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Speaker: Two Barclays analysts. One hot topic, all sides explored. This is The FlipSide. The FlipSide is a podcast series featuring lively debate between two Barclays research analysts taking opposing viewpoints on timely topics of importance to economies and businesses around the globe.

Hiral Patel: Welcome to The FlipSide. My name is Hiral Patel and I'm the Head of Sustainable Thematic Research. And with me today is Christian Keller, our Head of Economics Research.

Christian Keller: Hi, Hiral. Great to be here.

Hiral Patel: Now, just a few weeks ago we hosted a panel on artificial intelligence and productivity growth at the World Economic Forum in Davos based on a paper Christian and his team had written on AI in collaboration with the IBM Institute for Business Value. Now, today we want to follow up on the discussion in Davos. And the topic of AI which seems to be one of the defining themes for 2024.

Christian Keller: Certainly, will be a topic that stays with us I guess for some time.

Hiral Patel: Now. Not to rehash our panel discussion in Davos too much. But just to set the tone at the outset you shared the optimism that recent developments in AI can boost productivity across economies.

Christian Keller: Yes, I think Chat GPTO more generally large language models have been a crucial breakthrough in the AI evolution that has been actually going on for quite some time decade if you want. And I believe now we could be finally at that stage where AI becomes what we economists call GPT. Actually, we used that acronym even before it became famous with ChatGPT, we call

GPTA general purpose technology. That is a technology that transforms an economy and boosts productivity levels throughout all the sectors of an economy.

Hiral Patel: I appreciate your enthusiasm. But frankly, we've had this tech optimism for quite some time now. Remember how much a smartphone and all the apps and platforms it brought were touted as transformative. But, as much as they may have transformed how we communicate, consume information, spend our leisure time and organize our lives they don't really seem to have had much positive impact on labor productivity.

Let's look at the data. Labor productivity growth has been around 1% to 1.5% since the early 2000s in spite of the digitization of the economy since. That's much below the mid-1990s when these rates were around what? 3% to 3.5%?

Christian Keller: Yeah, I give you that and it's certainly an apparent contradiction. But it's not the first time we had such a productivity puzzle if you want. There's laureate Robert Solow famously equipped in 1989. I was seeing computers everywhere but in the productivity statistics. And this became known as a solo paradox. And as you highlighted yourself, however by the mid-1990s actually productivity then had increased, and it was growing rapidly. And somehow so paradox was resolved.

Hiral Patel: So, I guess your point is that it will be as with so many phenomena in economics just a matter of timing? Or better the time lag between that initial impetus and the full effect.

Christian Keller: Yeah, indeed. If you look at the history of general-purpose technologies, you know, steam engine, electricity, computerization, they all show a pretty long-time lag, you know, three to four decades in the case of the steam engine even longer. And that is the time between the initial technological innovation and then when economies really show a boom in productivity growth. And the low productivity in the 2000s which you just mentioned, and which some people call now the

modern productivity paradox may finally be resolved just by time. And so just as I mentioned earlier as a solo paradox became in the mid-1990s.

Hiral Patel: Sorry to insist but why are you so sure that AI can truly be a general-purpose technology like electricity and not just another digital gimmick with little consequence for productivity?

Christian Keller: Well, the research that looked into these general-purpose technologies and transformative effect typically found that, you know, there are three criteria that are really crucial.

First, that technology has to be pervasive. That means it needs to affect really most of the economy. And second, it needs to continue to improve. And third, it needs to lead to complementary innovations. And if you look at technologies of electricity or computing they all have these characteristics. And I think if you look at AI now, it really seems to have them as well.

First of all, you know, pervasiveness certainly if you look at modern economies now have 80% or more cognitive tasks, they all will be affected by AI. Second, AI by its very nature continues to improve itself. And then we already see there's a lot of additional innovation and applications around these, so-called Foundation Models. So, in my view AI does seem to tick all the boxes of a general-purpose technology.

Hiral Patel: Okay then. So, let's take it as a given AI will be transformative. But let's be realistic on the timing. As you mentioned yourselves, we may need to wait decades until seeing this. How much will the increase in labor productivity actually be? Ultimately the question is whether positive economic growth rates can be sustained? Because besides technology there are so many other factors. Most importantly the accelerating demographic change in most advanced economies that suggest output will expand at much slower rates if at all in the future.

