House of Commons

Treasury Committee

Oral evidence: Jobs, growth and productivity after coronavirus, HC 150

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Watch the meeting

Members present: Mel Stride (Chair); Rushanara Ali; Harriett Baldwin; Anthony Browne; Felicity Buchan; Emma Hardy; Julie Marson; Siobhain McDonagh; Alison Thewliss.

Questions 1 - 62

Witnesses

I: Professor Bart van Ark, Managing Director, The Productivity Institute, and Professor of Productivity Studies at the Alliance Manchester Business School, University of Manchester; Dr Anna Valero, Senior Policy Fellow, Centre for Economic Performance, London School of Economics, and Deputy Director, Programme on Innovation and Diffusion (POID); Giles Wilkes, Senior Fellow, Institute for Government.

Written evidence from witnesses:

Institute for Government – JGP0025

Bart van Ark – JGP0054

Examination of witnesses

Witnesses: Professor Bart van Ark, Dr Anna Valero and Giles Wilkes.

Q1 **Chair:** Good afternoon and welcome to the Treasury Select Committee's first evidence session in our inquiry into jobs, growth and productivity after the coronavirus. I am very pleased to be joined by three witnesses this afternoon. I am going to ask them to introduce themselves very briefly to the Committee.

Professor van Ark: Good afternoon. My name is Bart van Ark. I am a professor of productivity studies at the Alliance Manchester Business School at the University of Manchester. I am the managing director of the Productivity Institute, which is an ESRC-funded initiative around the nation to support productivity growth in the UK.

Dr Valero: My name is Anna Valero. I am a senior policy fellow at the LSE's Centre for Economic Performance and deputy director of the Programme on Innovation and Diffusion, which is an ESRC-funded programme.

Giles Wilkes: Good afternoon. My name is Giles Wilkes. I am a senior fellow at the Institute for Government and a consultant at Flint Global. Before that, I spent six and a half years as a special adviser to Theresa May and Vince Cable in various Governments.

Q2 **Chair:** Thank you very much, and thank you, Giles, for appearing again before our Committee. I am going to start the questioning to try to get a bit of background on the evidence around productivity. Perhaps I could start, Bart, with you. What is the latest evidence on how the UK is doing in terms of productivity compared to advanced economies internationally? How have things developed for the UK both before and after the financial crisis? Can you tell us a bit about that, please?

Professor van Ark: Yes, absolutely. Thank you for asking that question, because it is a very timely question. The picture on UK productivity performance changed a little bit last week when the Office for National Statistics revised their output and productivity estimates slightly. The productivity slowdown, which definitely has been there since the mid-2000s, is still there but it is not as severe as people had thought it would be. On the other hand, the uptick in productivity before the financial crisis that was visible in the earlier statistics was perhaps not as sharp as it was originally expected to be.

It is a question of numbers, though. The picture is still there: we have seen a very significant slowdown in the growth of output per hour worked but also in terms of total factor productivity. That is a bit more of a technical term, which also takes into account the investments that businesses do, for example. That has slowed down very significantly. As you say, it is an international phenomenon. We see it across most advanced OECD economies, but there is some evidence pointing in the direction that the slowdown has been a bit more serious in the case of the United Kingdom. That will be discussed a little more widely this afternoon.

What is interesting about the revision that the Office for National Statistics made last week—forgive me for being a little technical for just a few seconds—is that they provided separate estimates for the price measurements of outputs and the price measurements of inputs. Of course, you need outputs and inputs for productivity. As a result of that, now that we have measured the prices of inputs separately, we find that the real growth in productivity since 2008 is perhaps slightly better than it used to be by 0.1% or 0.2%.

It is more interesting to look at the underlying industry results, because we also find that the performance of productivity manufacturing has been going up slightly, whereas in the case of the services sector productivity has slowed a little bit compared to the original figure. There is a little bit of a widening in the growth rate of the manufacturing industry versus services with one big exception. The big exception is the telecommunications services sector, which was not very well measured until now. It is now properly measured, and we can take into account the very rapid quality changes that have happened in the telecommunications sector. We now find that productivity growth in telecommunications was not just 6% per year on average but as much as 25% a year on average. That had quite a significant impact.

Q3 **Chair:** Just to stop you there for a second, that is quite a change in assessment. What drove that? How did everybody get it so wrong?

Professor van Ark: The reason for that is to do with the price measurement that was used to turn the output growth in pounds into a real measure that is adjusted for inflation. Originally we used the consumer price index as a measure for inflation for telecoms services, whereas what we should use for productivity is a producer price index that takes account of the very rapid quality changes that have been taking place in telecommunications services.

It is a methodological improvement that many countries have made, and the UK is now rightly making as well. Therefore, it is perhaps a little bit more in line with what is happening in other countries.

Q4 **Chair:** You say that manufacturing has been doing a bit better on the productivity front generally than services. What has driven that?

Professor van Ark: The reasons for it differ sector by sector. Again, there are a few sectors where it has not improved, but on the whole you can say that the growth rate in real inputs was not as rapid as what was estimated when you use the so-called single deflation method and do not separately take account of price measurements in the inputs. That has had a bigger effect on the manufacturing sector and the services sector of the economy.

Q5 **Chair:** Getting back to the international comparisons here, there are countries that have been doing better than us in recent times. What are the main drivers of that? Is some of it related to the level of employment that we have had in the UK and the effect that might have in terms of relying on labour rather than technology or other inputs? Might that be part of the story?

Professor van Ark: I am sure we will come back to this discussion later on this afternoon, because it is very important to understand the extent to which this is related to the sector structure of the UK economy. I know Giles, another witness here on the call, has views about this that are very important to share.

Sector share plays a little bit of a role, but what is most important here is that since the financial crisis we have seen many companies in the UK—this is not necessarily sectors but companies within each sector—that have gone on what we sometimes call a low value-creation path, which means significant growth in employment but low-productivity employment.

As a result, very many firms in many sectors of the UK economy have these very long tails that were not close to the frontier, although pretty much every sector did have a couple of firms that were very close to the frontier. These tails are relatively long in the UK, which partly translated into faster employment growth but slower productivity growth in the post-financial crisis period.

Q6 **Chair:** How would you see the impact of the pandemic and Brexit, including the change that has brought to the employment market in terms of less labour coming from the EU 27 than previously? What impact might those two issues—I know they are separate—have on productivity for us as we look forward?

Professor van Ark: During the pandemic not just the GDP numbers but the productivity numbers even more have become very volatile. At the Productivity Institute, we are doing some research on figuring out what really happened. One big impact that happened during the crisis was that we had some sectors, such as hospitality, services and accommodation, that pretty much shut down. These are relatively low productivity sectors in terms of having low productivity levels. When these sectors become smaller, the aggregate productivity number goes up, but it is just a statistical artefact. That is really what happened. It changed from quarter to quarter, because the sectors opened up again and then they closed down again. It is very volatile.

What we see on average is that at the aggregate level productivity growth has slightly improved in 2020 despite the decline of 9.8% in GDP. However, if you take out the sector-shift effects that I just described, productivity actually declined by about 2%, if you just look at within-sector performance. Again, we find that more of the productivity decline was happening in the services sector, whereas many industry sectors have been doing reasonably well and perhaps in some cases even better than originally because of the uptick in demand for manufactured goods during the pandemic.

We also see that effect in other countries. We have done some comparisons with France and the United States. We find similar pictures there, even though the productivity advance in the United States during the pandemic is probably significantly higher than it is in the European countries.

Q7 **Chair:** What about the Brexit point and the effect that has on migrant labour, et cetera? What is that going to do to productivity when it feeds through further down the line?

Professor van Ark: It is a little bit early to see this in the numbers, but we did see some disruptions at the beginning of this year when the Brexit arrangements were executed and implemented. We see some bounce-backs from that. We will have to see in the longer term whether Brexit is creating a situation in which many companies cannot perhaps benefit as much from deep relationships in the supply chain with Europe. That could have an impact on their productivity performance.

The other effect that you were mentioning is of course the availability of labour. Again, this hugely depends on the sector. In some sectors there was a very high dependence on immigrant labour from Europe, particularly in some services sectors. I definitely see challenges at this point, particularly now that the economy is opening up from Covid. You get this interaction taking place.

Again, we will have to see how this is going to settle. Once we go further down the line and once Covid is behind us, we will begin to see these Brexit effects much more clearly. A lot of it will depend on innovation and whether companies are able to better innovate and substitute the original supply chains that they had between the UK and Europe. That is still a little bit in the works, and too early to call.

Q8 **Chair:** Is it possible that there is an argument that labour may become more expensive for some of these sectors because it is not readily available on tap from elsewhere outside the UK? As a consequence of that, the balance between labour and capital could be driven in a particular direction that leads to better productivity overall. Might you be thinking, "Yes, there will be some of that effect, but it might end up being within sectors that are not set up to capitalise on improving productivity by the nature of what they do or the way they operate"?

Professor van Ark: Yes, you are pointing at the challenge around the differences between sectors. When there are shortages of labour, wages will go up. That is very likely to happen, and it will give companies an incentive to automate or to advance digital transformation.

The problem, however, is that in the sectors where we see bigger shortages—again, hospitality, services, accommodation and some transportation—there are limited opportunities to drive digital transformation and to substitute low-wage labour for automation. In a restaurant, you cannot replace the waiter with a robot, for example. You can to some extent, but it will certainly change the experience.

We definitely have challenges between sectors, but overall rising wages, if they occur across the economy, will provide an incentive for automation. To the extent that companies have already invested in digital transformation before and during the pandemic, the better those companies will be able to perform. The companies that have not made that investment may find it at this point perhaps even harder, because they will now have to do that automation at a time when they cannot find the skilled labour to implement the automation. We will see more inequality between the companies that will benefit from this and be more productive and more successful versus companies that will be even more challenged than they were before the pandemic and before Brexit happened.

Q9 **Chair:** I am going to go to Felicity just in a moment, but I am aware that I have directed all my questions at you so far, Bart. Giles and Anna, is there anything you wanted to add to any of the discussion we have just had there? Were there any points you want to make?

Dr Valero: On Brexit, I would say that it is clearly too early for us to understand some of the longer-term impacts, but there is quite a lot of academic analysis that points towards what some of those might be. It is not only skill shortages at the lower-skilled end. There is a risk that we might attract less international talent, who contribute to innovation and growth in the UK via either the research system or high-growth sectors.

There could also be barriers in the trade in services, which is an area of our core comparative advantage. This will depend on what final agreement we reach with the EU. There are already parts of financial services shifting out of the UK, for example. This will not only affect those direct jobs but the back office and everything else that relies on that. I would just highlight that.

On accelerating automation, there is this double shock in a sense. Given the social distancing requirements and the increased cost of safe labour, there might be accelerated automation in some production processes. They might also be hit with a shortage in certain types of labour, which would make it even more likely to occur. At a time when there is depressed demand and the process of reallocation that you might expect in a growing economy is less vibrant, there are real risks of scarring. I know this is one of the topics you want to discuss.

Q10 **Chair:** Felicity will come on to that in a second. Is there anything from you, Giles?

Giles Wilkes: I was just going to add—it might be an ongoing theme—that the higher productivity that you might see in some sectors measured by GDP divided by each worker is sometimes deceptive. If you had a range of different companies and half of the ones that could not operate under the new conditions went bust, you would see what looked like a rise in productivity but in fact the economy has suffered. This is just a warning against a naïve application of GDP divided by labour in each situation. There will be some that can and some that cannot. It does not mean the economy has in some sense become richer.

Chair: Yes, contextualising these things is very important. Thank you.

Q11 **Felicity Buchan:** Thank you and good afternoon. I am going to dig down a little deeper on scarring and what Government can do in terms of practical policies to reduce any effects of scarring. Let me take the witnesses in reverse order; maybe I will start with you, Giles. How big an issue is scarring to the UK economy? The Bank of England has clearly changed its forecast from 1.75% scarring to only 1.25%. How big an issue is it? What sectors are you concerned about in particular? Are there any policies that you feel Government need to adopt to address this going forward?

Giles Wilkes: It is a great question. This is one of the many areas that has shifted as we have gone along through Covid. I was extremely worried about this at the beginning, because it looked like we were going to be in a very deep economic hole for a long time. Inactivity itself is the most scarring event that can happen to people. There is quite good economic data showing that when people lose their jobs and have to get the next job, that next job is 5% or 10% worse for them. That hits productivity and people's potentials are wasted.

The most important scarring is in the labour market. The labour market outcomes since around a year ago have just continuously come in better. Clearly, the furlough scheme has been a great success, although its final test, the exit from it, is yet to be seen. I am not as concerned by scarring as I would have been a year ago.

In a slightly flinty-hearted Treasury mode, I would also say that there is always a great deal of churn in any economy during good times and bad. From memory, the number of job separations that you normally see in a healthy economy like the UK is about 6 million. People are losing jobs and moving jobs all the time. In fact, if you had stopped and asked everyone about this 18 months ago, before coronavirus, they were concerned about a lack of dynamism, people not moving regions, jobs and so forth, and that reallocation that helps to boost the economy not happening enough.

