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Technology and Work:
Is the Long-Run getting shorter?

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Before we get started: have all the low-hanging technological fruits been picked?

Some (e.g. Robert Gordon, 2017) seem to think so.

My answer here is unequivocal: there are far more fruits on this tree than the eye can see: we just have to build taller ladders --- and that is what scientists do.

As far as technology is concerned, the future may be seen as "you ain't see nothin yet" .

Why do I say that? See Mokyr (2018, 2019 but many others, e.g. Alexopoulos and Cohen, 2017).

The question everyone is asking:

If “disruptive” technological progress continues at the pace of the past 200 years (or faster):

What would happen to work? What would happen to jobs?

Would widespread technological unemployment and involuntary idleness be a real possibility and people reduced to vapid and bored drones as in dystopic novels or cartooned in the *Wall-E* movie?

Life in such a dystopian world is almost invariably described as dreary, degenerate, and devoid of meaning.

Technological Disruption and the future of work

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The best literary treatment is in Vonnegut (1952) and a (bad) pop-econ by Rifkin (1995).

Most apocalyptic is Harari (2017, p. 330) who predicts “the creation of a massive new unworking class... a “useless class” [who] will not merely be unemployed — it will be unemployable.”

Among twentieth-century economists, the best-known of the dystopians is Leontief (1983) who famously suggested that workers in the twentieth century could end up like horses in the nineteenth: having lost their economic function horses are now reduced to expensive hobbies.

Among modern economists, good --- if conflicting --- surveys are Frey and Osborne, 2013, Bessen (2015, 2017), Autor and Salomons (2017), and Brynjolfsson and MacAfee (2011, 2014). For an excellent survey of the research up to date, see Kapelyushnikov, 2018).

An Economic Historian's First Reaction:

We have seen this movie before! More than once.

In the past, workers often feared that machines would replace them and make them redundant.

And hence they resisted technological progress and mechanization.

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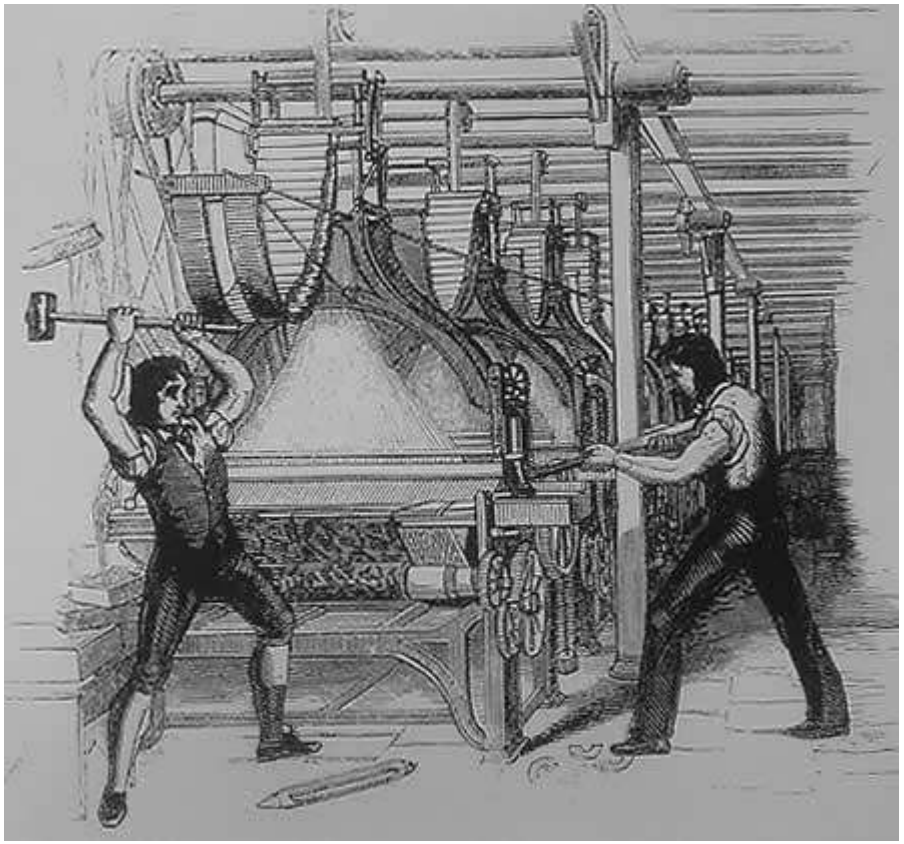
Best-known: Luddites in Nottinghamshire, 1812-16



