Lisa D Cook: What will artificial intelligence mean for America's workers?

Speech by Ms Lisa D Cook, Member of the Board of Governors of the Federal Reserve System, at the Ohio State University, Columbus, Ohio, 26 September 2024.

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I am grateful for the educational opportunities this university has afforded my family over the years, including my uncle Samuel DuBois Cook who received his M.A. and Ph. D. here in 1950 and 1953. I am delighted to be here! Today, I would like to discuss the implications of artificial intelligence (AI) for workers and the labor market, more generally.[1] I will discuss AI's potential to boost productivity, offer a framework to consider which jobs will be most affected by AI, and consider AI's effect on aggregate employment. I hope this discussion will be informative for many of you in the audience, especially those of you who will be entering the job market in the next few years. However, before discussing AI, I think it will be helpful to first set the stage by reviewing how the labor market has evolved in recent years and where it is today.

View of the Labor Market

On the eve of the pandemic, the labor market was quite strong. The unemployment rate was flirting with historical lows, having fallen to 3.5 percent in the fall of 2019 from an average of 4.7 percent between 2014 and 2019. Jobs were relatively plentiful, with 12 openings for every 10 unemployed job seekers.

Then, the labor market changed dramatically in the first few months of the pandemic when economies around the world shut down. By April 2020, nearly one out of every seven U.S. workers was unemployed. The U.S. labor market lost more than 20 million jobs in just two months. To put that into perspective, that is nearly four times the total number of jobs in Ohio. U.S. workers and employers, with the support of timely and extraordinary policy action, proved to be resilient and innovative. As we know from the National Bureau of Economic Research's Business Cycle Dating Committee, the pandemic recession was the shortest on record, even though it was the deepest since the Great Depression. By mid-2020, the economy was growing again.

And grow it did. The labor market roared back, gaining 25 million jobs in the three years from its low point in April 2020. Demand for labor outpaced supply such that by mid-2022 there were 20 job openings for every 10 unemployed job seekers. By early 2023, the unemployment rate fell to 3.4 percent, its lowest level in 60 years.

In the last year and a half, labor demand has moderated, as restrictive monetary policy helped bring aggregate demand in line with supply and eased inflationary pressure. At the same time, labor supply grew rapidly, and now labor demand and supply are more balanced. While the overall labor market remains solid, it has cooled noticeably this year and is now less tight than it was on the eve of the pandemic. In August, the unemployment rate stood at 4.2 percent, having risen by almost a 1/2 percentage point over the past 12 months. And, in recent months, the number of job openings relative to unemployed job seekers has fallen to just below its pre-pandemic range.

As labor demand and supply are now more evenly balanced, it may become more difficult for some individuals to find employment. For example, younger workers could experience more hurdles as they look for that first job that will launch them on a longer career path. Over the past 12 months, the share of 16- to 24-year-olds in the labor force who are unemployed has risen over 1 percentage point, notably larger than the overall increase. Such data are consistent with a report in the most recent Beige Book, a compilation of anecdotal information from around the country shared with Fed officials before our meetings, indicating some recent graduates are facing unexpected difficulties finding suitable jobs.[2] It is also the case that less-educated and minority workers could face greater hurdles, as they tend to benefit more from tighter labor markets and suffer more from weakening economic conditions.

The slowing of the solid labor market has come alongside a significant easing in inflationary pressure. Inflation was 2.5 percent over the 12 months ending in July, notably closer to our 2 percent target than a year earlier-when inflation was 3.3 percent-and far below its peak of 7 percent in mid-2022. In recent months, the upside risks to inflation have diminished, and the downside risks to employment have increased. In response to these changing conditions, I whole heartedly supported the decision at last week's Federal Open Market Committee (FOMC) meeting to lower our policy interest rate by 1/2 percentage point. The FOMC, of which I am a member, is the Federal Reserve's primary monetary policymaking body. That decision reflected growing confidence that, with an appropriate recalibration of our policy stance, the solid labor market can be maintained in a context of moderate economic growth and inflation continuing to move sustainably down to our target. In thinking about the path of policy moving forward, I will be looking carefully at incoming data, the evolving outlook, and the balance of risks.

