Four Points about Robots, Jobs, and Wages

Testimony of Andrew McAfee before the Joint Economic Committee hearing on “The Transformative Impact of Robots and Automation”
May 25, 2016

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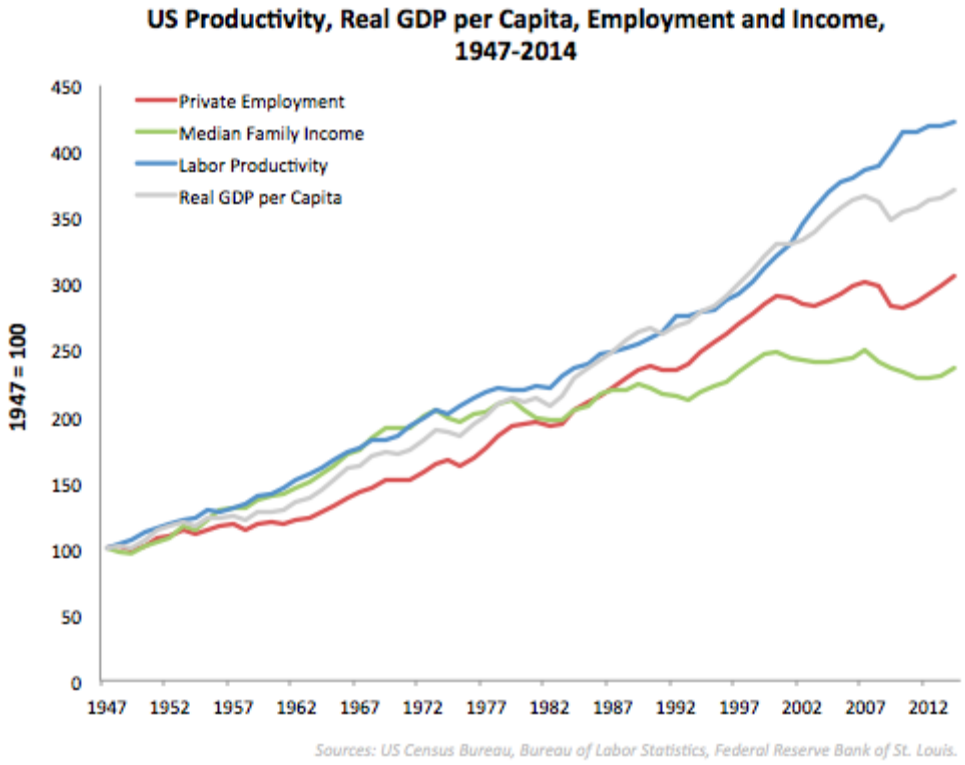
Four Points about Robots, Jobs, and Wages

I would like to thank Chairman Coats and Ranking Member Maloney for giving me the opportunity to testify today on this important topic.

I'd like to make four points. First, that the American workforce is undergoing substantial and important changes. Second, that technological progress is one of the driving forces behind these changes. Third, that tech progress is accelerating at present, and that this speedup will have consequences for the labor force. And fourth, that effective policy responses to these changes do exist and should be put in place.

Important recent changes in the American economy can be seen in the graph below, which illustrates a phenomenon my coauthor Erik Brynjolfsson and I call “the great decoupling.” It is a decoupling between measures of output, like GDP per capita and labor productivity, and measures of the health of the workforce, such as job volume and median household income. Output measures have risen fairly steadily throughout the post-war era, declining only during recessions (of which the most recent is also the most significant). Workforce measures used to rise almost in lockstep with output measures, but as the graph shows in recent decades the pattern has changed, with job and income growth both tapering off. By some measures, in fact, median American household income is lower than it was at the turn of the century.



Other research, much of it conducted by my MIT colleague David Autor and his co-authors, shows that the historically large, stable, and prosperous American middle class has in recent decades been getting "hollowed out." High-wage jobs, like corporate executive or computer programmer, are still being created, as are low-wage ones like restaurant busboy and home health aide. However, mid-wage, mid-skill jobs are not being created at the same rate as in the past. Many of these jobs involve routine work, both physical and cognitive; the archetypal routine physical job was on a factory assembly line, while a typical routine knowledge work job was as a payroll clerk working at that same factory. Jobs like these are becoming increasingly rare within the American workforce.