I would not regard the fact that some industries are going to be smaller and some are going to be larger as itself a concern so long as the workers are able to move around between them. The concern is where there are really big and concentrated pockets of this. There are real reasons to be concerned there. We cannot assess the full extent of this yet. For example, if London's city centre emerges with 15% less demand than there was going in, there are going to be a lot of stranded assets, stranded people and stranded jobs. That kind of concentrated problem can take a long time to work out, particularly—this is the final point I will make—if there is a lot of debt attached to it too, which is an inevitable consequence of a crisis like this. That is where I would be particularly worried.

Q12 **Felicity Buchan:** Thank you. That is very interesting. You talked about the labour market really feeling the effects of scarring. Are we doing enough to reskill our population?

Giles Wilkes: This is a perennial that goes back a long time. We recognise that our further education system has not been as well resourced or as well run as many of our rivals. Are we as good as we could be? No, absolutely not. There are numerous policy pamphlets out there about, for example, the Danish flexicurity system, which manages to combine the flexibility of an Anglo-Saxon economy like ours with retraining and high skills and has less of that loss of productivity that you get when you move jobs.

We could certainly do more, but it would be a big political call. If memory serves—this might be 10 years out of date—Denmark spends something like 0.5% of GDP, which would be £10 billion extra a year in the case of the UK, to fund that system. It is supported by a real sense of national solidarity; taxpayers realise that they might benefit from it.

Yes, we could do better. Our further education system—I do not think anyone argues with this—was hit particularly hard during the austerity years. Governments since Theresa May's have been trying to make that up. We could certainly be doing better, but the effect of doing better will still take decades to show through.

Q13 **Felicity Buchan:** Let me pick up on your point about central London. I should just declare an interest: I am an MP for central London; and Rushanara is also an MP for central London. One of the main ways that Government are encouraging investment is through the super-deduction, but that is linked to physical capital investment, which is not so appropriate to our inner cities, whether that is London, Edinburgh or Manchester. Do Government need to be doing more to encourage non-physical investment both for the issues that inner cities face but also in terms of productivity? For instance, there could be more incentive to invest in R&D.

Giles Wilkes: You have hit on a key criticism of what is otherwise quite a well-received policy. There is something slightly atavistic about the idea that it is more plant and machinery. If it sits within a broader Government agenda of relying on manufacturing as the motor of growth and the exporter—it is a higher-productivity sector, to be fair—I would be concerned not just as a Londoner myself but as someone who thinks that future economies are very much based on intangible capital and that needs funding too.

In the case of the problems that are going to happen within London—I am not an expert in this area—it is going to be as much about property not being as viable as before, our gummed-up property market and rents not falling to the extent that they need to in order to clear the market and get people back in. That might need capital of some form to cushion the blow and to incentivise people to move things around or make better use of empty properties and so forth.

It is not necessarily investment in higher education, for example, which is what you might normally mean by "intangible capital", but, yes, we should not be a one-club golfer and hope that investment in manufacturing is the real driver of future productivity.

Q14 **Felicity Buchan:** Anna, why do I not bring you in on this discussion? How concerned are you about scarring? Are you concerned about any particular areas? What would you like to see Government doing to address it?

Dr Valero: I may be a bit more worried about scarring. As Giles said, we know that the crisis has exacerbated a number of inequalities. In the labour market, people on lower pay with lower skill levels tended to suffer worse disruptions. We know that in education young people from disadvantaged backgrounds with less access to support at home or digital technology access have suffered worse disruption. There is recent CPE analysis that has come out quantifying this as well. There were already large gaps in education and labour markets, and there were inequalities that were already of concern pre this crisis. To the extent that they are opening up without policies to address those gaps and deal with them, I would be worried about scarring and the impacts of that on social cohesion and the allocation of skills and talent going forward.

When it comes to remote working—I am sure we will talk about this a lot—I have been generally quite optimistic about remote working in terms of improving the allocation of talent. In an ideal world, people would be more flexible and perhaps more female talent would stay at more senior levels in the workforce and could do jobs that were not possible before. Of course, there are risks here. If women disproportionately worked at home and were away from the kinds of office interactions, you could have bigger gaps there. There are also massive concerns about housing inequalities will then enter labour market inequalities, because your housing becomes your workplace. There are differences in the ability to work at home.

On the investment side, I would worry about scarring to the extent that we already knew that smaller businesses face constraints to investing in technologies or other assets: maybe financing constraints, maybe information constraints or maybe skill constraints. Many small businesses are emerging from this crisis heavily indebted. The evidence from previous crises has showed that financially constrained firms do not invest for longer. This has already been raised as a concern. Again that points to policy in terms of the phasing out of the support and then the future support, for example the Help to Grow scheme. We have to make sure that programmes like that are well tailored and evaluated so we can learn from them. There is an increasing amount of evidence in this area that continues to contribute to the evidence base on what works.

On the plus side, there are reasons to be optimistic. As I said, there will be more adoption of digital technology and perhaps flexibility could improve.

Q15 **Felicity Buchan:** Thank you. That is very useful. Not to put you on the spot, but, if you were seated as Chancellor of the Exchequer or head of BEIS, what one policy measure would be useful to address scarring and indeed productivity?

Dr Valero: One thing that we have recommended for quite a while now at the CEP at the LSE is human capital tax credits. Currently, as we have discussed, the system is geared towards incentivising capital investment. We already have R&D tax credits. There is some precedent internationally for incentivising investment in the workforce. Given the pre-existing challenges due to the current displacement and the future challenges due to automation and net zero—we need the skills to deliver net zero—that seems like quite a useful tool.

It is also about complementarity. It is not just improving skills as an end; there is a whole literature that links skills and technology adoption and skills and management practices. There is then the complementarity; you would increase productivity via that as well.

Q16 **Felicity Buchan:** Thank you. That is very interesting. Bart, I am just being told that I am out of time, but I want to hear your thoughts on the subject. Can I bring you in, finally?

Professor van Ark: Yes, I will be very quick. I share a lot of what has been said. Like Anna, I am a bit more concerned about scarring. It is really the K-shaped recovery. Some pockets in society will be doing fine out of the crisis and some will not.

We talked extensively about people, but the other thing that I want to underline is the difference between firms. I mentioned this long tail before. I particularly worry about the firms that were not doing very well on the digital transformation before the pandemic and perhaps found it challenging to get it done during the pandemic, which means they may therefore fall even further behind after the pandemic. I worry a lot about firms. That leads me to this point: anything that can be done from a Government perspective to improve what we sometimes call absorptive capacity, which is the ability of firms to drive new technologies, to innovate and to retain skills is going to be very important.

The other thing that I would mention on the K-shaped recovery, in addition to people and firms, is regions and place effects. We worry about the fact that the persistence of regional disparities will be exacerbated by the crisis. We worry that we will have these pockets where social infrastructure has been hurt even more, because the NHS has been under pressure and because a larger number of pupils in schools have dropped out and have not been able to catch up.

All these things could be exacerbated by the weak and underperforming social infrastructure that many regions in the country have. That would really point in the direction, again, that we need a lot of emphasis on education and training. Investing in catching up kids in schools and improving the intermediate skills of the workforce, for example, are important Government priorities to avoid the scarring effects as we emerge from the crisis.

Felicity Buchan: Thank you. That was very interesting.

Q17 **Anthony Browne:** First of all, I am going to give Giles a chance to answer that question, because he was waiting there. Very quickly, what is the one policy that you would introduce to improve productivity if you were the Chancellor or the Business Secretary?

Giles Wilkes: I must admit that I am biased, because as a special adviser I was lobbied on the idea that Anna referred to there; I thought it was a really impressive one and that it was worth a go.

The most important policies are probably macroeconomic, which I understand might be on the agenda later. Keeping the macroeconomy growing strongly, even at the risk of inflationary outbreak, is more important than we might have realised 10 years ago. A rising tide oils the economy beautifully. Biasing on that side stops people from being stuck in their positions and stops businesses failing to be able to float off the rocks of debt. If I could be that grandiose, it would be to have a more expansive macroeconomic approach. Otherwise, I would put in a second vote for Anna's idea.

Q18 **Anthony Browne:** That is great; there is some sort of consensus there. My questions are about the impact of the pandemic on productivity and then also on technology and technological diffusion. We have touched on the pandemic in terms of scarring, but my questions are really about how the pandemic has changed working practices around working from home and the fact that we can all do this videoconferencing here. Lots of people have worked out that it makes us a lot more efficient. Thinking of our witnesses here, you are just spending a couple of hours on a Zoom call with us, whereas before you would have had to have travelled into

Parliament and then travelled back home, and it would have taken four hours rather than two. Maybe we have doubled your personal productivity this afternoon using Zoom.

I will come to Bart van Ark first. What has been the impact of the pandemic on productivity? Is it a one-off or will it be lasting, because we have all learned how to do new things in new ways?

Professor van Ark: To answer this question, we need to look back again at the pre-pandemic period a little bit. In the pre-pandemic period, we saw some companies doing quite well in terms of new technologies and new technology adoption. That was not so much sector-focused; it was really across the economy in both the services sector and the manufacturing sector.

These new technologies—in particular the latest vintage of digital technology: mobile, data analytics, the move to robotics and artificial intelligence—are quite complicated technologies for companies to integrate into their business models. It tends to be larger companies, companies that have been able to invest significantly. We had a discussion earlier about investment in intangibles. This is investment in organisational capabilities, management capabilities and reskilling the workforce, who are able to advance most quickly on their journey. The companies that were not able to do it—because they did not have funding, the skills or the management competencies to do it—are the ones that fell behind.

That is the way they entered the Covid-19 crisis. Originally, when we entered this crisis, we thought that everyone would be in trouble, but we then found out that these differences got exacerbated. Companies that were already on their journey with regards to digital transformation were doing even better. They were able to set people up very quickly to work from home; they had the systems in place very quickly. The companies that were not used to people working from home had to find out how to work with them; they had to reinvent their working methods and their models.

What we are seeing now is that this difference has increased. Some companies have managed to catch up. That is good news. Some companies were forced by the crisis to step up and make some progress. There is a certain element of convergence taking place here of catch-up of some of the firms that had fallen behind, but a lot of firms are not doing this. That really raises the question about what happens after the pandemic.

Now that we are winding down these programmes, are we going to lose the companies that have not been very successful in this transition? Are we going to therefore open up space for the more productive and more digitally advanced companies to progress? A key policy question here is whether we can design the winding down of the support programme in such a way to avoid losing the most productive companies, which we may lose simply because they have liquidity problems and not necessarily productivity problems, while at the same time not leaving companies in place that are not going to survive without that help. That is a very critical question. Again, as I mentioned earlier, support programmes and investment programmes for firms to invest in that absorptive capacity are going to be the test to see whether companies are going to be successful at this or not.

Q19 **Anthony Browne:** Anna, I understand you have been doing surveys about the take-up of technologies, working practices and working from home. What have been your findings there? Has there been some impact on productivity from the pandemic?

Dr Valero: This comes back to Giles's point. We see productivity in the aggregate figures and we might see it in firm figures once we have all the statistical datasets available to us, but surveys in real time are quite useful to understand firms' experience and workers' experience of these things. Of course, it is subjective, but asking these questions directly can be useful.

Very early in the pandemic we conducted a survey with the CBI. We wanted to understand the knee-jerk reaction to the pandemic and whether this had accelerated the adoption of digital technologies, capabilities, management practices and the introduction of new products and services into firms. We found that this appeared to have done. 60% of firms adopted new digital technologies and management practices; 40% of firms adopted new capabilities or introduced new products and services.

This was a while back now. In fact, later this week we are doing our follow-on survey. What we want to understand at this point is how some of the expectations reported then by businesses—they thought it would raise productivity; they thought it would be good for their workers rather than replacing workers—have actually played out. We are asking, "Have you seen an increase in profitability during this period due to the adoption of new technologies?" We are asking detailed questions about specific technologies, and then we are asking how this might have impacted on the workforce. Maybe they have had to hire more people with specialist skills; maybe they have had to reduce their hiring in certain parts of the business or reallocate tasks among the business.

The key question, though, as Bart said, is how much of this initial response, even if it was a positive one, can persist. Will there be productive and otherwise viable firms that go out of business due to liquidity constraints created by the shock? That would not be optimal from a societal perspective, because that firm could contribute if it were supported for a little longer.

While the process of dynamism and reallocation is good in the long term—we have seen that it has been in decline in advanced economies like the UK for some time—as I mentioned before, coming out of a crisis you do not want to have this massive number of people losing their jobs, because there is not necessarily the confidence in the growth to make a smooth reallocation. We also know that people do not necessarily travel for work because of social ties to the places where they are.