Frame-Breaking.

£.200 Reward.

WHEREAS, on Thursday Night last, about Ten o'Clock, a great Number of Men, armed with Pistols, Hammers and Clubs, entered the Dwelling-house of *George Ball*, framework-knitter, of Lenton, near Nottingham, disguised with Masks and Handkerchiefs over their Faces, and in other ways,---and after striking and abusing the said *George Ball*, they wantonly and feloniously broke and destroyed five STOCKING FRAMES, standing in the Work-shop; four of which belonged to *George Ball*, and one Frame, 40 gage, belonging to Mr. Francis Braithwaite, hosier, Nottingham: all of which were working at the FULL PRICE.

NOTICE IS HEREBY GIVEN

That if any Person will give Information of the offender or

This includes the father of political economy writing in the midst of the Industrial Revolution

In a much-debated chapter inserted into the 3rd edition of his *Principles of Political Economy* (1821), David Ricardo noted that in earlier days he had been convinced that an application of machinery to any branch of production was a general good, but he had more recently concluded that the "substitution of machinery for human labour is often very injurious to the interests of the class of labourers ... it may render the population redundant and deteriorate the condition of the labourer."

Furthermore,

He already foresaw a dystopian world in which nobody works in an 1821 letter to J.R. McCulloch when he wrote that “if machinery could do all the work that labour now does, there would be no demand for labour and nobody would be entitled to consume anything who was not a capitalist and who could not hire or buy a machine” (Ricardo [1821] 1952, pp. 399-400).

[All the same Ricardo realized that this was a rather restrictive limiting case, and that in the long run higher productivity would lead to higher saving and investment and eventually rising demand for labor.]

As it turned out:

Ricardo's concern were unfounded for that period and the Luddites' fears turned out to be misplaced in the long run (though that did not help them in the transitional dynamics).

The sons and daughters of the handloom weavers, nailmakers, and framework knitters displaced by machinery found employment as railroad engineers, electricians, telegraph operators, boilermakers, department store clerks, and other occupations that were not yet on the horizon in 1820. Or they migrated to the U.S.

Is this time different?

So people worried --- and the absence of evidence for any long-term technological employment does not seem to have persuaded doomsayers.

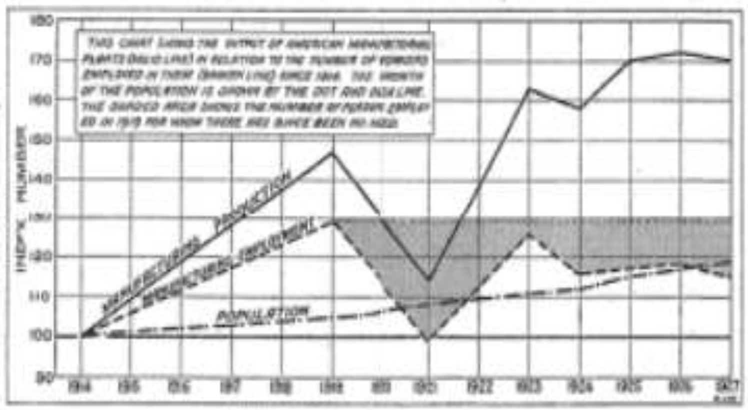
Every generation seems to say: yes, in the past technology never made people and work redundant, but maybe *this time it's different*?

