner. The entrepreneurs are the ones driving it.

Dr Patrick P Rose: I am often accused of being an iconoclast on this topic because I look elsewhere. As Darja Isaksson said, it is a global market. It is impossible to create a company and be successful if you are focused only on a regional market. That said, pharmaceutical companies, for example, go to the US because the Food and Drug Administration has a rapid response in approving new pharmaceuticals and allowing them to get to market. In the end, it is about the bottom line and the regulation that you have to deal with to get to a point where you can generate some revenue and profit and attract more investment. It is the regulation that scares investors in the first place from coming to Europe. The fact that regulation in Europe is extremely slow prevents companies from accelerating. At the end of the narrative, they have to go elsewhere to be able to do things, and that is part of the nature of how things are. As Darja Isaksson just alluded to with some examples, if you can become a trusted, valued and preferred partner then the individuals creating these companies will always come back to where the first individuals gave them the opportunity to do it.

Lord Drayson: Do you have data to back that up?

Dr Patrick P Rose: At my last organisation, when I worked for the United States Office of Naval Research Global, we had plenty of data to show that that was the case. The Office of Naval Research Global invests only outside the US, and my job was to go around the globe and invest everywhere that I could find some interesting technology. Over the 81 years that it has existed, it has shown that

it has become a preferred partner and a partner of choice, where it has invested the first level of money in these companies and created something amazing, and in the end it ended up in the United States. It does not finance them the entire time—you definitely do not want to do that—but they will come back because they saw it as a partner of choice.

It is too early for us to have enough data to show that, but some of the European companies that we are investing in outside Germany at the moment have certainly indicated that that is becoming true for them as well.

Q126 Lord Drayson: The point that Darja Isaksson made about first-generation entrepreneurs recycling their expertise and capital at home is an important part of an ecosystem for wealth creation. If the witnesses could share any data on the experience in Sweden and the policies that have encouraged that, or the experience in Germany, even if it is at an early stage, that would be interesting. The concern we are seeing is that, after acquisition, the companies often move their headquarters to the United States and people do not stay and recycle, so policies to encourage that would be interesting. I have a specific question for SPRIND. You have a specific mandate to produce breakthroughs that benefit Germany. **How do you ensure that your investments benefit Germany?**

Dr Patrick P Rose: We believe that not only should you create a strong ecosystem internally but you should surround yourself in a strong ecosystem. If we are going to invest a significant amount in, for example, a Danish start-up very soon, that is because we believe its technology will benefit Europe as a whole, and it will then come back to strengthen Germany as well. An important part of this is that if the people and countries around you are not strong and resilient enough to support you in your time of need, how can you rely on yourself when you do not have all the resources or the manpower? Even in terms of companies leaving, you do not have all the talent here to be able to recruit. The companies that we talk to in the UK are struggling with talent. The same is true in other parts of the world, so they have to go somewhere else. If we can build a stronger ecosystem around us then that justifies the means in an effort to strengthen Germany as well. Germany believes in being a strong and good European partner within and outside the EU. That is the value proposition for why we are investing in the UK, Denmark, Belgium and other countries.

Lord Drayson: That is really helpful. Do you compete with the technology transfer offices of the universities that are trying to get the 30% and provide an alternative route for the academic entrepreneur to say to the university, "No, I will go with SPRIND",

or do you have to collaborate with the university?

Dr Patrick P Rose: We try to be nice up front and say, "Listen, this is not going to work because our experience has shown us that investors will never invest in this company if you levy those types of taxes on it". If that does not work, our argument is that I have another 50 or 60 companies elsewhere in Europe that I could go to that do not have the same conditions and requirements that you are leveraging. It is unfortunate for you and us that we cannot encourage and empower these individuals to create this company. We go into it a bit a bit heavy-handedly. We do not want to overrule the universities; we want to educate them and say, "Look, there are concepts like virtual shares where, if you let this company flourish and give it the best opportunity to grow, the revenue after the larger investments come in and generate profit will be 100 or 1,000 times greater than you leveraging 30% up front with a company that doesn't even have a chance to succeed".

Baroness Northover: My question is for Dr Rose in particular about the comparison of ARIA with your organisation, SPRIND. What comparison do you see? What might you each have learned from each other? In particular, what can we learn from you about how ARIA operates? You have talked a bit about how SPRIND has changed over time since it was set up in 2019. Any lessons for ARIA would be really helpful.

Dr Patrick P Rose: We are trying to work more closely with it as a valued partner. My understanding is that ARIA is focused on looking after lofty creative goals in terms of asking questions: "Is this possible?" "How do we create a programme around something and explore the realm of the possible?" What it lacks, though not through its own fault as this is certainly something it would like to do, is the same execution power that SPRIND has in terms of being able to make equity investments or create subsidiaries. Maybe it does not want to do that specifically, but certainly it should be able to empower the scale-up of investments to do things after they have made a discovery.