There are opportunities, however. Thinking about the firms that are in place now, we found that there was this path-dependence, as Bart said. If you had previously adopted new technology, you were more like to have that initially positive response to the pandemic. Larger firms, of course, were more likely to respond in that way. Will we see some positive impact of this experience whereby firms have shifted on to a more innovative trajectory where they will continue innovating, or will it be the case that this was just a one-off and they will embed this new technology but everything else will go back to normal?

That is where we need to build that understanding, but it is also where Government policies and support will make the difference so that we can leverage that opportunity rather than letting it go to waste.

Q20 **Anthony Browne:** One of the impacts of the pandemic is that we have all learned how to use videoconferencing, as you said. Presumably, we will only carry on using it if we find it of benefit to ourselves. If we do not, we will stop using it. That will differ from person to person and company to company, but overall that will be a benefit, presumably.

Dr Valero: This is where surveys at the individual level are very useful. Nicholas Bloom and others have recently done surveys of UK employees, which have found that there is a general consensus that about two days remote working is preferred by many. Obviously, this is in professions where this is feasible and an option. There are questions there about the particular type of work that might be more productive in that way.

What they find is quite specific. For very large meetings it is perhaps less effective, but it is fine for smaller ones—these are meetings with, say, with four people, where you can see everybody on the screen—or something like this, which is very structured. There is going to be a lot of heterogeneity, even within firms and occupations. You would just hope that there can be a new equilibrium that can work without excluding certain types of workers or exacerbating those inequalities.

Professor van Ark: It might be useful to quote some of the numbers from the Office for National Statistics on this. It is quite interesting to see that 50% of workers in the UK are already back to work in person. There is a very significant group that has gone back to that. The number of people working from home entirely has gone down from 37% to 22% now. About 15% of the working population is having this hybrid model.

The key question here, to Anna's point, is whether companies can manage to deal with this hybrid model. Frankly, it is the hardest one. Having everybody in the office or everybody from home, at least for office-type functions, is much easier to do than this hybrid model. At the moment, companies are working very hard in terms of HR practices to make this work.

The percentage of hybrid workers—these are people working partly from home and partly in the office—was 5% before the pandemic and it is 15% now. It could very well go up to 25% or one-third of the workforce, but we still need to realise that two-thirds of the workforce are likely to be back at work, at a minimum, once the pandemic is over.

Q21 **Anthony Browne:** Giles, what do you see as the impact of the pandemic on productivity? Do you have anything to add to the points being made?

Giles Wilkes: One of the really interesting points you made there—this was illustrated well by Anna talking there—is the policy discussion between trying to help companies that do not do the right things to move up the ladder a bit versus trying to work out why they are not going bust.

This is something that we were really puzzled about for many years before the crisis. The concern was, "It is a nice idea to create an agency or something that might help push people towards the right policies, or to use a tax break or training, but why on earth is the market not working?" The policy that dares not speak its name is to look at all of the implicit subsidies that encourage companies to remain small, like our quite high VAT threshold or policies like the employment allowance. We need to ask ourselves whether they are giving a subsidy for not being quite good enough. Those not good enough companies are a drain on the other ones that are competing with them.

Again, this is a very flinty-hearted thing. I fully accept Anna's warning that you do not want to have a mass insolvency when the rest of the economy cannot support all of the dynamism that you need. Ultimately, the way the market adopts better techniques is that, if you do not, you get outcompeted by your rivals. It strikes me that we need to be thinking about why that has not been happening and whether the coronavirus crisis might at least be a jolt towards it by making the returns much more extreme.

It shows why I would have been a terrible political spad, but this is the sort of mechanism that works long term, not Government schemes that help people take up the right IT techniques.

Q22 **Anthony Browne:** You are not going to get many politicians saying that we need more companies to fail, but I get your point. I just want to broaden it out to technology more generally, so not just about the pandemic. The last decade or the last five years have been characterised by an increasing focus on digitisation, big data and a real rollout of advanced technologies that did not exist 10 years ago. It clearly has not had any impact on aggregate productivity, at least not that we can notice, though productivity might have gone down without it. There seems to be a bit of a puzzle here about all of this amazing technology and the fact that it does not really show in the productivity figures. I am just wondering who you reconcile that. I will come to Bart van Ark first, but I see Anna nodding away and I will come to her next.

Professor van Ark: That is one big part of the productivity puzzle. First of all, we need to realise that not all technologies that are being invented are driven by R&D. Some of them are based on incremental innovations. We should be careful not to align research and development spending with technical opportunities.

Particularly in terms of the latest technologies that you are referring to, they are amply available. The problem is really the absorption of those technologies within companies. To a large extent, this is work done by companies. I very much agree with Giles's earlier point: if companies are not very successful in adopting these technologies, at some point they just need to leave, because they do not have the right competencies.

The question then is why it is that they do not have the right competencies. It turns out, again referring back to this long tail of less productive firms, that we have a relatively large number of firms, compared to other countries, where we see that they are locked in particular regions or areas in which they are operating. They are not growing their market; they are not scaling up. They miss the management competencies; they do not have the connections with other firms that are more productive.

The role for policy and Government here is to facilitate the connections between firms, the education sector, which is absolutely critical to this, and Government at a very local and regional level. A lot of this cannot be done at national level; it is really dependent on local and regional activities and activities in the devolved nations to create what we call these ecosystems where the business community as a whole, the education community and the Government can connect and drive innovation and skill generation.

A lot of the technology challenges that we are seeing are not around the fact that the technology is not available and not even that it does not get diffused but that it does not get absorbed by many companies. To make this happen, we need to facilitate the companies that can do this and, indeed, the companies that will ultimately not do it should be allowed to fail.

Q23 **Anthony Browne:** Just coming back to the point about the UK's productivity being less than other countries, is the diffusion and absorption of technology worse here than in other countries? Does that explain part of the productivity difference?

Professor van Ark: A lot of the research has shown that the long tail—the large number of companies within sectors that are not close enough to the frontier—is very much due to the fact that they do not absorb technologies properly. A lot of that relates to management competencies and a lack of intermediate skills in the workforce.

For these new digital technologies, companies really need to restructure themselves. They need to be less hierarchical and have a much larger part of the workforce getting engaged in using this technology in order to produce new products and services. Skill changes and management competencies are really important here. A lot of the research has shown that the UK is really behind several other countries in addressing the long tail that I mentioned before.

Q24 **Anthony Browne:** Dr Valero, you were nodding away to a lot of that. Does the UK have a particular problem with the absorption of new technologies? Is that part of this?

Dr Valero: I would agree with everything Bart said there. The international part of the puzzle and absorptive capacity is seen to be a key part of it. There are disagreements amongst different academics. There is the Brynjolfsson, Rock and Syverson hypothesis, which basically says that we have these technologies that have enormous potential, but you need all the complementary practices to be in place, including management practices and skills, to help them be adopted and therefore see those productivity gains.

This is the case when it comes to digital technologies like ecommerce, et cetera, even before we get to AI. The most recent international dataset that I have seen is pre-pandemic, from 2019. The European Commission has comparisons of various types of digital technologies, and the UK is generally middling. That is the term used to describe its performance. Larger firms do better, but it is in the smaller firms where we do not have as high adoption as some of our peers. On management practices, the World Management Survey has shown that on average we have worse management practices than, say, Germany and the US and we do have a thicker longer tail, as Bart said as well. It is about those competencies to enable that diffusion.

Giles Wilkes: If I can just make a quibbling point, one of the other issues is that, although over the millennia the relationship between more technology and more growth is quite straightforward, over the short run and sector by sector it really is not. If you look over the last 10 or 20 years, you can find sectors that adopted lots of technology and shrank as a result. Some of them grew and added employment, because they found overseas markets; some of them gained productivity but lost employment, like manufacturing. Publishing and audio-visual is a great example of this. It became much more productive because of technology, but the GDP rise was not fantastic.

There is just a very ambiguous relationship. Sometimes it all goes to the consumer. Sometimes it is a manufacturing technique. Sometimes it is like the iPhone, which in my view is used too much as an example, where you invent something, sell it to the whole world and benefit an awful lot. That is just one model for how technology changes things. In some cases, like the newspaper publishing business, it enables you to be much more productive, the consumer gets lots of it and you have a lot of people who would have been employed as journalists employed in other, less productive businesses because not as many of them are needed than in the previous business. It is simply ambiguous.

You could have a period like the last 10, 15 or 20 years where technology is transforming all of our lives and you are not seeing it in the GDP figures, because that is what technology does. It does not mean we are failing; it is inherent to the ambiguous relationship.

Q25 **Anthony Browne:** I have one other quick question to ask. Does it matter where the technology come from? Does it matter that it is invented in the UK or invented elsewhere? Presumably it does not really matter, does it?

Giles Wilkes: In some sectors it absolutely does not. Three or four global centres are responsible for all the vaccines that are getting us out of this crisis. Although it would have been nice to be the people inventing them in Oxford, BioNTech in Germany or Moderna in the US, that is not as important as being the user of it.

In some cases, it is great to dominate the production of something because you get a lot of high-value product out of it. The figure from William Nordhaus, the economic historian, is that 98% of the value of an innovation goes to its users rather than its producers. Mostly it does not matter so long as you are free-trading and open to it.

Professor van Ark: If I may add to that, the first point that Giles made is really important. It is so important, therefore, to do a lot of work, which we are doing at the Productivity Institute, to think about how we think about and measure productivity. If we just look at one individual firm does, Giles is exactly right: sometimes new technology does not benefit a firm. It can benefit other firms or it can benefit the consumer. We need to think about productivity in relation to the overall growth of the economy but also in relation to welfare and wellbeing, because those are very important aspects of technology. It is important to take that into account.

On your second important question, we sometimes understate the importance of openness to the rest of the world in terms of importing new technologies. The UK is a middle-sized economy so it can produce a lot of technology itself, but it still will hugely benefit from importing technology simply through trade and foreign direct investment.

There are also relevant factors within the country. For example, having an R&D percentage of 2.4% is not something we should apply across the whole nation. We should think about which regions have the greatest absorptive capacity to get that R&D. You quite often concentrate R&D in particular places. It should not only be London; it should be more places in the country. Applying 2.4% R&D across the nation is probably not a very sensible thig to do because of the fact that you need so many more things to create that absorptive capacity for that new technology.

Anthony Browne: That is great. Thank you very much. I would love to continue, but I am afraid I have massively overrun and I am eating into my colleagues' time. Thank you all very much.

Q26 **Harriett Baldwin:** I want to probe some of the points that have already been raised, but I would like to start by asking Dr Valero to talk about this management issue. One of the things that has been launched by the Treasury is the Help to Grow campaign, targeting management training at smaller and medium-sized businesses. Is that the right approach? Will that make any difference?

Dr Valero: Yes, my personal view, based on the evidence, is that it will. I have done quite a lot of research looking at the human capital of workers and managers and the link with measured management practices in firms. I have found that there is this very strong correlation and tried to get more exogenous measures or measures that are not just correlation but actually mean something more causal. That work supports that hypothesis as well.

There are two avenues. Better trained managers are more likely to know and able to implement productivity-enhancing management practices, but better trained workers are more likely to understand and implement them and to work together with managers. Training programmes are a promising way forward, and there is quite a lot of evidence from around the world with randomised control trials trying to build causal evidence in this regard.

The challenge is to understand exactly which mechanisms help to address different barriers. Sometimes the barrier might be time constraints on managers, a lack of information, a lack of skills or maybe resistance to change. We have to try to understand which barriers dominate in different contexts and what the best way to do this is.

From what I see, the Help to Grow management programme will combine some general learnings with one-to-one support. The experience I have had in experimentation with firms is that one-to-one support is very valued by firms, but they also have severe constraints on their time, particularly in smaller firms. Taking time out of the business to think about these things can be very challenging. From what I have seen, this is set up in a really promising way. I understand that it is going to be evaluated as well to help build the evidence base, which is so crucial.

Q27 **Harriett Baldwin:** It sounds like you think it is a good intervention. Is it on the right scale? How will it avoid deadweight cost?

Dr Valero: It is focused on smaller businesses that perhaps would not be naturally doing this anyway.

Q28 **Harriett Baldwin:** How are they going to find the right ones? Do you know?

Dr Valero: From what I understand, again, this is something you apply for. This is often the case with this kind of programme. You are not just randomly choosing businesses out of the population.

The positive side of that is that these are businesses that want to do something to grow. When you target random businesses in the population, some of them may have no desire to grow at all. They might not participate or be interested in the programme. Yes, you will have a selection into the programme, and it might be that those businesses were going to do well anyway, but the likelihood is that the support in this programme, which is very well designed with a number of experts, is going to be quite holistically of high quality and potentially better than what they could have accessed on their own.

Trusted advisers are so important. There is a perception among small businesses that, if they go to a private consultant, there is a profit motive there. Having the Government, universities and business schools involved will make this a trusted adviser-type relationship.

Q29 **Harriett Baldwin:** Turning to Giles, I am fascinated by your response to some of the recent publications from the CBI. You are really focusing on the fact that the CBI now seems to be emphasising collaboration rather than competition. You feel that we do not have a healthy level of competition in the UK business sector at the moment.

