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Written Testimony

House Committee on the Budget

Hearing on Machines, Artificial Intelligence, & the Workforce: Recovering & Readying Our Economy for the Future

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Chairman Yarmuth, Ranking Member Womack and Members of the Committee,

Thank you for inviting me to testify today on this important subject. Today, the U.S. economy— and U.S. workers — are suffering from what I view as excessive automation. The extent of automation is excessive in that it is not leading to increased productivity, creating new tasks for humans or increasing wages.

Automation — the substitution of machines and algorithms for tasks previously performed by labor — is nothing new. Ever since the weaving and spinning machines that fueled British Industrial Revolution, automation has often been an engine of economic growth. However, in the past it was part of a broad technology portfolio, and its potentially negative effects on labor were counterbalanced by other technologies boosting human productivity and employment opportunities. Not today.

Recent advances in AI and machine learning are not responsible for these trends. In fact, AI, a broad technological platform with diverse applications and great promise, can be used for helping human productivity and creating new human tasks and competencies in education, health care, engineering, manufacturing and elsewhere. But it could exacerbate the same trends if we use it exclusively for automation.

The COVID-19 pandemic will also contribute to this predicament as there are now more reasons for employers to look for ways of substituting machines for workers, and recent evidence suggests that they are already doing so.[1]

Excessive automation has had major costs for the U.S. economy. One aspect of this can be seen in Figure 1, which plots private sector spending on workers (the private sector wage bill) normalized by population. The left panel shows that private sector wage bill increased, on average, about 2.5% faster than population in the four decades following World War II. This meant over 2% real wage growth for the majority of the U.S. workforce during these years. This growth (and resulting wealth) was very broadly shared. The real wages of all demographic groups (by education, gender and race) grew more or less in tandem, and if anything, overall inequality contracted.

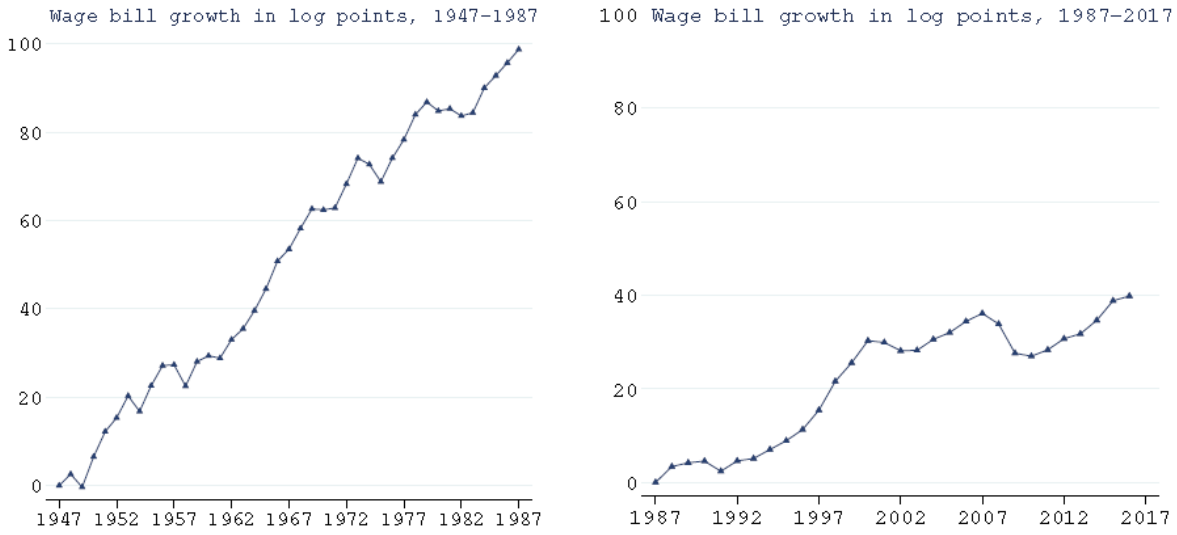

Figure 1: Evolution of US Labor Demand. From Acemoglu, Daron and Pascual Restrepo (2019) "Automation and New Tasks: How Technology Changes Labor Demand." *Journal of Economic Perspectives*, 33(2): 3--30.