Christian Keller: Those are valid points. Let me try to address them one by one. First, on the question of timing. So hopefully the productivity improvement that come with AI should not be necessarily a matter of decades but hopefully rather years or let's say a decade. And the reason for that I think is that a lot of the digital infrastructure that we need to implement AI, you know, internet, computer networks, data centers they already exist. There needs to be possibly more investment into them. They need to be extended. But in principle they are there. And another important point is that the ease of access that generative AI provides. That means people can use prompts in plain English rather than learning complicated code. And that really should help also to make AI-based processes adapted relatively quickly throughout the economy.

Hiral Patel: But the need for additional computing power and the related energy needs should not be underestimated here. There's also the need for complimentary spending on training and potentially redesigning business processes without which AI cannot unfold its full effect on productivity.

Christian Keller: Very true. Indeed, the history of genera- purpose technologies actually shown that these complementary investments that you mentioned they don't only take time but they may actually exceed the cost of the core investment. So, for example, you know, in the first wave of computerization, the spending on training and redesigning business processes actually exceeded probably the spending on physical computer infrastructure initially. And I guess all I'm saying here is that we are not at the beginning of a new technology, say like electricity. When the first light bulb patent was in 1879 or so. And then one had to build all the infrastructure for a fully electrified economy. With AI and digitization. We are much further along the road already and so we don't have to really start from the very beginning.

Hiral Patel: Okay. But you still need to answer the question about what kind of increase in labor productivity would you expect?

Christian Keller: Well, let's start with what we've seen in the past with general purpose technology breakthroughs. I mean, you mentioned already with the electrification in the mid-1920s and the first wave of computerization in the mid-1990s we saw annual growth of labor productivity around 3%/3.5%. So, if AI was to achieve that, even that would be about doubling or tripling the productivity growth rate that we experienced in recent years.

Hiral Patel: Still such numbers sound quite down to earth compared to some of the other expectations of how AI could alter our productivity.

Christian Keller: Yeah. And it's just so extremely difficult to predict. But if we look at sectors or certain tasks where we have implementing AI and where we have some feedback already for example, let's say customer service agents. The reported productivity gains were typically in double digits and sometimes even over 30% in particular actually among those with least experience in the job. So those are double-digit gains but then in aggregate if we look at the economy-wide increase in labor productivity growth that would likely be lower. But I think chances are good that we see significant pickup in productivity growth.

Hiral Patel: I guess the question is also how long such higher productivity growth rates would sustain? It seems that after a few years of the high labor productivity growth you mentioned for the 1920s and the 1990s the growth rates came quickly down. Again, they remained positive but the boost in the annual growth rates was only temporary.

Christian Keller: I think that's an excellent point and maybe here is where AI is actually different. Not necessarily how high the productivity growth will be in any year, but we may be looking into a more persistent higher labor productivity growth rate. And that is because as we mentioned earlier, AI constantly improves itself. That's its very nature. And these improvements then can be shared pretty much instantaneously across the globe. So that would suggest that you could have more

persistent higher labor productivity growth rates year by year. And then of course you're going to get cumulative effects. And as we all know those are very powerful.

Hiral Patel: And so, the hope is that this could offset the decline in actual labor force in many advanced economies. As I mentioned earlier, in many advanced economies the working-age population is now declining. And in extreme cases such as Italy, this decline could be about 1.5% annually by the end of the decade. Yes, there may be migration and perhaps also changes to what is considered working age. But the main hope must be for higher labor productivity to offset this lack of labor slip supply. Without it it's difficult to really see how these economies GDPs can continue to expand.

Christian Keller: That's true. And even if aggregate GDP may always grow somewhat less in a shrinking population. If we achieve higher productivity growth it will still boost the per capita GDP growth and that enhances obviously, the wealth per person. But now imagine what higher labor productivity could do to aggregate GDP growth in emerging and developing economies where you actually still have a growing labor force but a labor force that's so far at relatively low productivity.

Hiral Patel: In principle, that may be true but isn't AI rather risk for these economies and their workers? Robotics and automation has already replaced many jobs in manufacturing which used to be the main driver to boosting productivities in emerging economies. Poor rural workers with low productivity moved into urban areas taking on more productive manufacturing jobs in factories. Now, AI can even replace jobs in service industries where digitization has created new opportunities such as call centers. So why should AI be a boon for emerging economies?

Christian Keller: Yeah, that's a fair question. And the question of automation is indeed a very crucial question. But I don't think it's specific to emerging or developing economy. It's a question whether AI will mainly augment the abilities of workers or whether they fully substitutes them. And so far, the evidence is actually quite optimistic in the sense that AI what we've seen so far has mainly

really augmented workers' ability rather than replace them. And this varies across occupations and functions. For example, you know, automation seems more likely in certain areas like marketing, customer services, human resources. But it's less let's say in procurement risk compliance even in finance.