The return to balance in the labor market between supply and demand, as well as the ongoing return toward our inflation target, reflects the normalization of the economy after the dislocations of the pandemic. This normalization, particularly of inflation, is quite welcome, as a balance between supply and demand is essential for sustaining a prolonged period of labor-market strength. Of course, there will always be new developments and changes that will reshape the labor market. Recent advances in AI technology are perhaps the most talked about and debated of such developments today. I anticipate that these advances may have a significant effect on workers, the labor market, and the economy in coming years.

Artificial Intelligence and Productivity

From the outset, I, like most of my economist colleagues studying the economics of innovation and AI closely, acknowledge that the implications of AI are highly uncertain. We still do not know what the ultimate magnitude or intensity of this effect will be, which workers and firms will be most affected, or even the time period over which these effects will be realized. But today, I will highlight how economic theory and some recent studies can shed initial light on these critical questions.

The key reason why many expect AI will have a substantial effect on the economy is, because AI has the potential to provide a large and sustained boost to labor-productivity growth-which is simply how much output of an individual worker grows over time.

Ultimately, growth in output per person, workers' real earnings, and households' real purchasing power can all be tied back to growth in labor productivity. Like many of the most significant technological innovations of the past 200 or so years-such as the steam engine, electricity, computers, and the internet-AI has the potential to affect labor productivity in a plethora of economic activities across many industries and occupations.

For instance, over the past few years we have seen dramatic advances in generative AI technologies, which synthesize massive quantities of data to create models that can produce high-quality text, images, and video. Building upon these recent advances, a wide variety of new AI assistants have been deployed to help workers in a broad range of jobs. Although the degree to which these new assistants will improve labor productivity is likely to be quite idiosyncratic, some early studies suggest the effects could be large. One recent study examined the effect of an AI assistant for customer support agents and found that agents using the AI assistant resolved 14 percent more customer issues per hour-with this improvement being most pronounced for workers with comparatively less experience and less formal training.[3]

But perhaps even more promising is AI's potential for improving our ability to generate new ideas. AI is being used in drug discovery to identify novel chemical compounds; in energy research to extend the duration of a fusion reaction; and in engineering to better understand the aerodynamics of automobiles, airplanes, and ships. If AI can improve our ability to generate new ideas, then it could provide a long-term boost to labor productivity growth, as each newly discovered idea will itself provide an incremental boost to labor productivity.

Judging the Effect of Artificial Intelligence on Occupations

Because of their effects on labor productivity, past technological innovations have resulted in dramatic positive and negative shocks to the demand for specific occupations or tasks. We should expect AI to do the same: eliminating some jobs but, crucially, also creating new ones. As a society, we will need to consider how to retrain and support workers who may be displaced from their jobs, even as many others benefit from AI adoption. As I think about AI's implications for employment in any given job or task, I tend to focus on three questions.

How much exposure?
First, how exposed is a particular job to AI?

It is helpful to think about a job as a set of tasks that the worker must perform. Economist David Autor pioneered this task-based framework for jobs. He used it to demonstrate that the shift in labor demand, which began in the 1970s, away from jobs that involved a large degree of routine tasks can be explained by these jobs' greater exposure to the rapid adoption of computerization and automation technologies.[4] We can take a similar task-based approach to determine a job's exposure to AI.

Start by considering what share of a job's tasks can be performed by AI. For example, we might expect AI to be able to perform a larger share of a software programmer's tasks versus those of a plumber.

Next, for those tasks that can be performed by AI, consider how well AI performs them relative to a typical worker. For instance, generative AI is used in a medical setting to summarize patient interviews-a task that it performs quite well relative to a human doctor. Based on that interview, AI could diagnose a patient and develop a treatment plan, but these are tasks that doctors still tend to perform better than AI.