Once you have learned from a challenge what the new capabilities and technologies are and what kind of start-ups you are spinning out of it, then you want to be that resource sponsor and transition partner. Everyone that I know, even DARPA, does not have the capability to say, "Okay, we're going to invest further". They have to rely on some military command or resourcing agent saying, "We like this and we're going to pay more money to scale and mature it". That is something that would add to ARIA's capability to make

it even stronger and more powerful in its ability to do its work successfully for the UK.

Baroness Northover: And that is what you see as being important about your organisation?

Dr Patrick P Rose: Absolutely. It is important that the Government get involved in investments. They should not subsidise technology investment. There are plenty of examples all across the world where you can see that if you as a Government invest for long enough, if it has been too long, once you let those companies fly they will go bankrupt in an instant. There has to be a limited space and time where you are going to invest, and at that point they have to be commercially ready and succeed. Like us, Vinnova and others are doing that through mentoring programmes and by bringing in individuals who look at not only the technology but its commercialisation capability. That is extremely important. ARIA absolutely has a role to play. Its people should be thinking unconventionally about things and should not regret having tried something, as crazy as the ideas might be. But then how do you translate that over? They should not have to rely on someone else to take that over. That is the strength of what we are able to do internally from our side.

Lord Lucas: How does SPRIND choose projects and project managers?

Dr Patrick P Rose: Our innovation managers come out of many different areas. They have been company founders themselves, and have worked in some of the most exciting fields and companies. I myself come out of working for government and continuing programmes like this. Our managing director takes a careful look at how it complements what we are doing at the moment because we need individuals who are technically inclined and like to take risks, and then those who understand the investment landscape and how you deal with investors and think about scale-up.

We have a stellar crew of analysts who help us. When we take a look at a technology—it can come in through an open portal, or I or some of my colleagues will scout it ourselves—we will say, “What has been done in the world? Who is doing what in this space and how does it compare to that?” Then we have to go through arguments such as, “Has someone already invested in this technology?”, “What is its maturity level?” and “Where are we on the hype scale of things?” Quantum technologies, for example, are pretty much at the peak of the hype scale, so we will say, “Okay, we’re going to sit back and look at that for the moment and see

how it evolves”, then we will build a business case around that on the technology and commercialisation sides as well as the investment side. That creates an investment case for us when we are asking, “Are we going to invest in this?” Critical to that is that our analysts help us to inform our intuition. It is about not just technical capabilities but intuition. You can have 10 people pitching you the same idea but only one of those individuals will be successful at actually translating that idea into something, and that is driven by investors’ intuition to understand what is going on.

The Chair: I want to ask you about the relationship with Fraunhofer, which you mentioned briefly. What is the relationship between SPRIND and Fraunhofer, which is much admired around the world?

Dr Patrick P Rose: We have a great relationship with it; I believe I will be speaking with its director later this week. It has a clear mandate to look at technology transition and work with companies to mature the technology and get it to scale up. It is business focused and takes a much more conservative approach, which is not a negative thing; it is important that it fills the niche or the requirements for its customers, which are the businesses. We come at it from another angle and are much more creative and unconventional in our approach, so we complement each other in that respect when it comes to doing business.

Baroness Northover: I want to ask a little about those analysts, who you say are outstanding. How do you attract them? How do you compete with what they might be able to earn in other places? It is striking that you have managed to secure such people. How long do they stay for, and so on?

Dr Patrick P Rose: Again, keep in mind that we are only five years old. Our managing director sees us as a little like a chocolate factory, in terms of being able to explore different things and have a lot of fun with that. There is something unique—this is certainly what has kept me in a position such as this, even though we have a limited time rotation. An analyst in SPRIND will never become an innovation manager, and an innovation manager has about five to six years before it is time for them to rotate out. So we have built some institutional amnesia into the system. I will try many things and fail at those; we will learn from that and someone else will try again after me.

The analysts come in, and certainly none of us really comes in because of the salaries; we are here because we want to make a difference. It is unique to work for an organisation where you can try crazy things. My team is currently developing a challenge

around building a space elevator. There is the ability to be creative, to think outside the box, to be unencumbered by the thought process and to say, "Okay, we understand how physics works, but let's question the assumptions of physics at the moment and ask why this is not possible". That creativity—that fertile ground and the ability to see all these creative crazy ideas that people are bringing to us—gets everybody stoked and excited to work for such an organisation. Being able to translate some of those things into reality is really exciting. That is what attracts good talent to organisations.