Hiral Patel: Yes, we're trying to explore this ourselves in research. Feedback suggests that by having repetitive tasks automated workers feel like they have more time to focus on the tasks that they have an edge or are extremely passionate about.

Christian Keller: Exactly. So that's a positive. And what makes me also optimistic about developing emerging economies workers is that a lot of the early surveys and tests seems to show that the less skilled workers actually report the highest productivity gains from helps, for example, from AI-driven digital assistance. And so, I think that's potentially positive news for emerging and developing economies.

Hiral Patel: Sounds promising but we are still in early stages. If the productivity gains are, as large as, you referenced earlier wouldn't corporations consider having fewer workers to do a particular task?

Christian Keller: That's true. We are still in early experimental phase and eventually when one has successful implementation one would expect that there's reduced need for some jobs because people are so productive or there will be also a full automation of some tasks. But that really has always been the case with any new technology throughout history, really. And what then happens is typically new jobs emerge often jobs we cannot imagine right now. And those jobs then offered new employment opportunities. And frankly, over history, those were often then the more pleasant, more productive jobs than the ones that were automated away.

Hiral Patel: Yes, but that still can be a disruptive process for workers and companies. What seems key in my view is whether AI will mostly augment the skills of humans rather than to mimic their

skills in order to replace their jobs? I guess the good news is that confronted with ongoing demographic change and the shortage of labor companies have a stronger incentive to keep workers and try to re-skill them in areas where AI affects the jobs that they have done this far.

Christian Keller: Yeah. I think that's what you and I certainly also heard in doubles from some of those companies. But I still think public policy will probably have to play a role as well. For example, how flexible educational systems? Do they enable lifelong learning? Do education systems in emerging and developing economies provide workers with the basic skills to actually be complimented by AI rather than being replaced?

And taxation systems also important, you know, in particular taxation between labor versus capital. Are they properly designed for a world where AI and robotics will play an increasing role? We don't have the answers yet. But I think this would be a debate. And also, these are questions where we need possibly fundamentally rethink existing systems.

Hiral Patel: I guess one big question is also whether AI will also reinforce that trend of winner takes all outcomes where scaling and network effects leads to that ongoing concentration of power. I guess at the expense of innovation and labor income share? We have researched such effects already as a consequence of the digitization in business models over the past decades and AI looks as if it could further accelerate such trends.

Christian Keller: I agree. AI essentially depends on data access and computing power. And this suggests that scaling and network effects will play an important role. And this probably why we currently see that the large leading tech companies are essentially in a race to outstand each other as to have the best AI model. But at the same time and I find that encouraging is from what I understand that open resource and niche players that work on smaller models, on local data, on more specific tasks are also making progress. So, I assume the role of antitrust policy which

already has become a focus in recent years will become even more important with the AI revolution. Data ownership, transparency these issues will play an even larger role.

Hiral Patel: Let's circle back on the point you raised earlier on taxation. Because surely that's the best way to rebalance the costs and benefits of AI in favor of society. So, introducing AI tax that is able to address expected job losses that would work?

Christian Keller: I'm not so sure about this concept of an AI tax. What specifically would we be taxing? That's my concern. Does it view AI as a taxable person or is it targeting the actual owner of the AI technology?

Hiral Patel: Well, that sounds complicated. Some also mentioned to charge companies a levy on the level of redundancies made due to AI.

Christian Keller: Yeah, I'm not sure whether that's an ideal solution either as probably we don't want to prevent change in innovation. But I think what does need to be addressed is probably that there shouldn't be a bias towards capital-intensive over labor-intensive solutions by charging lower marginal taxes on capital than on labor. And that is often the case today. And so, while there are no easy or ready solutions, we certainly need to start to think how to adjust our various policies to an AI world. So, to say.

Hiral Patel: Taking a step back, there is little doubt that AI will be a game changer to global productivity. However, guardrails will need to be in place to ensure the costs to society are fairly managed. I think we can both agree that regulation is unlikely to be the saving grace here. But it will be interesting to see how governments respond because to your point, Christian, it's still unclear on how we ensure these AI productivity gains will be shared by society.

Well, that's all that we have time for. Thank you Christian for joining me. And thank you to our listeners. We'll catch you next time on The FlipSide. For more on the topic, read our latest impact series report titled AI Revolution Productivity Boom and Beyond. Available now on our website. Alternatively, clients of the corporate investment bank can log on to Barclays Live for more insights on this and other topics.

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