[1] See https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/ey-capital-confidence-barometer/pdfs/22/ey-22nd-global-capital-confidence-barometer-march-2020.pdf, https://www.nytimes.com/2020/04/10/business/coronavirus-workplace-automation.html and Alex Chernoff and Casey Warman (2020) "COVID-19 and Implications for Automation" NBER working paper.

The right panel of the figure shows a very different picture after the mid-1980s: slower growth of private sector spending on labor, and subsequently, almost no growth from the late 1990s onwards. This drying up of labor demand in the U.S. economy has many causes, but it is fundamentally related to the changing nature of technology. From the mid-1980s onwards, there is faster automation and automation-related displacement of workers from U.S. industry, and much less rapid introduction of other technologies that would increase human productivity and opportunities. [2]

The adoption of industrial robots, a typical example of automation technologies, illustrates these implications. Robots have raised productivity in many parts of modern manufacturing. But their impact on labor has been more mixed. Local communities where businesses have adopted more robots have experienced employment and wage declines (relative to the rest of the U.S.).[3] While robots impacted a relatively narrow segment of the US workforce (manufacturing workers specialized in production tasks), the substitution of algorithms and software for white-collar tasks probably had even more sweeping consequences.

The next phase of automation, relying on AI and AI-powered machines, such as self-driving cars, can be even more disruptive, especially if it is not accompanied with other types of more human-friendly technologies.

The imbalance of technology may also be partly responsible for the disappointing productivity performance of the American economy. Despite the bewildering array of new

[2] Acemoglu, Daron and Pascual Restrepo (2019) "Automation and New Tasks: How Technology Changes Labor Demand." *Journal of Economic Perspectives*, 33(2): 3--30.
[3] Acemoglu, Daron, and Pascual Restrepo (2020) "Robots and jobs: Evidence from US labor markets." *Journal of Political Economy* 128(6): 2188-2244.

machines and algorithms all around us, productivity growth in the U.S. economy has much lower rates of productivity growth over the last 20 years than during the decades that followed World War II.[4] Even though information and communication technology (ICT) has advanced rapidly and is used in every sector of the economy, industries that use ICT more intensively have not performed better in terms of productivity, output or employment growth.[5] The reasons for slow productivity growth over the last two decades are not well understood. But one contributing factor appears to be that many automation technologies, such as self-checkout kiosks or automated customer service, are not generating much productivity growth.

The implications of our recent unbalanced technological portfolio and the resulting slowdown in private sector labor demand are widespread and include: the sizable decline in the share of labor in national income (driven partly by the reduced role of labor in the production process); the stagnation of middle-class wages and the huge increase in inequality, which has also meant large declines in the real wages of low-education men.[6]

Excessive automation is not an inexorable development. It is a result of choices of researchers who have focused on automation applications at the expense of other uses of technologies and companies that have built their business models on automation and reducing labor costs rather than broad-based productivity increases. We can make different choices.

[4] Gordon, Robert J. *The Rise and Fall of American Growth: The US Standard of Living Since the Civil War*. Princeton University Press, Princeton, NJ, 2017.
[5] Acemoglu, Daron, David Autor, David Dorn, Gordon H. Hanson and Brendan Price (2014) "Return of the Solow Paradox? IT, Productivity, and Employment in US Manufacturing" *American Economic Review*, 104(5), 394-99.
[6] Acemoglu, Daron and David Autor (2011) "Skills, Tasks and Technologies: Implications for Employment and Earnings." *Handbook of Labor Economics*, 4: 1043--1171, and Acemoglu, Daron and Pascual Restrepo (2019) "Automation and New Tasks: How Technology Changes Labor Demand." *Journal of Economic Perspectives*, 33(2): 3--30.

While there is no consensus on exactly what brought us to this perilous state, we know of a number of factors that have pushed the economy towards greater automation.