A different way of seeing the same idea is this: the *short-run* the disruptive consequences of technological progress may be costly, but in the *long-run* it benefits all. But with the speeding-up of technological progress, maybe the long-run is getting shorter and the costs of disruption are becoming harder to overcome?

SUNDAY, FEBRUARY 26, 1928

MARCH OF THE MACHINE MAKES IDLE HANDS

Prevalence of Unemployment With Greatly Increased Industrial Output Points to the Influence of Labor-Saving Devices as an Underlying Cause



INDUSTRY CARRIES ON WITH FEWER HANDS
The Nation's Factories Have Been Turning Out More Goods Than Ever While More Men Look for Work

DOES MACHINE DISPLACE MEN IN THE LONG RUN?

New Studies Cited as Old Argument Is Renewed Over Significance of 'Technological Unemployment'

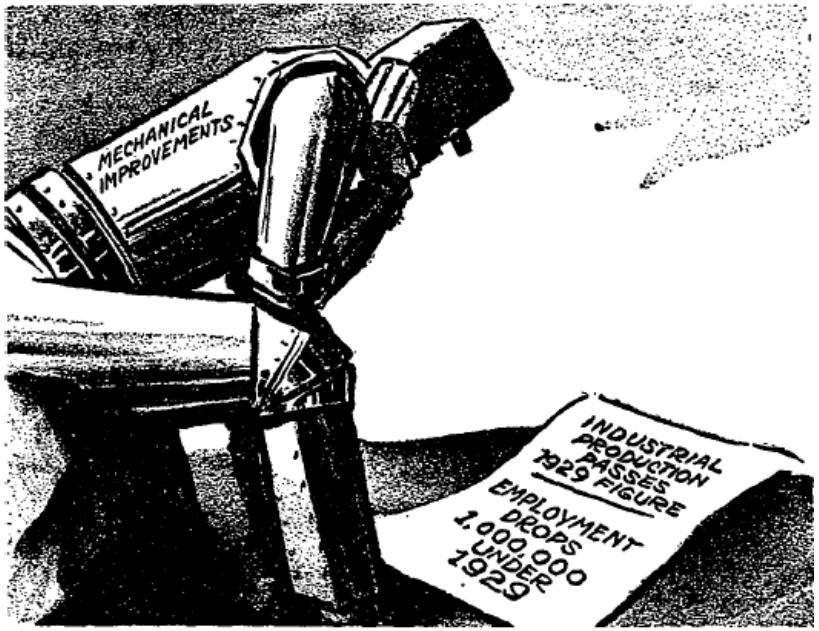
By LOUIS STARK

WASHINGTON, Feb. 24 — Does technological progress, by increasing the efficiency of our industrial processes, take jobs away faster than it creates 'hem? On this question Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, clashed a few days ago with President Roosevelt.

Dr. Compton objected to President Roosevelt's statement, in his labor by 62 per cent as compared with the hand process. In terms of production costs, the reduction in labor time represented a difference in favor of the machine process of at least $3 per thousand of cigars.

In 1921 the industry employed 112,000 wage-earners and in 1935 the wage-earners were 56,000. By 1935 it was estimated that 44,000 hand workers had been severed from the industry due to use of the long filler cigar machines alone and

"IS THE ROBOT BEGINNING TO THINK?"



Bishop in The St. Louis Star-Times

One cartoonist's view of man and the machine.

The New York Times
Published: February 25, 1940

Once the depression was over, any evidence for technological unemployment was gone. Between 1945 and 1970 unemployment of any kind was only a traumatic memory of the 1930s.

And yet, the famous memo by the “Ad Hoc Committee on the Triple Revolution” (signed among others by Linus Pauling and by prominent economists Gunnar Myrdal and Robert Heilbroner) sent to President Johnson in 1964 warned him of the dire consequences of what they called “the cybernation revolution of increasing automation” that would lead to increasing levels of unemployment

Despite these fears

Automation in manufacturing and technological progress in agriculture have been huge blessings for the economy.