Giles Wilkes: I have a couple of concerns. First, I was struck by the lack of curiosity about competition as a policy issue within politics when I was there. The assumption must have been that, because in many ways we were a trailblazer on this during the 1980s, we have shown the way and done that work, and it is all fine. In the meantime, evidence was piling up, particularly in the United States, where most of the evidence was found, that there are competition issues, particularly with large concentrations in technology companies but also concerns in the UK around consumers not getting a fair deal. It was very much a theme of the Prime Minister's. I believe the Resolution Foundation has some reasonably good work on concentration. That does not always coincide with competition issues, but it is a problem.

The other problem is that co-operation is quite hard and unnatural to operationalise. You can talk about having roundtables and coming together to fix problems. Sometimes it will be perfectly appropriate for the companies to be co-operating, but something that requires continuous stewardship by the Government is a really difficult policy to propose. We saw this with the sector deal policy we had in the Theresa May period. Competition is what companies are meant to naturally do. In a way, it is an easier way out. If competition can fix an issue and do all the natural sorting of activities towards companies that are the best at doing them, in a way it is the one that is going to be a more enduring solution.

It was not a bad CBI document at all, by the way. It is an excellent reference point for all of the different issues that we need to be tackling by one means or another, but it struck me as a good example of something that has been bothering me for quite a while.

Q30 **Harriett Baldwin:** Is your point that it is written by an organisation that almost represents the oligopolistic part of the economy and therefore is not necessarily going to be encouraging competition, because a lot of the members of the CBI are presumably companies that benefit from less competition?

Giles Wilkes: I am not sure I can quite accuse them of that, although, to echo what Anthony Browne said earlier, it would be really rather brave of an organisation to come out and say, "It is the red in tooth and claw aspects of capitalism that we need to get going. We need more companies failing and more jobs being reallocated". That is a pretty difficult message for anyone to land.

I would not accuse the CBI at all of trying to promote a less competitive culture, but I would say that this is a constant risk. If you, as Government, talk to business about solving a problem, you have to bear in mind that the people who want to be competing with the businesses you are talking to are not in the room; the potential substitute products are not in the room.

Businesses' interests, collectively or individually, are not the same as the economy's. A business is trying to maximise what we economists call their economic rent. That seems great for them and great for their shareholders, and it might even be great for their employees, but it might not be the best thing for the overall economy, which needs more churn and more of that rent being taken away by the next hungry competitor. I did make that point as a continuous warning against just sitting down with businesses and saying, "We have had a great conversation and we are going to work together; isn't this great?" You have to worry when everyone is happy in a conversation like that.

Q31 **Harriett Baldwin:** What role do you see in terms of competition policy? First of all, this is around the regulator but also the role of takeovers by companies from other countries.

Giles Wilkes: That is an interesting question. The regulator has several big, important pieces of work ongoing. The most notable is probably the digital competition work, which I cannot speak much more of, partly because in one of my jobs I speak to those companies from time to time. That is a big and interesting theme that is not unique to the UK but is across the world. It is going to be very interesting to watch progress there.

The Government cannot intervene all around the place to deal with competition. They have a good regulator in the CMA that can look at all sorts of issues, big and small, and make sure that people are particularly scared of ever conducting themselves in an anti-competitive fashion that deserves sanction.

Otherwise, you need to look at conditions. This is about things like whether the structure of taxes is biased towards keeping too many small companies going and whether that is impeding competition. This is why these sorts of broad structural features need to be looked into. The Government could look into those and ask, "Are some of these preventing competitive mechanisms working as well as possible?" For example, in the United States, President Biden has produced a long list of things to address, including those clauses that stop people from being able to move companies. Anything like that, which stops the natural churn in the business world, might be contributing towards the problem.

Q32 **Harriett Baldwin:** Professor, I wondered whether you would just elaborate on something for me. You have spoken a lot about the long tail in your evidence. Could you help us understand whether you think the long tail in the UK economy is more with bigger firms in terms of their slower productivity growth or with the very small firms?

Professor van Ark: The evidence generally points to the fact that smaller firms are at the tail end of the curve. Of course, it is not entirely so, but that is the case on the whole. On the whole, larger firms tend to be closer to the frontier.

The point here—this comes back to your discussion of competition—is that the larger firms get to the frontier because they will fail if they cannot grow. You have a lot of firms at the lower end of the tail; the question is whether they are going to get stuck there. They will not be able to get out of the long tail because they cannot grow, and therefore they will either succeed or leave the market.

Competition policy is very much about that. There is a very fine balance between letting companies find a space where they can have a little bit of a monopoly for themselves for a while but not for too long, so you need to have them being challenged so they are moving up to the next stage. There is a fine balance in competition policy between, on the one hand, making sure companies can actually create niches in which they can grow, perform better and get to the frontier versus, on the other hand, not creating situations in which they over-concentrate and over-dominate the market. That is really critical.

That also allows me to go back to the Help to Grow programme, because the Help to Grow programme is an important part of the way to allow companies to get out of that low trap. There are so many companies in the UK that do not want to grow; there are entrepreneurs who have no ambition to grow. They want to stay small, partly because they are locked up in the local market do not immediately see the opportunity, or they have to overcome a huge hurdle in order to be able to grow.

That is the real challenge here. Help to Grow can help. To your question, in my view, Help to Grow is way too small in size; it will have to be bigger. Management skills and digital skills are exactly the things to focus on. The other thing that I would say on Help to Grow is that it has to be executed in a regional or local context. A lot of these companies are often very localised. Helping them to get out of the local environment needs to be done in a way that understands what the local constraints and barriers are. It is really important that Help to Grow gets executed and implemented at a regional and local level in order to be successful.

Q33 **Harriett Baldwin:** In a rural constituency like mine, the smaller businesses will point to the fact that they do not have very good physical technological links through their broadband, for example. Is that something you have done work on? Is the rollout of fibre linked to low productivity growth particularly for smaller businesses in particular parts of the country? Can you point to any particular type of region or economy where that is particularly marked?

Professor van Ark: There are two issues with access to broadband. First, it happens in regions that do not have very dense populations. The last mile of broadband is extraordinarily expensive; therefore, lots of companies and households are not able to tag on to that. That is why you do not get a GPS connection, for example, in many places.

The other problem with broadband access has to do with lower-skill and lower-income pockets in the population that do not have the means to use the broadband technology. They can be sitting in cities, but they do not have the equipment or the skills to make use of broadband. The worst thing is to have a combination of those two. If you have low-skilled communities in thinly populated regions, these problems are going to be even bigger.

The problem with broadband access, particularly the last-mile effect, in areas where you do not have dense populations is that it is extraordinarily expensive and it is unlikely to be done just by business. That is where Government spillovers can be quite important, but only if it will ultimately lead to more economic activity, so that you get the spillover that you want to generate.

That means you cannot just give them broadband. You have to make sure that, where you put broadband in place, you also have a lot of facilities in place for people to have proper skills and for companies to be able to access the resources they have in order to be innovative and to grow.

Q34 **Harriett Baldwin:** What I am hearing you saying is that there is an important link between access to technology and productivity.

Professor van Ark: It starts with the access to technology. It will only lead to productivity growth if companies have the additional means to absorb those technologies in order to improve their processes and in order to produce new products and services for the market.

Q35 **Julie Marson:** Bart, you referred earlier to the Government's ambition for R&D spending to rise to 2.4% of GDP. That takes us to just under the OECD average. Other countries, such as the USA and Japan, are at 3.1% or 3.2%. You referenced some of the difficulties of doing a blanket national target, but is that target ambitious enough, when you think of where we are now, where it takes us and where some other countries are?

Professor van Ark: The reason why we are not quite at the level of the OECD is perhaps because there is an acceptance in the UK that some highly R&D-intensive sectors do not have a big footprint in the UK, and just offering R&D investment does not necessarily mean that they will suddenly come into the UK.

In that sense, I agree with you that the ambition level could be higher, because there is no reason why the UK would not be successful, provided that it put all of the other conditions in place, at getting foreign investment or domestic investment into those R&D-intensive industries. In that sense, I would agree that we are not ambitious enough and that we should be a little more ambitious.

Having said that, R&D is restricted to a very limited number of industries. In the last two decades, that is even more the case. It is pharma; it is electronics. It is a limited number of sectors. Many sectors do not use any R&D, but they are very innovative and they do a lot in terms of incremental innovations on the basis of digital, as we are talking about. I guess at some point we will also talk about the net zero economy as well, where again some R&D plays a role but not to a huge extent.

That is why you have to be really cautious with a blanket R&D policy. Again, we need to look at this in the regional context and see where it makes sense. We need to look at the ecosystems and see whether the companies that spend on R&D create spillovers and help other companies in their supply chains, quite often in the same region, in order to perform better. I worry about R&D policies that are isolated from the other parts of the innovation policies that are important in making companies productive. That is why it is so important that we execute and implement some of these policies at a regional level and at the level of the devolved nations in order to put them much more clearly in the regional context.

Q36 **Julie Marson:** That is very interesting. Perhaps I could turn to Giles. We have had a lot of experience over the last year with CBILS and lots of Covid-related finance. We have talked on this Committee about the potential for indebted companies. To what extent has a lack of finance been an issue for investment? Has it been a lag on investment, if you like, for companies, including SMEs? What effect is the Covid pandemic going to have on that contribution to productivity?

Giles Wilkes: It is a great question. You mentioned CBILS, and there are other things like the bounce-back loans, which I know this Committee has taken a keen interest in. I suspect that most of that money is for working capital, salaries and basically staying alive.

When I came in as a special adviser in 2010, the Secretary of State, Vince Cable, was very concerned about finance and all matters of it. I expected it to be the case that companies wanted to invest but the banks were saying no because of the crisis and the regulations that followed the crisis, and that this was the big blockage. I have come to learn since that it is not that straightforward. Bank finance is not equally sought by many small companies in particular. Bart has characterised these companies: they are often quite anti-growth. For a lot of the companies that have taken on bounce-back loans, it is their first really significant loan exposure. I suspect they will want to revert to their lifestyle before and pay that debt back, and not get into the whole borrowing business and use it for investment. I suspect that survey evidence will be better for finding this.

You would also expect to see some market signals that tell you. If there are great investments going begging because the financial system is not providing the money for them, you would expect there to be really great returns on the investment that does take place. I sound too much like a free market purist, but you would expect someone out there to be seizing the opportunity. If Britain's stodgy old banks are not lending to really great ideas, we have a really aggressive financial sector that ought to be seeking out and finding those opportunities.

If I remember from my days trying to write about it for the *Financial Times*, a lot of this is about waiting for internal resources. Companies accumulate earnings and then use their own money as finance. An investment—particularly a long-term fixed capital investment, which might or might not work out—is a really risky thing, so they wait until they have accumulated enough money so that it is not going to be the end of them if it goes wrong. They take it really seriously.

It is not about the banks suddenly switching a light on, being told what to do or maybe being subsidised, and suddenly these things will come out. I suspect it is much more about there not having been great things to invest in during a time when nominal GDP has been growing so slowly that investment prospects have generally been quite poor. The supply of finance has not necessarily been the problem coming up to now. It might be slightly different in Covid, because there is a whole need to restructure the economy, a new mindset and maybe new demand conditions. It might become a factor going forward, but for the last 10 years it was not as big as we thought it might have been.

Q37 **Julie Marson:** Is fundamental short-termism more of an issue? Is that an issue in UK firms?

Giles Wilkes: I have been told that a lot of businesses will think, in that cautious mindset, "If I do not get my money back in three or four years, I am nervous about doing this". That sounds very short-term, if you think about interest rates and long investment cycles.

I always feel a bit mean making this comparison, because individual entrepreneurs are doing something really brave. I would not be someone to criticise them and say, "We would like you all to be investing more and taking more risks with yourself". We have been concerned about short-termism in the past. I believe that there might be good analysis from the LSE, showing that a lot of companies take it really very seriously and they want the sort of shareholders that will give them the space to take a really long view, but investment ideas are quite hard to find.

I am not sure how one would prove it. That is the problem. It feels very fast-paced out there, with quarterly reports and all that, but I am not sure what would count as an economist-worthy proof so I will have to suspend judgment, I am afraid.

Q38 **Julie Marson:** Anna, like you say, you have been doing surveys. Do you have any way of proving this or any perspective on it? Would you like to add anything to that?

Dr Valero: There are some perspectives that I would just add to that. One is on access to finance and the willingness to borrow to grow. In conversation with BEIS last week, it highlighted that the most recent SME finance monitor had shown an increase in the share of firms that had said that. This might be because there are all these loans flying around. Maybe businesses have had to make these changes, which they are also perceiving will contribute to growth rather than just being something that is necessary to survive. That comes into the idea about trying to view this moment as a moment when firms have seen a shift and that could be continued with the right support in place.