Chief among these has been the transformation in the corporate strategies of leading companies in the U.S. American and world technology is shaped by the decisions of a handful of very large and very successful tech companies, with tiny workforces and a business model built on automation.[7] Big tech companies are responsible for more than two out of every three dollars spent globally on AI and their vision, centered on the substitution of algorithms for humans, influences not only their own spending but also what other companies prioritize and the aspirations and focus of hundreds of thousands of young students and researchers specializing in computer and data sciences.[8] There is of course nothing wrong with successful companies pushing their vision, but when this becomes the only game in town, we must be on guard. Past technological successes have more often than not been fueled by a diversity of perspectives and approaches, and if we lose this diversity, we will also risk losing our technological edge.

The dominance of the paradigm of a handful of companies has been exacerbated by the dwindling support the US government is providing for fundamental research. The transformative technologies of the 20th century, such as antibiotics, sensors, modern engines, and the Internet, have the fingerprints of the government all over them.[9] The government funded and purchased these technologies and often set the research agenda. This is no longer the case.[10]

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[7] Acemoglu, Daron, and Pascual Restrepo (2020) "The Wrong Kind Of AI? Artificial Intelligence and The Future Of Labour Demand." *Cambridge Journal of Regions, Economy and Society* 13.1: 25-35.
[8] Artificial Intelligence: The Next Digital Frontier? McKinsey & Company.
[9] Lerner, Josh. *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed and What to Do about It.* Princeton University Press, New York, 2009, and Mazzucato, Mariana. *The Entrepreneurial State: Debunking Public Versus Private Sector Myths*. Public Affairs, New York, 2015.
[10] Gruber, Johnson, and Simon Johnson. *Jump-Starting America*: *How Breakthrough Science Can Revive Economic Growth and the American Dream*. Public Affairs, New York, NY, 2019.

Last but not least, government policy is encouraging automation excessively, especially through its tax code. The U.S. tax system has always treated capital more favorably than labor, encouraging firms to substitute machines for workers, even when workers may be more productive. As Figure 2 shows, over the last 40 years, via payroll and federal income taxes, labor pays an effective tax rate of over 25%. Even twenty years ago, capital was taxed more lightly, with equipment and software facing tax rates around 15%. This differential has widened even more with tax cuts on high incomes, the shift of many businesses to S-Corporation status making them exempt from corporate income taxes, and very generous depreciation allowances. As a result of these changes, software and equipment are taxed close to zero now and in some cases, corporations can get a net subsidy when they invest in capital. This generates a powerful motive for excessive automation.