The US economy did not collapse, the streets were not filled with millions of desperate unemployable ex-farmers and ex-factory workers (except perhaps for the Great Depression, which was *not* driven by labor-saving technological progress)

The debate has been confused

1. Does technological progress cause a *long-term decline* in the demand for labor? And if so, at what scale? In an industry? In a sector? In specific tasks? In the entire economy? Will the labor market eventually adjust to full employment (possibly with lower wages)?

2. Even if technological progress in the long-run leaves the demand for labor unchanged, could it still cause unemployment because of technologically-driven disruptions in the demand for labor and structural mismatches (in the sense that workers are not qualified for available jobs and tasks that go unfilled).

To repeat:

So far, historical evidence for technologically-induced long-term massive unemployment since the Industrial Revolution is non-existent. The main reasons are well-known:

1. The growth of services and the emergence of new occupations and tasks.
2. Productivity growth was relentless but relatively slow or local so labor markets had time to adjust (e.g. the decline of agriculture or elevator-operators).
3. Labor supply *per worker* declined (in terms of hours worked as a percentage of life time hours), so more jobs were created.
4. Participation rates: women joined the (formal) labor force after 1945, but children dropped out. Most workers started work later and later in life because of higher education.

But maybe *this* time it's (really) different?

There is serious concern that if the rate of technological progress will really *accelerate* (as I believe it will), job creation may not keep up with job destruction. The main concern is that automation, AI, robots, and similar advances will "hollow" out the demand for labor especially in services, leaving only highly skilled and very unskilled workers, with fewer and fewer in between.

So far, this has not happened --- if anything, labor productivity has been growing very slowly in recent years (though more and more people are arguing that it is to some extent mismeasured because the numerator is mismeasured). But it will probably pick up (as it did in the 1990s) --- indeed the data for Q1-2019 are at historical averages.

[If anything, the labor market today suffers from excess demand.]

If labor productivity rises, is that the good news (higher incomes) or the bad news (fewer workers needed)?

There is no way of knowing for sure. Could Ricardo's nightmare be realized?

The costs and benefits of “disruptions”:

The transitions will NOT be painless and they never were.

The bad news: Human capital is “putty-clay”; it is not “malleable.” Moreover, the capability of middle-aged dogs to learn new tricks declines with age, and the ageing of the labor force will reduce worker flexibility even further.

The good news: The history of technological progress indicates that on the whole the jobs that were replaced by machines tended to be physically exhausting, tedious, boring, dangerous, noisy, and unhealthy. Even the “low quality” jobs today are better than they used to be.

If this remains the case, more and more workers in routine-heavy grunt work will be “promoted” to more fulfilling, more challenging, and more pleasant work. If technology won’t take away your job, it may make it less onerous and more interesting. And almost surely less physically exhausting.

It may liberate many workers from what Keynes memorably called “The Adamite Curse.”

Another consideration: Labor Supply

Much of the industrialized world is looking at a crisis in the *supply* of labor, not the demand side.

We all know why: lower participation ratios, population-ageing, reduced immigration due to rising nativism, hence higher dependency ratios.

That suggests possible labor shortages even with labor-saving technological progress. Indeed, given demographic change in industrialized countries, maybe we should all wish for more robots replacing workers.

But let's take a worst-case dystopian analysis

Baron Robert Skidelsky famously wrote "sooner or later we'll run out of jobs."

Suppose that in the long run, the demand for labor somehow falls behind the supply, so that there are fewer "jobs."

If that happens, how will it affect income and economic welfare?

Two remarks about the future of work

First, The Protestant (or Jewish) ethic implies that "work" means more than just a way of making a living by generating income: for many (and a growing number of) workers, work is a source of identity, pride, and satisfaction. It is a *vocatio* ("calling") in Luther's famous terminology.

Moreover, for many it is a primary way of maintaining social connections. This has been reinforced by the improving physical conditions of work (the invention of the "water cooler" and the "company retreat").