As a mechanism for something risky, loans are not ideal, because you always have to pay interest. That is why equity finance is important. We know it is quite difficult for SMEs to access equity finance, whether it is venture finance or other forms. It is often quite concentrated in and around London and networks are very important, so the regional aspects of this are important. The type of work that the British Business Bank does is important in terms of risk finance and high-growth potential funding. There are also things like Innovate UK grants, for example. That kind of finance is also helpful.

We are doing quite a lot of analysis of the high-growth economy and trends in venture finance and things like that. We are trying to understand where the growth has been. A lot of it has been in the tech sector. As we mentioned before, that is maybe not as R&D-intensive compared to pharmaceuticals or biotech, et cetera, but there is a lot of growth and innovation going on there.

In terms of clean technologies, if we are thinking about that as a sector and the need to invest in innovation and growth, we cannot always use history as a guide. We know we have to step up activity and innovation so significantly there. If we look back and say, "It is not so R&D-intensive in this part or that part", we need so much R&D and innovation across the board to meet net zero.

Going back to the discussion we were having before about whether we should innovate in the UK or not, I would argue that we are a research-intensive economy. We have a lot of strengths. It is about actually building on those strengths where we have a comparative advantage internationally so that we can benefit from the growing market. That is where you need really good data and analysis to understand where the strengths are.

Q39 **Julie Marson:** Bart, what is the role of public investment in addressing the productivity puzzle? In particular, to what extent should infrastructure spending be a priority?

Professor van Ark: If you will allow me, may I briefly comment on the finance question and then go to public investment, which was also a great question? On finance, a very important question is, "What finance?" We should not automatically assume that companies just rely on banks. Many companies do not. One of the reasons for the slow growth of small and medium-sized enterprises in the UK is a lack of access or limited access to other sources of finance like angel investors and venture capital for rapidly growing firms.

Some research that was published by the Productivity Insights Network, for example, finds that angel investors are quite often too locally orientated and do not have the ambition to grow. Therefore, even if entrepreneurs have growth plans, their investors will say, "We are not sure whether that is really a great opportunity". There is still some education for investors to be done in order to allow small companies to grow. That goes to the issue of short-termism issue. Quite a few of those angel investors may not actually be looking at the long-term results but the short-term results. That is a big difference, for example, with Germany, where the Mittelstand firms do have investors behind them that look at a longer timeframe.

The issue of public investment and long-termism, if you like, is related to that. Aligned with the short-termism in companies, we also need to address short-termism in Government. All Governments have this issue. Having worked in Government in the Netherlands and in the United States, I find that there is a lot of short-term thinking in policymaking in the UK. Plans and schemes change very quickly. They get abolished even sometimes by the same Government. It is not necessarily because of a change of Government, which is what you see in the United States. Within a Government period here you can see rapid changes in policies. That is really hard from the perspective of innovation and productivity. It needs to have a long-term focus; programmes need to be sufficiently scaled up and they need to have some time to play out and get properly evaluated before you follow up with another programme.

That leads me to your public investment question, because public investment is most importantly a long-term investment. The hardest thing about investing in infrastructure is that it is nice to show, because you can put some spades in the ground and you can see some construction activity, but the real productivity effects are probably going to pay out in about 10 years' time or so. You are only going to see the effect once the infrastructure is there, once companies have begun to make use of the new infrastructure and once they have changed their settings and their markets. It is important for Government to think about the longer-term effects that infrastructure may provide and not overemphasise the short-term impacts in terms of, "We will see more construction activity".

Related to that, in addition to the hard or physical infrastructure, there is the digital infrastructure that we talked about before and the social infrastructure. Ultimately, once you have a road somewhere or you have broadband, you want to have skilled employees, healthy employees, people who have proper housing facilities and places where people can work productively and live a good life. Thinking about social infrastructure in connection with digital and hard infrastructure is very important in policymaking.

Q40 **Rushanara Ali:** Good afternoon. I am just going to pick up on this question of infrastructure, starting with Professor van Ark. I want to focus on social infrastructure in particular. Sir Kevan Collins, who is the Prime Minister's catch-up tsar, said that a conservative estimate would show that the long-term economic costs of lost learning in England due to the pandemic would be about £100 billion. That is just school children losing an average of about 115 days of education. Yet only a very small amount of money has gone in to help them. If we look across society, there are other areas such as the NHS, as you mentioned earlier. We can see the dramatic impact that the pandemic has had on the economy and the pressures it has put on the NHS.

We have talked quite a lot in various inquiries about the productivity puzzle, and the tendency has been to talk about the supply side. Before I go on to what the demand-side explanations might be, could each of you talk us through your assessment of what the additional hit is going to be in the medium to long term on productivity because of the consequences of the pandemic? What have we learned about the interconnection between the social infrastructure and the pressures on that and the economic infrastructure?

Professor van Ark: It is very difficult to put a good estimate on it. I am personally very cautious about putting estimates on this. That is partly because we are still in the middle of Covid and we still need to understand what these effects are, but it is also partly because there is another element here, which is our adjustment to the post-Brexit environment. That interacts with some of these challenges. As we discussed earlier, a lot of the infrastructure, particularly the social infrastructure, is likely to only play out in the longer term. In other words, if you already have pockets of weakness in your social infrastructure, it is likely to get worse because of the pandemic. If you are in a relatively good place, it is likely that you will get out of it much faster. How that is playing out is a big issue.

My main concern is that it will accelerate the inequality and the K-shaped recovery rather than reducing it. The key question in infrastructure is really what we can do about this. You are right that we need to start by catching up the losses in education. We need to do that very quickly. Every month lost in this respect is going to have a significant cost down the road. It may be that we will not even recognise it down the road, because the kids will have grown up and be in their 20s, and we will probably have forgotten about the fact that this problem occurred in 2020 and 2021, when they were losing literacy and numeracy skills, et cetera. That is obviously where we need to start.

We also need to start to think differently about our healthcare and NHS system and we have to make sure we improve access. There was a silver lining to the crisis for the NHS. We did a study on this in our institute with Diane Coyle from Cambridge University. The study looked at the impact of the pandemic on technological change in the NHS. As much as the sector was challenged, it was amazing to see how, during the crisis, the sector has made a jump in terms of technology applications. Again, we need to make sure that these kinds of technology applications continue to be applied as we come out of the crisis and that we do not fall back into the kind of bureaucratic arrangements that take away the incentive to drive these kinds of technology improvements.

Education, healthcare and housing are key areas of social infrastructure that will be needed in order to alleviate the impacts of the pandemic in the longer term.

Dr Valero: I would agree with those points. Even if you wanted to size the longer-term impacts on productivity, it is very hard because of Brexit, because of net zero, which is a massive transition, and also because of all the policies that are going to be put in place. The longer-term impacts will depend on the policy frameworks around levelling up, the investments that are announced and the investment in catch-up. It is so endogenous and interrelated with many things.

In the work we have been doing at the LSE, working with colleagues at the Grantham Research Institute, we have really emphasised the five types of capital that we have discussed: knowledge capital, infrastructure, human capital, social capital and natural capital. We need complementary investments across all of those. Social capital is really important. If you think about the strains we face in the UK, with the division after the referendum, et cetera, and the discontent with certain communities feeling left behind, if we do not increase that social capital and involve communities in decisions that affect them, we are not going to get support for the types of policies that are required in the transition to what is hopefully a stronger, more productive, more sustainable and more inclusive economy. It seems to me that a lot of changes are required if we want to get there. We cannot just leave things as they are, given the scale of the changes we are facing.

Giles Wilkes: On your question about how much scarring this will cause, I agree. I should have mentioned this earlier when I was asked about scarring by the Chair. The educational hit is a really significant one. It is worth reflecting on that number. If it is anywhere near true, it suggests that not only are we facing a really big and long-term hit but, as Professor van Ark pointed out, it will take a very skilful economist to pin it down. Some economists can do that. It will be really interesting to see. There might be a cohort effect or something that they are able to tease out one day.

It also suggests that we are underinvesting in education full stop, because the entire schools budget is something like £40 billion. If we have lost an entire half year and that is counted as nothing, if we spend £20 billion, £100 billion is a very large prize indeed to get from that. It would suggest that the social investment that is education is something that we should be taking more seriously, having that conversation with taxpayers as a result.

The overall effect of Covid is incredibly hard to untangle, in part because we are still trying to work out how much transitional investment we need in order to adjust to a new world of semi-permanent Covid. If it becomes like a cold or mild flu in a couple of years and we do not have to go through every establishment with new protocols, new physical infrastructure and new apps and things, it might be relatively little in terms of the deadweight investment cost to adjust to it.

Not wishing to make a political point, I still think Brexit is a more significant issue. The more that I look at the productivity figures for individual sectors or companies, access to a really large market is just so important. You have the same fixed cost to set up your company and produce what you are making. If you can sell it across a country the size of the United States, you are going to be more productive by virtue of that fact only. That is what we were trying to replicate through the EU and the single market, plus all the advantages of having them right there next to us competing against us.

That is why the 4% or 5% of GDP that Brexit might cost is going to be much more than the coronavirus crisis. We do not reflect enough on quite what a large number that is. On its own, that is £100 billion a year too. Yes, coronavirus is really important. I am slightly nervous about that £100 billion figure, but it is a really significant signal that we are underinvesting in education. Brexit is probably going to be the bigger long-term one that the economists are arguing about in 10 or 15 years.

Q41 **Rushanara Ali:** The picture for productivity and growth looks very bleak if you add on Brexit. On this Committee, we have had evidence from the Governor of the Bank of England about the medium-to-longer-term hit, as you have pointed out, even though he pointed to the fact that the short-term effect of the pandemic has been graver in the last year. If you add that, the climate challenge and the bunch of other challenges that Dr Valero and Professor van Ark were talking about, it looks very bleak. Whenever we have had debates about productivity and addressing the productivity puzzle, it has been pretty miserable.

What are the things that the Government should be doing? Are there any routes through demand-side approaches that should be considered? What is going to be different compared to the financial crisis, where we saw a period of austerity and wage freezes? This is a period in which you have seen very significant investment through things like the job retention programme and support to businesses. How different do you expect the outcomes to be given those quite different responses? Should there be more around demand stimulus?

Giles Wilkes: I will answer very briefly. You have highlighted the one thing that is bigger than the Brexit thing that I mentioned. If you compare the demand pathway that we are now on to the one we were expecting in 2008, it is 18% or 20% off the pathway we were on before. Depending on how much you see the previous pathway as unsustainable and some supply-side factors or sectors like the financial sector that were just growing like they could not, if some of that is to do with demand being run too slowly, people's incentives to invest being hit and generally low animal spirits and all of the negative feedback that can come from that, it might be a really significant difference.

To put the other side briefly, someone will at some point say, "But inflation". The inflation signal through several of those years was sending the signal that the economy was near its limit. I think it is a bad signal as a result. We all knew there were underused resources in the economy, and it could have been pushed harder. "What has changed?" you ask. Partly what has changed is the political environment, of which all of you are part, most significantly the President of the United States. There is also a general reflection that the worst mistake to make is to undershoot for too long. That makes a really big difference.

Some people will say, "Interest rates have fallen a little more". That is true, but we thought interest rates were really low in 2010-11. I was astonished when the 10-year gilt went below 2%. At that point debt becomes so affordable. 2% or 1% is not very much at all. The political atmosphere around it has changed too. I would say that it is worth listening to people like Jason Furman in the United States who are concerned that we are forgetting just what an inflationary moment can be like and how it can be unleashed.

In the 1970s, when we last really suffered from this, we did not have a central bank that was independent and fully understood that. That is a really important institutional change that ought to feel like a guiderail to enable us to move more in the direction in which you are hinting.

Q42 **Rushanara Ali:** To sum up, you would not say that we are anywhere near a point where we should be shying away from stimulating demand because of inflationary pressures, which indeed has come up in this Committee. Some colleagues have, understandably, raised concerns around that.

Giles Wilkes: Not personally, no. If a mistake is made that way, we know how to deal with that mistake. We took a long time to learn how to deal with the other mistake.

Q43 **Rushanara Ali:** I am going to ask you a cheeky question. The response to the financial crisis was austerity rather than an attempt to stimulate demand. Would you say, with the benefit of hindsight, that we could have had a slightly different approach, or more than a slightly different approach?

Giles Wilkes: I will try to restrict myself to a two or three-sentence reply, because I want to hear Professor van Ark's and Dr Valero's opinion too. The second turn towards austerity in 2013 was definitely a mistake—the announcement of a fiscal surplus. That was an appalling mistake, which was also going to leave the public sector underfunded in ways that were really obvious.

On the first one, it was necessary to make it clear that there was a challenge to be addressed at some point. Otherwise, it depends very much on your view about whether monetary policy can be enough, near the zero lower bound, to do it. If you do feel it could be enough, the question is whether the Bank of England could have done more rather than whether the Government could have done more. Over the whole period, higher aggregate demand definitely would have been a good thing.