Finally, for those tasks that can be performed by AI, think about the quality threshold required for that job task. Coming back to the example of a doctor and AI, while there may be some tolerance for incorrectly summarizing a patient interview, there is little tolerance for misdiagnosing a patient or developing a bad treatment plan. I would also note that we may have higher quality thresholds for AI than we do for human workers-with driverless cars being an example where AI drivers may be held to a higher standard than human drivers. Thus, a job will be more exposed to AI, if AI can perform a large share of the job's tasks sufficiently well relative to a human worker and a set of quality thresholds. Importantly, we can expect that a job's exposure to AI will change over time, because advances in AI technology will both expand the set of tasks that AI can perform and improve the quality of AI's performance of those tasks.

Which brings me to my second question for AI's implications for any given job.

Complement or substitute?
Will AI be a complement to or a substitute for the job, given its set of tasks?

AI is more likely to serve as a complement to jobs that have less exposure to AI but use the services or products that are produced by jobs with a high degree of AI exposure. For instance, a job as a litigator may have little direct exposure to AI but will benefit from AI's ability to assist with legal research.[5]

Even for some jobs with a high degree of exposure to AI, it is possible for AI to serve as a complement. Let's return to the example of the doctor, who may now see more patients or spend more time on diagnoses, because AI has taken over writing summaries of patient interviews. More broadly, jobs with a high degree of exposure to AI will likely be complemented by AI, if workers are able to offload time-intensive, but low value-added, tasks to AI and focus their time on the highest value-added tasks.

However, we can expect that there will be some jobs that have a high degree of exposure to AI and for which AI can perform some especially high-valued tasks. Thus, AI may be more of a substitute for human labor in these jobs. But even for these jobs, the employment implications are ambiguous and will depend on the third question.

What is the elasticity of demand?
What is the price elasticity of demand for the output of these jobs that are highly affected by AI?

To understand what I mean, it is helpful to consider a concrete example. I want to come back to the software programmer jobs that I mentioned before as having a high degree of exposure to AI. Recent advances in generative AI have resulted in the development of new AI-powered coding assistants that help automate some aspects of writing software code. Some early studies have found that these AI coding assistants can

provide a significant boost to programmers' productivity. One randomized controlled trial found that these AI coding assistants cut in half the amount of time it took to finish a small programming project.[6] Another study found that programmers who were randomly assigned to use an AI coding assistant submitted 20 percent more requests each week asking to add code they had written to a software project.[7] And I emphasize that these tools are still in their infancy, which suggests that the productivity gains for software-programming jobs may be even larger.

These productivity enhancements will allow software programming projects to be delivered in less time and at a lower cost. As we know from economic theory, as the costs and delivery times for software projects fall, demand for such projects should increase. The number of software-programming jobs will depend on whether the demand for software projects increases more than one for one with the decrease in cost. In other words, is the price elasticity of demand for software projects greater than one? If it is, then the reduction in software programmers' hours devoted to programming tasks that can now be performed by AI will be more than offset by the increase in their hours from the greater demand for AI-enhanced software programming.

I find these questions helpful for framing how to think about AI's implications for any job or set of tasks. While I mentioned that there will likely be benefits for certain workers, it is important to recognize a universal lesson from past technological innovations-namely, that the employment and earnings of some workers are likely to be negatively affected by these innovations. The magnitude and extent of these negative effects will depend on a variety of factors.

For instance, consider if AI is able to perform job tasks that previously required a high degree of training or specialization. Affected workers in these jobs could experience larger declines in their earning power, if AI depreciates the value of their accumulated human capital. The degree to which AI could negatively affect some workers' earnings and employment will also be influenced by the pace of AI adoption. It is possible that if AI adoption is rapid, we could see the effects on some workers come quickly and be more concentrated, depending on which sectors are early adopters.