Why is this? There is an active debate at present about the reasons for the great decoupling and the hollowing out of the workforce. My read of the available evidence is that two causes are particularly important: globalization and technological progress. The increasing globalization of trade in recent decades and the opening up of large economies like China and India have meant that both physical work and knowledge work that used to be done in America have moved overseas. At the same time, technological progress has allowed more physical and knowledge work to be automated.

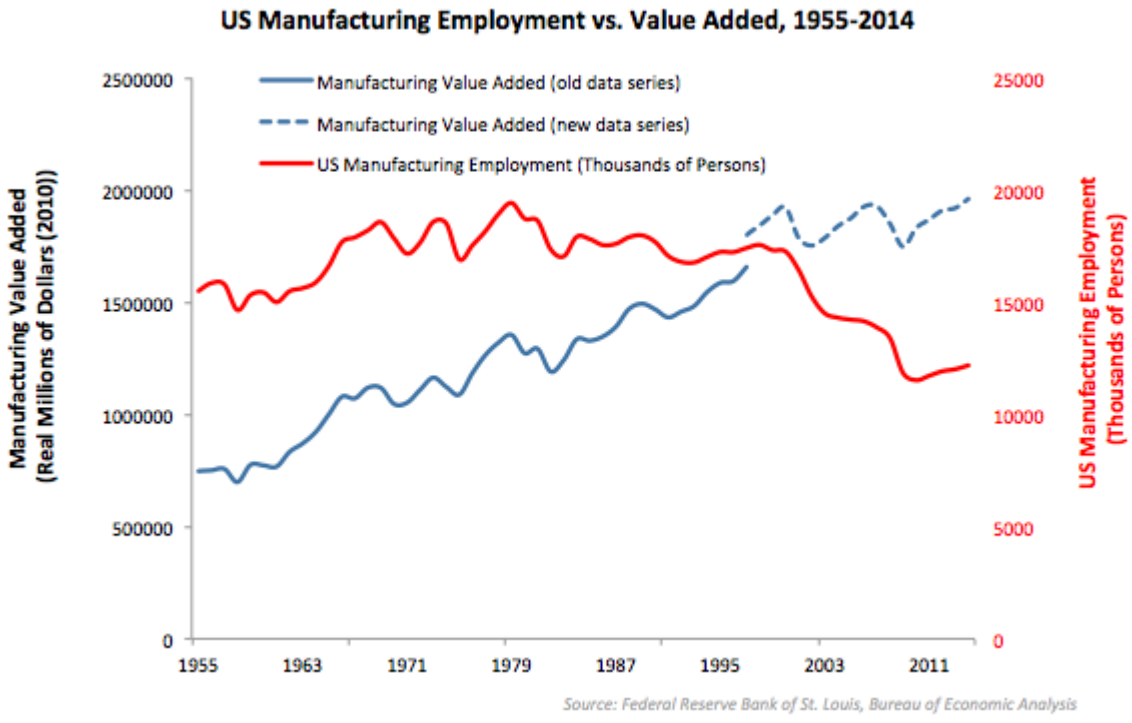
Both trade and technology have had their greatest impact on routine work. Many assembly lines have moved overseas, and many of the ones that have remained in the United States have become highly automated. Much routine “back office” knowledge work like processing payments also now takes place overseas in low-wage countries, or entirely inside a computer.

It is important to stress that both global trade and technological progress have been hugely beneficial to Americans and the American economy as a whole. Both have increased our overall prosperity, given us access to previously unavailable goods and services at lower prices and higher levels of quality, and benefited many American workers by opening up new markets and furnishing better tools to help them in their jobs.

However, there is no economic law that says that the benefits from either trade or tech progress must be shared equally, or in a way that strikes us as “fair.” It is perfectly possible for many of these benefits to go to a relatively small group. When economists speak about the “distributional consequences” of trade or technological progress, this is what they mean. The consequence that most concerns me is that as both trade and

technology race ahead, it seems that they are leaving many Americans behind in their capacity as people who want to offer their labor to an employer in exchange for a good standard of living.