Professor van Ark: You started your question about this rather bleak picture on productivity growth. I want to be cautious here: it really depends on your timeframe. As I said also in my written evidence, thinking about the time period is really important. In the short term, we will be positively surprised. It is likely that we will some procyclical productivity uptick; demand will get released; there are a lot of new savings, which people will start spending. All of that depends on whether or not we see a fourth wave or something like that happening. I am not too concerned about that.

The medium term is the bigger concern. The concern there is whether we can be certain that we are out of this period that has been characterised as secular stagnation, where there is a lack of demand, low interest rate and low inflation, which is clearly not a good environment to operate in.

To your later question, the austerity programmes that were applied in a couple of countries, including the UK, have not helped us to come through this.

We are now entering a period where we could begin to think about stagflation, which is a period where, even if demand does not pick up, the probability of inflation is significant because of supply-side constraints. We have talked about labour shortages, for example; we have talked about the potential impacts of Brexit. There are other reasons to think that we could see significant constraints on the supply side and not just on the demand side. That is important to keep in mind. Stagflation is a real scenario.

The third scenario, which is of course where we want to go, is a scenario in which demand grows, technology really comes to fruition and investment begins to accelerate. There are a couple of points at which policymakers can intervene. One is to try to reduce the effects of the K-shaped recovery. If we can get the lower leg of the K to pick up as well, it will help the demand side of the economy enormously. That is one policy area that we talked about.

Then there is the difficult balance in terms of interest rates and inflation. My personal opinion is that an increase in interest rates is not necessarily going to be a problem. One of the big issues around interest rates has been a significant misallocation of capital across and within economies. We have seen that there is plenty of capital available, but it is not necessarily spent in very productive ways or in the right places. A rise in interest rates will put a price on capital and it will get companies to think about where we can use capital best. For an economy a rise in interest rates is a desirable thing from a productivity point of view, provided that it goes together with the recovery of demand and growth in technological change. That is the other area where policy can really play a role.

Dr Valero: It is easy to feel like things are pessimistic. Even pre-Covid there was a feeling that you could be pessimistic. At the same time, there is so much that can be done. To be honest, back then, following the financial crisis, many of us were arguing that we could grow out of the crisis through productive investment in all of the things that we know the UK has to invest in. We know there is chronic underinvestment, whether it is fixed capital formation, R&D or skills. We know there are longstanding gaps. By making those investments in a low interest-rate environment, it is possible to achieve growth at a faster pace than interest payments and worries about public budgets overall.

While we need the enabling macro policies, it is not just about Government or public investment. It is about that, but we should have the aim of crowding in private sector investment. That should be accompanied by changes in regulations, incentives via the tax system and the policy framework, both at the national level and the local level, via more empowered local authorities, for example, where that capacity exists, to overcome the many barriers that there are to investment, the many market failures and the path dependencies. When you are talking about green growth, we are in a system where all the path dependencies favour dirty assets. We do not want to lock in those assets. This is the decade when we need to make the changes. You can have a more optimistic feeling about this, because we know what we need to do, and it is about getting the framework right.

Rushanara Ali: Thank you very much for injecting some optimism. I hope the Government listen to the excellent advice you are providing when we make our submission to them at the end of the report from this Committee.

Q44 **Emma Hardy:** Thank you, everyone. It has been a really interesting evidence session. I have been particularly fascinated by the comments you have all been making about post pandemic, homeworking and how that could potentially restructure the economy. Thinking about post pandemic, looking to the future and technological developments, are we going to see a period of pronounced structural change in different sectors and in the labour markets? Do you anticipate things roughly turning to the way they were before?

Giles Wilkes: White-collar workers, if that is the phrase that we use for people who sit in front of laptops all day, are going to have a change. It is one of these signal moments that has just changed the social norm and suddenly made it acceptable.

Professor van Ark made a comment about personal preferences and things. There is going to be some of that, but there is a co-ordination issue. If enough people cluster in a certain way in their patterns of behaviour, it becomes easier to do it as well. If you go to a workplace where it is 20% at home, everyone will do it. That is really a vast difference. That is probably the biggest difference that I see coming. As was observed earlier, this is a much more productive way of doing things. We are saving ourselves the commute. It has become almost revoltingly productive how many meetings you can stack up next to each other. That is a really significant change that will happen.

I am not sure about the other ones, because it is really hard to gauge people's behaviours towards the leisure industries, which were the most deeply hurt in the first place. My suspicion is that human nature will rebound more robustly there. The big change for me is probably in travel to work patterns and working in the office. On its own, that is pretty significant.

Professor van Ark: Specifically on working from home, let us leave this to business and to employees. They need to work out the best way to do this. It depends on the business; it depends on the preferences of the workers. The Government can do relatively little in making that assessment of what works best for companies.

Where Government needs to come in, however, is around the potential implications that this all has for the environment in which companies are operating and people are working. For example, even if only 25% of the workforce move to hybrid working, it has major implications for commuting patterns, for where people live and work, for city centres and for commercial real estate versus the desire for residential real estate. There are major implications for the environment. Public transportation is another where Government really needs to begin to understand what the implications of these changes in preferences are.

The evidence that Anna was referring to earlier points clearly in the direction of a greater desire from workers to have more opportunities for hybrid work. A lot of companies are ready to deal with that, and it will save them money, because they can, for example, save office space and things like that. What is important for Government is to understand what the implications of that are for the cities and the places in which people work and live. That is going to be of critical importance.

To the other part of your question, again, in terms of optimism and pessimism, I have been writing for a long time under different titles on a theme along the lines of, "Why we do not want to miss the productivity revival again", because it has happened before. The 1980s and early 1990s is a good example. People said, "Productivity is terrible", and then productivity suddenly took off because a new technology did actually gain ground. I believe that the current technologies that we are talking about give us that opportunity in terms of demand. Particularly when you think about net zero, the need for digital technology is going to be very large, but there are major bottlenecks in there that we will need to resolve. For me, the question for Government is to find out what those bottlenecks are, where businesses and workers need help, in order to break those bottlenecks and drive productivity growth forward.

I can be fairly optimistic. For me, there is definitely a thinkable good scenario, but there is a lot of risk down the road if we do not get it right. A lot of that is about infrastructure; a lot of it is about the way we think about city centres, the places where people live and so on.

Emma Hardy: I like your optimism. I am optimistic too.

Dr Valero: This is a moment that will generate structural change, both on remote working but also due to ecommerce changing the location and type of consumption. We have already seen a bit of that, with some companies having their flagship stores as more of an experience rather than where the actual sales would take place. In some sense, it might accelerate that, because many more people have set up their apps. Maybe older people who had not previously used ecommerce for their weekly shop are now set up to do that. That will be a structural change in terms of the affected sectors but also the location of economic activity and how that flows out to everything else. There is a lot of discussion about how, if people only have to go into London twice a week, they will live further out and the location for all their services will shift to that place.

The other structural change is the ageing population. That has another implication. We know from the past that older workers are more likely to find it difficult to reallocate if they lose a job. We know there is the net zero transition, which for some workers will be more difficult. Some of these structural changes might create problems in certain places, so we definitely need policies for a just transition to manage and anticipate those changes and to enable the transition. Thinking about net zero itself, there will also be structural changes that we need in various sectors and across various sectors to decarbonise, ensure the diffusion of technologies and the changes in work as well.

It is true that, at a business level, what works in terms of working from home really will depend on the interactions that people in teams have and the extent to which they need to be together to generate ideas. There is quite a lot of evidence that in creative and innovative sectors those spillovers are very important, not just within a team but geographically via agglomeration and economies, et cetera.

There will also be things for Government to consider to do with the regulation of labour markets and workers' rights in a changed environment. We hear a lot about surveillance, different technologies being used to monitor workers' inputs and the always-on culture. There will be new issues like that in sectors where this becomes very prevalent.

Q45 **Emma Hardy:** I am really interested to note that in Ireland and in Spain it appears that those Governments are actively supporting the move to remote working and actively encouraging and offering tax incentives for it. Do our Government have the right policies in place to help people reskill and take advantage of these new opportunities in remote working? Would you advise that our Government should be looking at actively supporting a move to remote working, or should it left to the market rather than left to policymakers? Can I go back to Giles with that, please?

Giles Wilkes: I am trying to picture what it would be like if I were given the job to try to work out that policy in Government. It would be really difficult. Presumably the Government are not choosing who should and who should not. Are they trying to ease the passage or are they trying to say that, for health reasons, it is a now a public good to subsidise shifting people to work from home? I would struggle, because we simply do not yet know what people's preferences are. As a result, I would probably leave it to the market until we have learned a little bit more.

Professor van Ark: Where people live and work and how they live and work seems to me to be something that Government should not get involved in and should not dictate. I agree that having a workable policy in a free society is going to be really difficult. This is really to be worked out between employees and employers. However, as I said before, Government have a role to play in understanding the implications of all of this and what it means for public transportation, city centres and everything else. That is a very important role to facilitate this transition.

This pandemic has unleashed a desire among a group of people. Again, we have to realise that we are probably not talking about more than a quarter or a third of the population who will ultimately work in this hybrid framework. The majority of workers will still go to work every day, partly because they have to, because they have customer-facing jobs or they are working in production plants. We should not over-do the topic, but even a shift from 15% before the crisis to 25% or 30% is significant enough for Government to pay attention to it. It is really something that is between businesses and their workers; it is up to people to decide where they want to work and live. It is for people to decide where this is going to go rather than for Government.

Q46 **Emma Hardy:** Just before I come to Dr Anna for her comments, it is probably worth me pointing out that the reason the Irish Government are doing this is to support the economies in the rural parts of the country, where there have been fewer job opportunities. That is their motivation for doing so. I do not whether that might lead to any change of opinions around whether we should leave it or whether we should be actively trying to support regional economies.

Professor van Ark: We see that workers have left cities, because companies have allowed them to move to the countryside. That is a great thing. If companies say, "It works if you work remotely, and you can be in the office once a week", or whatever, that is fine. We have seen these trends in all countries, including in the UK, and it could have really important implications for rural development policies.

You can also think, for example, of companies themselves that may, in a different environment, decide that city centres are not the best place. Yes, if you have very creative jobs, as Anna was referring to, you want people in one place, but for a lot of businesses this is not necessarily the case. They may move to rural areas for that reason.

Dr Valero: There are two areas where there is definitely a role for policy. The first, as I said before, is when it comes down to discrimination in the labour market or equal opportunities. That could be to do with housing inequalities or gender imbalances. If policies are introduced from the family perspective, it is important to ensure that such things are offered on a level playing field between men and women and there are not ways to lose out.

On housing equality, there is the whole place-space agenda. Investing in places will make places more attractive for people to work. Currently, we know that the people benefiting from remote working tend to be more highly skilled and better paid people. The places they have gone to move to are generally quite wealthy areas. In terms of thinking about the role of this in levelling up, it is actually about linking it with those local industrial strategies and levelling-up policies. It is about investing in cities to make them cleaner and more liveable. I am hearing a lot of stories about green spaces in city centres; these are really pleasant, clean and green city centres with flexible working spaces, for example. It is all linked in with that agenda, which is why you need that broader policy co-ordination at the national and local level to make a success of it.

Emma Hardy: That is brilliant. Thank you all so much. That was really helpful and really interesting.

Q47 **Dame Angela Eagle:** I want to spend a little bit of time asking about the regional aspects of productivity and equality and whether we can balance our economy out a bit more than it is at the moment. If we look at OECD figures, the UK has the fourth-highest regional disparities among 29 OECD countries. Professor van Ark, what are the opportunity costs of finding ourselves in this situation?

Professor van Ark: You are correct that the UK is one of the places where we see the highest regional disparities. What is most problematic about this is the persistence of these disparities. They have not really moved much over the past decade or so. The regions that were behind have stayed behind. There are only a few exceptions. Manchester, where I am based, is one example, but it is just the centre of Manchester; the surrounding areas have very persistent weak living conditions and performance.

Productivity is playing one role in this, but it is only one part of the story. It is productivity and employment that together determine people's living conditions. The problem is that a lot of people ended up either with no employment or employment in a low-productivity environment, in which they were making low wages. You get this very negative spiral. This persistence is causing this kind of trap that places get into in terms of weak education, a lack of access to healthcare, weak housing and no access to transportation. Mobility out of these areas is quite often very limited, so people get stuck in these places.

It has been extraordinary in the case of the UK, particularly given the relatively short distances between the areas that are performing differently. These differences are quite large. The important implication of this, which goes back to some of the earlier discussion that we had, is that there is too little opportunity in the UK for companies to scale up and grow. There is also a lack of ambition. We need to put more ambition into these places. Of course, this is provided by the opportunities that people get to grow out of the current situation they are in in order to improve their lives. That is why this combination of social infrastructure, hard infrastructure and public spending is so very important in those places in order to open up those areas.

That is where a lot of our focus has to be. The levelling-up programme is, in the grand design, trying to focus on this, but we really need to think about this in terms of the individual local circumstances. If there is one area where I find the UK very different from other places I have worked in—again, I have worked particularly in the Netherlands and the United States, but I am also very familiar with a couple of other European countries—it is the huge fragmentation that we have in the policy framework. We do not have sufficient connections between various policy levels, and therefore central Government policies do not really trickle down to the areas where they need to be implemented. It is that sort of disconnect between these various policy areas that is another cause of the persistence of these regional disparities.