Q127 Lord Berkeley: There is a lot of evidence that the civil servants in Germany and Sweden have a very good technological background—rather better than we have here. That may be wrong, but the evidence you have given us so far this morning is very impressive. Do you think that evidence is right or wrong? As a supplement to that, does it help if the personnel, like you in your younger days, move between industry, academia and government in a way that does not seem to happen here? Let us start with Sweden.

Darja Isaksson: I have not seen the data, so I am not sure what I am saying. From a Swedish perspective, I would say that we generally agree that moving between sectors and in the world is a good thing. It is not uncommon. For instance, at Vinnova we often hire mid-career professionals from industry, resonating with SPRIND. I do not talk to people at Vinnova about how to make your career at Vinnova; that is irrelevant. "What do you learn here that gives you an opportunity in the real world afterwards?"—that is how we think about our internal talent attraction. It is not about keeping people but about really helping them to develop.

I recognise what I hear about people generally being motivated less by money and more by making a difference. It is not unusual to see desk officers at the ministries later working for industry and then perhaps coming back in another capacity. It is seen as building valuable experience. That mindset is perhaps driven by us being a small country: there are only so many opportunities around if you want to be on this specific spot on the planet.

Lord Berkeley: So the transfer between different sectors is seen as an advantage and a career move.

Darja Isaksson: Yes—at least it is not a disadvantage.

Dr Patrick P Rose: I have met many talented individuals here in the UK in different government agencies who are absolutely

brilliant and very capable. So I do not necessarily believe that you have a disadvantage.

Lord Berkeley: I am not knocking them; I am just thinking of career movements and expertise.

Dr Patrick P Rose: I also believe—this is advice that I give my analysts and others—that it is extremely important to have that unique perspective and distinct approach by working in the different industries and the different sectors. One of my biggest superpowers was travelling around for seven years, reaching about 36 different countries and being able to appreciate what they are doing. So it is about not just working in different industries but actually sending your individuals out to see what other people are doing in other parts of the world, because oftentimes they are trying to solve the same problems, just with different approaches and resources.

I have plenty of examples that I am happy to share with you of countries such as Armenia, which used to be the Silicon Valley of the Soviet Union, where they are doing physics research that can compete with the CERN large hadron collider in Switzerland, with a fraction of the money they are spending in Switzerland. Being able to appreciate that is just as important as going out and seeing how they do it in the private sector and the non-profit sector, because each of them runs things differently.

Q128 **Baroness Neuberger:** Thank you both—it has been fascinating, and I have been taking copious notes of things that we ought to do. We have to write a report, obviously, with recommendations to the UK Government about how we actually do the scaling up. Dr Rose has said that we are pretty much rubbish—

Dr Patrick P Rose: You will get me in trouble: it was in the execution power where the UK Government is lacking.

Baroness Neuberger: It was in the execution—we all smiled. If you had to help us write the report, what advice would you give us? What would you say we should do?

Dr Patrick P Rose: Yes—I meant rubbish in terms of execution power. Hopefully I will get back into the country in a week. I should mention the sense of urgency about doing something. Last Monday, you had the defence review, which said, “This is what we have to do and this needs to be done”. So how long will it take you to translate that into something? Similarly, when I came in 2016, I saw these six amazing synthetic biology centres that your Government had created at various institutions. There was brilliant execution in building these amazing institutions. You had a plan but

you did not execute it by keeping them going and supporting them further. That is what you need: that sense of urgency and that drive to then move forward with it. You have people who have the vision, you have people who can do this and you have amazing creative people, such as Harry in Bristol and others, who can help you with that. That is what you need to move things forward.

Darja Isaksson: I agree on this. I remind everyone that, when it comes to failure being celebrated, it is not because it is necessary but because this is proven to be the best and most efficient way to success. That is just a reminder of why this investment in risk taking is so important. You already have so many ideas about how to cover the whole journey. You have a great opportunity in ARIA and strengthening this.

In my last words I will say something that we only briefly touched on but perhaps should have spent more time on. Nobel Prize winner Daron Acemoglu reminds us that the actual societal outcomes of technology vary, and directionality and inclusion in these processes matter a lot—at this time perhaps more than ever, if we are thinking about Europe and the world at large. The UK has been a frontrunner in missions and impact-driven innovation, so I encourage you to continue to invest in that type of research, systems thinking and co-ordination. We know how to increase our ability to drive innovation at scale, but we need to do it in a way that is responsible and creates a future that we urgently need. For that, more is needed.

The Chair: Thank you very much, both of you. It has been very informative to hear the Swedish and German experience.