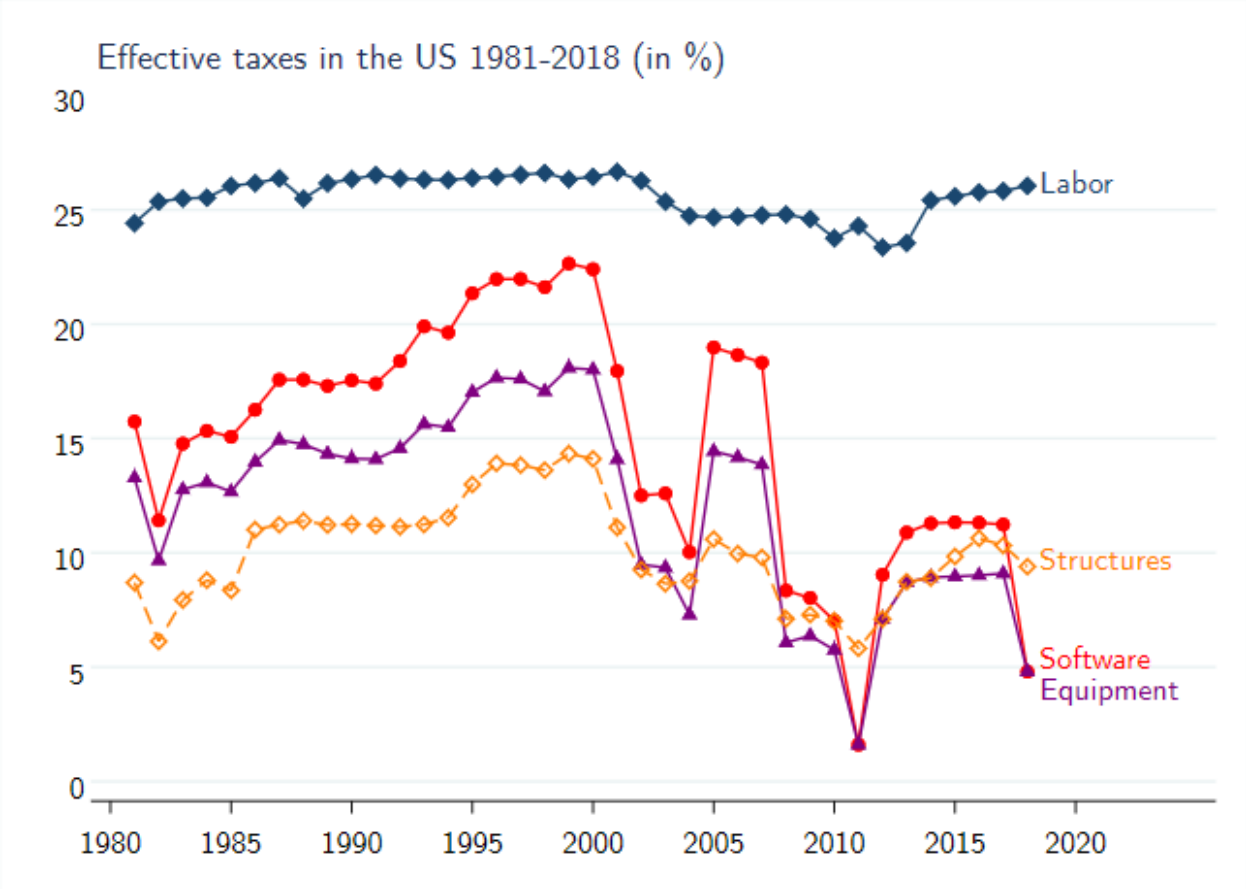

Figure 2: Evolution of effective taxes in the U.S. From Acemoglu, Daron, Andrea Manera and Pascual Restrepo (2020) "Does the US Tax Code Favor Automation" *Brookings Papers on Economic Activity*.

A critical consequence of these trends has been the disappearance of good jobs, the lifeblood of the American workforce.[11] Today it has become exceedingly difficult for workers without post-graduate degrees or very specialized skills to obtain jobs with decent wages, prospects for promotions and wage growth, and a reasonable amount of job security. The only way to change this trajectory is to redirect technological change. That will require changes in federal policy.

[11] Acemoglu, Daron (2001) "Good Jobs Versus Bad Jobs" *Journal of Labor Economics*, 19(1): 1-21.

A first step would be to correct the differential taxation of capital and labor. This would go a long way but is not sufficient by itself. A second step is to reevaluate the role of big tech companies in our lives, including in the direction of technology. This of course goes beyond debates about automation and AI, as it relates to the issue of limiting the size and the dominance of big tech companies.

These measures can be strengthened with government R&D policies specifically targeting technologies that help human productivity and increase labor demand. Research policies that target specific classes of technologies are controversial and difficult. They may be particularly challenging in the context of choosing between automation and human-friendly technologies, since identifying these may be nontrivial. Nevertheless, I would like to end my comments by emphasizing that such policies have been adopted and have had successes in the past.

Four decades ago renewable energy was prohibitively expensive and the basic know-how for green technologies was lacking. Today renewables already make up 19% of energy consumption in Europe and 11% in the U.S., and have costs in the same ballpark as fossil-fuel based energy.[12] This has been achieved thanks to a redirection of technological change away from a singular focus on fossil fuels towards greater efforts for advances in renewables. In the U.S. the primary driver of this redirection has been government subsidies to green technologies, as well as the changing norms of consumers in society.

[12] Renewable Power Generation Costs in 2018, International Renewable Energy Agency; Global renewable energy consumption, Our World in Data. See also https://www.lazard.com/perspective/lcoe2019/; https://irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019; https://www.sciencedirect.com/science/article/abs/pii/S1364032111003492?via%3Dihub

The same can be done for the balance between automation and human-friendly technologies, but as in the case of climate change, change must start with a broader societal recognition that our technology choices have become highly unbalanced, with myriad adverse social consequences, and with a clear commitment by the federal government to redress some of these imbalances.