Q48 **Dame Angela Eagle:** Is that a governance issue as well as an issue of perhaps economic ideology, which left it all to the market after the big bang and attracted a lot of the activity towards Greater London? That became a self-fulfilling prophecy. Dr Valero, do you have any observations about this issue?

Dr Valero: Yes, I agree. Basically, the view you can take is that the UK has very high regional disparities, although exactly how high really depends on the measure and the level of geographic disaggregation that you take. They have been very persistent. Skills tend to be a really key part of the story. Rather than just being area fundamentals, it is the skills of the people who are in a place or who move to a place that really matter.

It comes down, then, to how areas can attract and retain skilled people or build those skills themselves. When we think about the opportunity costs, I really see this as an issue of not realising potential. It might be a place not realising its potential because of various frictions that stop the firms knowing or being able to access the tools to grow; it might be innovative firms that actually have great ideas but that cannot access some of the support or finance, such as equity finance, as we mentioned.

There is research from John Van Reenen and others on what he calls lost Einsteins, which shows in America that young people who grow up in an innovative area are much more likely to be inventors themselves in the same technological area that they were exposed to in their youth. It is all of this lost potential at the individual level and the place level that is really the opportunity cost.

In terms of the governance aspect, there was a time, with the RDAs, when there was more of a long-term and well-resourced structure there. In the way the system works now, what I understand is that the resourcing and the capacity is quite variable across the country.

Q49 **Dame Angela Eagle:** It is also smaller. As someone who was a Minister and did the Bill creating the RDAs, I must say I very much regret their abolition.

Dr Valero: The general consensus is that there was a lot of capacity lost in that. What we need is institutional memory, capacity and the ability to have the right level of geographic aggregation in some of these policies, particularly where there are changes and interlinkages. Depending on the piece of infrastructure or investment you are considering, different boundaries are relevant. That increases the complexity. Indeed, there is a lot of fragmentation and just confusion. In recent years we had the national industrial strategy; we had the local industrial strategies. Now we do not have the national industrial strategy, but, as far as I understand, the local industrial strategies are still being developed or implemented.

Q50 **Dame Angela Eagle:** There is all this chopping and changing. We have had lots of very beautiful brochures, and we have had the name of the Department changed but not a lot seems to have happened. Giles Wilkes, how should growth policy address regional imbalances?

Giles Wilkes: Can I start by making a point in support of what you said about the RDAs? I was introduced to the important Government agencies that BIS ran. The TSB, now called Innovate UK, said, "Frankly, we have lost our eyes and ears in the regions". One of the big problems with all policies is, when you have a good thing, how do you make the company that needs it aware of it? That was the network that they were using, and that was cut off immediately. It takes time to build up those networks. From the time you passed the Bill until 2010, people were getting used to them; now they have gone.

I am sure they were not perfect, and I am not an expert in them, but it struck me that they needed something. The Government offices in the regions also went at the same time. We had to improvise new things; there was something called BIS Local, because suddenly we had to deal with issues out there. This should not only be for emergencies; we need something structural for permanent policy. We need a better governance structure to deliver growth policy out there.

As Professor van Ark pointed out, this is a long-term structural issue. There is not a productivity puzzle as big as this. You can explain the recent productivity shortfall by looking at a number of causes. Emma Hardy inspired me to look up the population density of Ireland and Spain, which would justify that policy a little bit more. They are between five and six times less population-dense than we are in England, if we just restrict it to England. That makes it all the more mysterious that we seem to have these gigantic regional differentials when we are so much more crowded and close together. It should be a relatively easy matter to travel 30 or 40 miles between places with very different productivity gradients.

Clearly, economic governance must be part of it. There is that well-known figure of us being as centralised as any other European country apart from Malta. There is a slightly dismaying refusal of the Government to look that one clearly in the eye, partly, I suspect, for political reasons. Devolution sometimes means giving power to your political opponents. At some point, somebody needs to accept that.

Q51 **Dame Angela Eagle:** The Treasury does not like it very much. When I was a Treasury Minister, there were a number of times that I went on visits with people from the Treasury and they were amazed that outside London was so nice, because they had hardly ever been there. That was very illustrative to me of part of the issue.

Giles Wilkes: Maybe they will now learn with the movement of civil servants to York, Darlington and other fine places.

Q52 **Dame Angela Eagle:** I am sure the key decisions-makers will not move. Perhaps that is just me.

Giles Wilkes: There is hope. I do not mean to criticise the Treasury, but it might also be static thinking. They will say, "What are the capabilities out there right now? They might not be very good, so we are better off having this incredibly brainy bunch of people who we have here, because they are better". The point is that you have to think dynamically about growth. What could the capabilities be out there? How can you build that up? You had a longer-term perspective with the RDAs.

I have a final point related to that, which also relates to the really good question earlier about whether Help to Grow will work or not. I am not an expert in the mechanics of it, but the commitment to keep at it is a really important one. I am sure there is a whole world of policy hobbyists counting the things that get created and then destroyed. For example, we left behind something called growth hubs and growth accelerators, and then they were destroyed in 2015. Then a separate piece of work comes up with a big lightbulb moment: "We need to create new growth hubs and accelerators". The really important thing is that these things take a long while to become habituated to, and they need to be stuck to. It is almost better to have a second-best thing that you stick with than a best thing that somebody keeps having to learn again. However good Help to Grow is, I just hope that they stick with it and, likewise, they do so with these regional policies.

Q53 **Dame Angela Eagle:** I have one final question to Professor van Ark. What is the relationship between inequality, growth and productivity? If we can deal with high levels of inequality, I am assuming that we are likely to get more balanced growth. Is that just me and my political values?

Professor van Ark: From a long-term development point of view, when the economy starts to grow, we know that inequality usually increases up to a point, but then to a point inequality tends to come down as societies develop more into welfare societies, as more people become part of the labour-force process and benefit from these productivity gains. You usually see this U-curve effect taking place.

From a short-term or medium-term perspective, obviously these things are related. Productivity can potentially lead to inequality, but inequality can also drive new innovation activities and involve more people into the growth process.

The causality quite often goes different ways, and it is for Government to make sure that we take the rough edges off this, that we allow companies to grow but at the same time also allow many people in the workforce to benefit from that growth. These aspects—growth, productivity and inequality—all tend to be related, but Government can play a role in terms of facilitating the move towards reducing the negative inequality effects and increasing the participation in those effects.

Coming back to your earlier point, I cannot emphasise enough Giles's point about sticking to what policies you are undertaking. This was true with the RDAs. The RDAs did not have to be abolished. They could be changed. The reason to go to LEPs was we wanted to get it more localised. That made sense, but it does not mean that you completely change the structure. It is just you try to refine the structure and improve and learn from it. It is also important that we evaluate what we are doing, do not immediately change it, but then use these lessons in order to improve the system that we are focused on. It is so important, from a productivity and innovation point of view, that short-term policies really do not work.

Q54 **Siobhain McDonagh:** My questions concern how the Government should develop an overall growth strategy and where that should sit within Government, the abolition of the industrial strategy and its replacement with a Treasury-sponsored plan for growth, and the virtue and pitfalls of industrial strategy more generally. For my first question, I will go to you, Giles, and then seek anybody else's comments. What should a growth strategy consist of? Where should it sit within national and sub-national Government? What should be the role of the Treasury?

Giles Wilkes: If you go back to when I last thought that this was adequately answered—and I am not just trying to butter up the Labour members here—Gordon Brown, the very long-standing Chancellor, had a clear view of a stable macroeconomic framework underpinned by inflation targeting. I personally think that could be updated with more expansion, touching on the question asked earlier about demand, and then a theory about how you boost the supply side underneath it. In his day, it was called the five drivers. You can barely find it on the internet, but they were very similar to the five foundations you often see referred to: infrastructure, skills, innovation and that sort of thing.

Then that gives you a way of organising the Government and the policies that you do with everyone else in the Government. For example, they launched the Enterprise Act and the Companies Act, and there was a long-term science strategy overseen by John Kingman, for example. That was a growth strategy, so a view about what we needed to do to improve the supply side and a view about how you should manage the demand side. That is good enough.

Also I should touch on things like the RDAs, and a policy for climate change and so forth. Something like that would approximately do but would need to be updated. The excellent points that Dr Valero has made about net zero are going to be really critical. Whatever you think it does for growth or productivity, we need to be doing that and that needs to be a part of it.

The plan for growth is not there yet. It was produced alarmingly quickly, and it gave some of the signs that it had been a ring-around of Whitehall—"Let us get as many things as we can into a document"—rather than there being an overwhelming philosophy. There was not the philosophy for what had gone wrong and therefore what needed to be addressed, but it is a good start.

You asked several interesting things though. What is the role of industrial strategy? What is the role of the Treasury? It is very hard to cover those exhaustively, but industrial strategy is important for those areas of the economy that need special attention, be they challenges, sectors or particular technologies. There is often a political choice of which ones they should be. Industrial strategy cannot be the answer to every question. You need a theory for where it stops and where most of the economy is just allowed to operate in a market base. Otherwise you are there with a giant skyscraper full of economists trying to deal with everything. You need a theory for where you need to be and where you do not need to be. I suspect that challenges like net zero and other big technological changes are where they should be thinking, but it does not hold the answer to all of productivity.

To your final question, you need a Treasury to be auditing policy to make sure that it is pro-productivity in lots of ways, but perhaps a slightly humbler Treasury that does not think the answer is always, "How can we conserve the power and the finances of the Treasury?" because they cannot have all the answers there, no matter how talented they are. Treasury as a backstop against bad productivity policies and a limited industrial strategy really counts.

Professor van Ark: In any country that I know of, growth and productivity policies are a co-ordinated agenda between the finance and the economics Ministries, in this case the Treasury and BEIS. The Treasury takes care mainly of the macroeconomic components, BEIS mainly takes care of the structural components, but they co-ordinate because these things obviously need to be looked at in conjunction. To me, the core of these policies is a very strong working relationship between the Treasury and BEIS at all levels: the level of the Ministers, the level of the civil servants and so on.

Having said that, there are another half-dozen policy domains that are absolutely critical and that are often left out or not being really integrated in the debate on growth and productivity. The five most important are education, housing, transport, health and therefore our regional and agriculture. Those Ministries quite often are missing out on the debate of how we drive productivity and growth. I have experienced it myself in discussions that I have had with Government Departments outside those two cores, where thinking about levelling up or growth or productivity is still not very well developed. It is critical for Government to recognise these horizontal policy domains that are touching on this issue and need to be looked at in comparison.

It is probably not going to work to start a new Ministry or a big co-ordinating group. Leave the co-ordination to Treasury and BEIS, but make sure that the other Departments get involved in the policy domains that are relevant for their stories.

Q55 **Siobhain McDonagh:** Do you have anything you would like to add, Dr Valero?

Dr Valero: Yes, I was going to make the same point about the fundamental importance of these other Departments, both for growth but also for the other massive challenges that we have, such as net zero. As Giles said, we know we need to meet our net zero commitments. Why not do it in a way that means we can also generate sustainable and strong growth, which we actually know from the academic literature is possible? We know that innovation spillovers from clean technologies tend to be higher than from dirty technologies. We know that there is a lot of potential in areas where the UK has a comparative advantage, like I said before.

In terms of where the roles and remits sit, there needs to be co-ordination. If we think of Treasury as the macro lever, with the tax policies, et cetera, we need to ensure that the incentives coming from them are aligned with whatever we are calling it: the grand challenges or net zero or levelling up. One example in recent years has been the continued freeze of the fuel duty, while at the same time we are regulating the phase-out of internal combustion engines. These two policies do not seem very aligned and actually, if we want to accelerate that transition and get all the incentives aligned on the demand and supply side, you need that co-ordination.

Also, I do not necessarily distinguish between industrial policy and growth policy. In some sense, that is a name that has come from the history. People talk about industrial policy when they think about supporting specific sectors or specific areas. I would like to see it as a co-ordinated and holistic growth policy where we understand there are places that some level of intervention is required based on the existence of market failures or the need to respond to a societal challenge, such as climate change, so you need to respond.

For that reason I thought that the framework of the 2017 industrial strategy had those fundamentals—the innovation, the skills, the people, the places—but it had these cross-cutting grand challenges. My feeling was that that framework could have been updated, but the framework itself was not redundant, because of the changed world that we found ourselves in post Covid.

Q56 **Siobhain McDonagh:** Following the withdrawal of the industrial strategy and the publication of the plan for growth, do the Government have a coherent strategy to promote long-term productivity growth and create new high-quality jobs? I will start with you, Giles.