Implications of Artificial Intelligence for Aggregate Employment

In addition to considering AI's effects on individual workers, economists also evaluate AI's implications for aggregate employment. As I discussed, it remains unclear whether AI will be a boon for or a drag on net employment for those jobs that are most directly affected by AI.

For workers who are not directly exposed to AI but, rather, are users of the output from AI-exposed jobs, the aggregate employment implications are more likely to be positive. Generally, these downstream jobs will benefit from the lower input costs that result from greater productivity realized by AI-exposed jobs. An exception might be jobs where the cheaper inputs are a substitute for labor in the downstream job.

Moreover, I anticipate that inventors and innovators will continue to discover new products and services that are enabled by AI. The companies that are then formed to deliver these new products and services can be expected to raise aggregate employment.

In light of the uncertainty regarding AI's implications for the labor market, I want to highlight the important role that decisions by firms and, to a lesser extent, workers can have for determining how AI will affect the labor market.

If incumbent firms are able to adjust their processes to capture productivity benefits from AI, then these firms could help mitigate some of AI's potential for job displacement by internally reallocating affected workers to new roles and providing necessary training. If some job tasks can be replaced with AI-especially those that are mundane and repetitive-workers may be freed up to focus on other tasks or new activities they find more rewarding.

Individual workers play a limited role in determining how AI will affect their earnings and employment. Workers in jobs that will be complemented by AI might benefit from familiarizing themselves with how to effectively use AI. Workers in jobs where AI will be able to perform a substantial share of their tasks will face greater challenges. Some of these workers may seek to develop expertise in the aspects of their jobs for which AI is particularly ill-suited. Yet, many of these more-exposed workers may need to invest in training in alternative occupations that are less exposed to AI, similar to some of the skill-retraining efforts for manufacturing workers over the past 50 years.

Conclusion

In closing, I suspect that the tremendous uncertainty I highlighted related to AI's implications for the labor market will be some combination of disconcerting and exciting for many in the audience, especially those who will be graduating and launching their careers in the coming years.

My recommendation to you is to take the time to experiment with AI, familiarizing yourself with its capabilities and limitations. Doing so will make you well placed to help your future employers - and that could include yourselves - transform their business processes to effectively use AI. And for the smaller subset of you who are purely excited about the opportunity presented by AI, I look forward to seeing the innovative new products and services you create and disseminate throughout the economy to raise the living standards for all Americans.

Thank you for having me at The Ohio State University. I look forward to your questions.

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1 The views expressed here are my own and not necessarily those of my colleagues on the Federal Open Market Committee.

2 The August 2024 Beige Book is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/files/BeigeBook_20240904.pdf.

3 See Erik Brynjolfsson, Danielle Li, and Lindsey R. Raymond (2023), "Generative AI at Work," NBER Working Paper Series 31161 (Cambridge, Mass.: National Bureau of Economic Research, April; revised November).

4 See David H. Autor, Frank Levy, and Richard J. Murnane (2003), "The Skill Content of Recent Technological Change: An Empirical Exploration," *Quarterly Journal of Economics,* vol. 118 (November), pp. 1279–1333.

5 See Bloomberg Industrial Group (2024), "How Is AI Changing the Legal Profession?" *Bloomberg Law,* May 23.

6 See Sida Peng, Eirini Kalliamvakou, Peter Cihon, and Mert Demirer (2023), "The Impact of AI on Developer Productivity: Evidence from GitHub Copilot," working paper, February.

7 See Kevin Zheyuan Cui, Mert Demirer, Sonia Jaffe, Leon Musolff, Sida Peng, and Tobia Salz (2024), "The Productivity Effects of Generative AI: Evidence from a Field Experiment with GitHub Copilot," An MIT Exploration of Generative AI (Cambridge, Mass.: Massachusetts Institute of Technology, March).