The impact of technological progress on employment is clearly visible in the history of America's manufacturing Industries. The graph below shows total domestic manufacturing output along with total us manufacturing employment. It reveals that overall manufacturing employment has been declining since about 1980, even as the sector's output has continued to rise. This is simply a story of increased productivity, which in turn is largely a story of automation and technological progress.



My third point Is that we are living in a time when this progress is accelerating rapidly. The promises of science fiction are becoming everyday economic reality. We have cars

and trucks that can drive themselves; swarms of autonomous drones that can work together to survey a construction site or build a rope bridge; software that can understand our spoken questions and give us accurate answers; machines that can print three-dimensional parts out of plastic, ceramic, or metal; thermostats that learn over time when we're home and adjust the heating and air-conditioning accordingly; and artificial intelligence systems that can quite literally beat us at our own games: poker, chess and the ancient Asian strategy game of go.

One particularly important recent advance, which is often described under the label “machine learning,” is our ability to build systems that don't need to be told by their human programmers exactly what steps to follow in order to achieve a desired result. Instead, these systems learn by being shown lots of examples (both of successes and failures) and eventually figure out the relevant rules, strategies, and patterns by themselves. This means that for the first time we humans have a digital colleague or second opinion that can, like us, look at information and draw inferences and conclusions from it. These systems can take in much more information than even an expert human can, which opens up intriguing possibilities. I am convinced, for example, that if the world's best medical diagnostician is not today a piece of technology, it soon will be.

Many of these innovations are quite new, and have not yet diffused throughout the economy. As they do, they will intensify technology’s already substantial effects on the workforce. In other words, they will benefit some types of workers, and substitute for others. I do not believe that the era of mass technological unemployment is right around the corner, or, in other words, that the robots are about to take all of our jobs, But I

believe the technology surge now underway will intensify the great decoupling, the hollowing out of the middle class, and other trends already underway.

My last point concerns the steps that the government can and should take to continue to reap the benefits of technological progress while dealing with the challenges it poses for some workers. I believe this is possible, yet we're not doing it.

For me and many others, the most frustrating part of the current economic policy environment is that we're not getting right the "Economics 101 playbook" — the set of things that virtually all decent economists, conservative and liberal, agree on. My playbook for the near future has five main elements, and to remember them I sing to myself the old nursery rhyme about Old McDonald's farm. The origin of the song's "E-I-E-I-O" refrain is unclear, but for me it stands for education, infrastructure, entrepreneurship, immigration and original research.

Education: The primary school system in the US has been called the country's best idea, but at present the country's students are no better than middle of the pack internationally. There is alarming evidence that college students are often learning very little and there's still too much focus on rote learning and mastering skills that technology is already quite good at.

Infrastructure: World-class roads, airports and networks are investments in the future and a cornerstone of strong growth. But the American Society of Civil Engineers gives the US an overall grade of D+, and internet speeds here are slower than in many other countries.

Entrepreneurship: Young businesses, especially fast-growing ones, are a prime source of new jobs. Unfortunately, entrepreneurship and business dynamism in the US have been on a slow, steady decline. No one knows exactly why this is - the economist John Haltiwanger has characterized the situation as “death by a thousand cuts” - but many believe that the thicket of regulations, licensing requirements, and other barriers confronting job creators is a serious impediment. American innovators and entrepreneurs are the best hope for American workers, and we need to make life easier instead of increasingly difficult for them.

Immigration: Many of the world’s most talented and ambitious people want to come to the US to build their lives and careers, and the evidence is clear that immigrant-founded companies have been great job-creation engines. Yet our policies in this area are far too restrictive, and our procedures are nightmarishly bureaucratic.

Original research: Companies tend to concentrate on applied research where they can capture the rewards from their efforts. This means that government has a role to play in supporting original, early-stage work for which the rewards are spread more broadly. Most of today’s tech marvels, from the internet to the smartphone, have a government programme somewhere back in their family tree. But funding for basic research in the US is on the decline as a share of gross domestic product.

We live in interesting times. I believe that modern digital technologies are poised to reshape our economy as profoundly as the combination of electricity and the internal combustion engine did a century ago. These new tools will greatly increase the productivity and abundance of our economy, and the overall prosperity of our people. It is up to us to shape how these benefits are shared. I'll close by repeating the last

sentence of our book *The Second Machine* Age: technology is not destiny; we shape our destiny.