Giles Wilkes: I am still waiting for the big speech that sets it out, because it is easy to make a speech where you just list a lot of things you are doing and say, "Aren't they good?" and it all adds up towards it. There is not a speech like the famous one Nigel Lawson gave in 1984, setting out the role of Government in this place and that place. From that point of view, no. It does not mean that there is not necessarily one, because most of what the Government do is implicit in the operating software of the Government. They do not have to say it for it to be happening.

For now, they are slightly winging it, and particularly given the last couple of years that is slightly forgivable. If you have strong demand growth in the short run and support for the labour market as it goes through this, we can then see what comes out and, when it comes to it, we will come out with something. I would not be able to tell somebody in a rush exactly what it is right now. The economy can cope for a year or two while they come out with it.

Professor van Ark: In terms of the abolishment of the Industrial Strategy Council and the pickup of the plan for growth, there was not a big plan behind it, to be honest. There may have been political reasons or maybe other reasons to do this, but there is not a clear-cut plan for why we had to go from one to the other. There is space there that needs to be thought through in terms of what this means. Both the Treasury and BEIS are aware of that space that needs to be filled out.

The other part of this is getting a lot more concrete about the levelling-up agenda. We believe that the White Paper that we are expecting in the fall is going to be very important for this. Levelling up is a little bit like productivity. You can think of it however you want it to be. We need to define it. That will be a debate and there will be different views on this. That is fine, but that debate needs to be held in the open, because not every part of levelling up is necessarily conducive to growth or for reducing regional disparity.

Initiative from the Government and a solid debate in Parliament about what levelling up really is about and how we are concentrating our resources to make some of these things happen in the longer run, as we discussed before, is a very important part of the debate to be happening. I really hope that the next few months will be used for having that debate, rather than having a last-minute White Paper that is thrown over the fence and then we are going to execute it. I am hopeful that that discussion will happen in the coming months.

Dr Valero: Institutionally there is a need to have stronger institutions governing industrial growth strategy. The Industrial Strategy Council was a really positive step in that regard. In the LSE Growth Commission, we set out what such a framework could look like. There are other areas of economic policy that have strong institutions governing them, regular reporting, data, evaluation and oversight. That seems to be a core part of success going forward, particularly given that, as others have highlighted, even within the same Government we have so much change. How can we try to isolate this area of policy from the political cycle so that it is based on some sort of consensus? Generally there is a consensus that we need to meet net zero targets now, that we do want to close disparities across and within regions and that we want to grow. How can we protect that consensus, if we want to grow in a good way going forward and ensure that the institutions allow that?

Q57 **Alison Thewliss:** My questions follow on quite neatly from Dr Valero's comments about net zero. Do you feel the Government's attitude towards the impact of net zero, productivity and jobs should be one of minimising costs or maximising the opportunities that are there?

Dr Valero: In a sense, those two things can happen at the same time. We know there will be costs to consumers and we know there will be costs to businesses transitioning, but actually innovation, new technologies and those prices of those things coming down via increased R&D will be core to actually reducing those costs and therefore building public acceptance. We have seen already that in solar, battery and wind technologies the price declines have been really radical in recent years, and this was without the strong commitment policy frameworks that would be required, and it has happened anyway.

If we have national and international frameworks and commitments to doing this, actually a lot of innovation could occur, which then creates those economic opportunities for the countries that can benefit from those inventions or from the diffusion, but also can bring the costs down for the consumers or the businesses that have to implement. Accompanied with that, there has to be some level of distributional analysis and distributional support to allow for a just transition.

We know that a lot of the upfront investments are simply unaffordable for people, not just those who are poorest but even for people actually relatively comfortable. They do not necessarily have the liquidity to make some of the investments required. If we know we need to do this, we need to provide the support and incentives. Maybe it is some kind of an interest-free loan to spread the costs, but we need those frameworks in place to enable the management of the costs and then also expanding the markets, the innovation and everything on the opportunity side.

When we talk about opportunities, just briefly, we should not just think narrowly about economic opportunities. There are productivity impacts, as others have mentioned, through the co-benefits associated with net zero. If we have cleaner air, we know that really matters for health and health really matters for productivity. If we have an active travel infrastructure, if we have improved natural capital, these things are important for health, both physical and mental, and therefore productivity. A holistic view of how this can improve lives and livelihoods is required.

Q58 **Alison Thewliss:** That makes a lot of sense. In terms of your previous answers, you talked about a lack of co-ordination across Government Departments on this. Are these targets going to be achieved without that co-ordination?

Dr Valero: It seems to me that we are making really strong commitments, but most of the experts on particularly how we can deliver this are saying that we are moving too slowly currently. We really need to make sure that the co-ordinated incentives, policies and investments are all in place. That might be, in some areas where the risk is high, having public support for R&D in a particular technology, for example. It might be through regulation, which is relatively costless for the Government, but when Governments can refer to regulation, it gives industry the certainty of direction of travel and then steers innovation in that direction.

Of course, carbon pricing and all the other environmental policies are also required, but they are not enough. That is what the evidence tells us. It needs to be complemented by these broader growth and societal policies.

I should also say that social attitudes, whether it is the voters or consumers, are crucial, and there is evidence showing that when consumers are more pro-environmental that actually steers the innovation of companies. Of course, social attitudes are steering the way politicians formulate policy. We really need to get society on board with this change, understanding some of the benefits to them as well, to people, to the country.

Q59 **Alison Thewliss:** Professor van Ark, you have said in the evidence that you submitted to the inquiry that the transition of energy supply from fossil to non-fossil is unlikely to create productivity gains very quickly. I wondered if perhaps you could comment on what that might been for cities like Aberdeen, which have a very highly fossil-fuel-based economy, and what can be done to mitigate those effects.

Professor van Ark: It is a really important point and insufficiently discussed that the transition to net zero may, in the longer term, be beneficial for growth of the economy and improving living standards, for sure, because we cannot go on like this, but in the short to medium term—the next five to 10 years—it is unlikely to create, on balance, more positive productivity effects. Transitions are very costly. We have already seen that initial transformation where it took a long time to get the productivity effects, but in the transition to net zero that is even more so.

To your point, it is very important that there is a big regional aspect to this as well, because there are regions, like the Aberdeen region, that are highly dependent on fossil fuel and now need to make a transition to non-fossil types of activities. Of course, there is more willingness in these regions to do something about this and try to make this transition, but it will need a huge amount of upfront investment to make these transitions with a huge risk of these investments not paying off, because it is a transition process. We have to accept that it is very hard in this transition process to be sure about the short-term benefits and the medium-term benefits from it, and these benefits are much more likely to be longer term.

Also there is a lot of uncertainty about whether these new green technologies are going to be more labour-intensive, which would be good for employment but would not be good for productivity. It would create potential issues in terms of raising wages and things like that, or whether they are actually going to be highly capital-intensive, which of course would be good for productivity, but it would not necessarily create a beneficial environment for people working in those industries, or whether it is going to be innovation-driven and is really going to be driven by continuous innovations that are having spillovers to other sectors of the economy.

It goes back to our earlier discussion about digital transformation. You can see something positive coming out of this, but only if this process is going to be innovation-driven. That is going to be very hard. There is a role for Government here, again to facilitate some of these transitions, to create these ecosystems, to provide upfront cost and take some of the risk in the regulatory environments. There is also, as Anna said, a very important role here for the Government to inform the public about the implications of this kind of transition. That can be done for pricing. It can be done through a direct regulatory environment, but there is a big role for Government to improve communication about the impacts of net zero on our economy and on living standards in the longer term.

Q60 **Alison Thewliss:** Do you think that people, firms and companies believe enough in the UK's commitment to that to invest and to believe in that transition at the moment?

Professor van Ark: Most people think that the awareness is there, but that the policies need a lot more work to be fleshed out. That is my general impression. I would say from a business perspective I can make a judgment better than from a general public perspective. From a business perspective, companies say, "The Government want to do this, but there is not yet a clear strategy on how we are going to get from here to there", and from here to there is a long road to go. There are few short-term gains from this, except perhaps mitigating some immediate effects of climate change.

Giles Wilkes: The climate change transition is meant to cost around 1% to 2% of GDP. First, that is really affordable. Secondly, even when we are going full-tilt at this, it is not going to be most of the jobs in the economy. On your original question about whether we should care more about cost or jobs, I would say both have been greatly exaggerated. To somewhat copy Dr Valero's, "You can be both about this", the important thing now is not to be scared of costs now but to ensure that the cost of it in future is much lower. We need to make it so that that playing field is totally tilted by the 2030s and 2040s, so that then it is the natural economic choice, because the nature of things is that we will do the easier things first, like we have with the electricity system. If we do not invest in the other, more difficult things—the high-heat industries, transportation and agriculture—when we come to those, they will be really expensive and the political cost will be much higher as people will say, "Is it really worth doing this?"

We need to invest now and not worry too much about that investment cost, in order that when the final moments come it is actually perfectly natural and good for the economy, and not worry too much about jobs. I can understand that for political messaging it is great to say, "This is creating a lot of jobs", but, as Professor van Ark said, a lot of it is going to be capital. We should not make that a condition of the green transition. What we are trying to do is get to net zero, full stop. If we could do it with one machine and one person, we should do it.

Q61 **Alison Thewliss:** Do you think enough priority is given to net zero within the plan for growth?

Giles Wilkes: No, not yet. He has his 10-point plan and that is a great start, but we need to know more about what the investments are that are going to change the cost curves here and which are the ones we are going to be really good at. There are still a lot of details to follow, again understandably, but we are not there yet.

Dr Valero: There was one area where I did not agree. There are economic benefits that can be realised relatively quickly, because there are some areas where we already know the solutions; we just need to roll them out. Rolling them out involves jobs and skills. There is a whole agenda now on green skills. We have done some work at the LSE reviewing the evidence and trying to understand what the job creation potential is in some of the net-zero-aligned investments that could actually be made relatively quickly—shovel-ready, as it has been termed—versus some of the longer-term opportunities.

Where there is uncertainty, the best you can do is try to look at the data on innovation and potential. That is why we look a lot at patenting, for example, to understand where our UK innovators are actually generating ideas, which are then actually generating lots of spillovers through the citation stage of patents. If you see a patent has been cited a lot in other patents, if means that it has stimulated other ideas. Where those other ideas are being generated in the UK suggests that they are contributing to innovation here. We have actually identified that the spillovers and the potential economic returns to some of these clean technologies are particularly high in the UK. We are also relatively specialised versus other countries in those areas.

Plotting where those innovations are occurring across the country, we find that they are not just all in the golden triangle or in London. They are actually quite spread around the country. We are currently doing some work on carbon capture utilisation storage, which is suggesting that actually a lot of those innovations are happening in places where there were also lots of oil and gas innovations historically. Trying to understand these transitions, and where the capacity, the skills and the infrastructure exist that enables that transition, is very important in the levelling-up agenda as well.

Q62 **Alison Thewliss:** It seems to me that there is so much potential here. There are so many opportunities and all the rest of it. Why is there currently, in your view, Dr Valero, a disconnect between that potential and Government listening to that? What more needs to be done to grab their attention on it?

Dr Valero: It is not just Government. There are a series of market failures that exist anyway in terms of innovation. Then there are further externalities when it comes to climate. We know that private actors left to their own devices would not internalise the cost of carbon. They would not necessarily internalise the benefits of cutting carbon and all those co-benefits to health and productivity.

Then there is a whole literature on path dependencies in innovation systems. Currently, all the path dependencies in terms of the stock of knowledge, where historically the bulk of researchers have been working, has been in what we might call dirtier technologies. We need to shift that whole equilibrium, so we are going to benefit, as Giles said, from the green path dependencies, so that you do not need intervention anymore. That is just the growth path. It is actually hard to make that shift without the enabling policies, just because that is where all the incentives might be in the short term.

Professor van Ark: If I may briefly add, a big difference between digital transformation, climate and net zero technology is the digital transformation is very clearly skill-biased. In other words, it has supported higher skills, and the need for companies to invest in better skills and the skilling of the population was important. If you did not do that, to our earlier discussion this afternoon, you would be underperforming. In net zero, it is still the big question as to what extent the technology is skill-biased.

Of course, there is innovation that will lead to different skills, but I worry that a lot of this technology may be more capital-intensive and actually favouring low skills. That creates jobs, but at the same time runs the risk of again creating low value-creating jobs with low wages. From a productivity perspective, as we have been discussing a lot this afternoon, I am concerned about the fact that the longer-term effects may still take quite a while before we get them. The technologies and the type of innovation and how it complements the skills are going to be a very important part of this transition.

Alison Thewliss: That is very helpful indeed and very interesting. Thank you very much.

Chair: Thank you to everybody, because that brings us to the end of this session on jobs, growth and productivity. Perhaps not surprisingly, a lot of it has been about productivity, a problem that has been around for a long time and that many say is not very well understood, but you have demonstrated today that much of it actually is quite well understood. What have been really helpful are some of the policy thoughts and approaches that you have been suggesting to some of the issues around productivity that we have touched on today. Thank you very much indeed to all three of your for illuminating some of our deliberations on these issues. That concludes this session.