In the limit, how much will people work?

It is hard to say, in part because for many the boundaries between work and leisure are becoming fuzzy. In the limit, we may have a larger number of people who work because *they want to*, not because *they have to*. They like work and the things that come with it, so if they don't work to earn money they will work until the marginal utility of labor = marginal utility of leisure (possibly zero).

Factoid: More than 25% of all Americans do some **volunteer work**. (The data are based on the Current Population Survey, a sample of 60,000 people). Those not in the labor force spent almost 40% more hours volunteering (though their number has been declining slightly in recent years).

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The question of leisure

Second: is the opposite of employment unemployment or leisure? Where is the boundary between voluntary and involuntary idleness?

If people do not work, what will they do? The technological revolution in leisure has been most dramatic.

The increase in leisure options and the quality of these options in the second half of the twentieth century have been subject to as much technological progress as we can see anywhere.

Some forms of entertainment such as massive spectator sports, access to unlimited sources of movies, music, and art, and sophisticated video games coupled to HD flat screens have arisen almost *de novo* in the past century and especially in recent times (e.g., virtual reality).

But even before the twentieth century, it seems hard to see that a life of leisure was so bad.

Leontief, in his essay on technological unemployment, remarked that "Those who ask what the average working man and woman could do with so much free time forget that in Victorian England the 'upper classes' did not seem to have been demoralized by their idleness. Some went hunting, others engaged in politics, and still others created some of the greatest poetry, literature, and science the world has known" (Leontief, 1983).

The same was of course true for the leisure classes of other societies and earlier periods.

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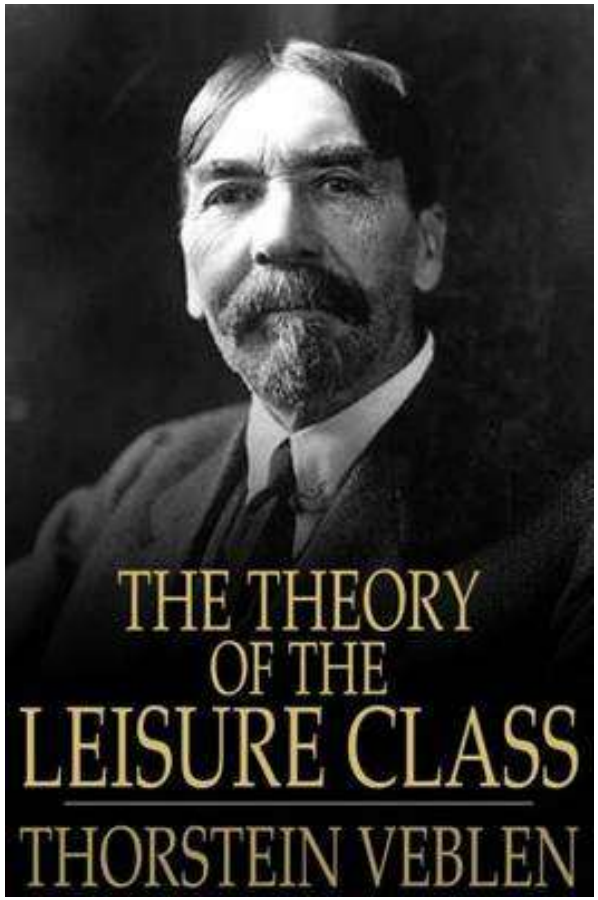
Again, this issue is far from new:



***(Idleness*, by John William Godward, ca. 1900)**

Finally, of course, Keynes, in his 1930 *Economic Possibilities for our Grandchildren*

He famously considered the possibility of "unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour."

"But this is only a temporary phase of maladjustment. All this means in the long run that **mankind is solving its economic problem…"**

"Thus for the first time since his creation, man will be faced with his real, his permanent problem - how to use his freedom from pressing economic cares, how to occupy the leisure, which science and compound interest will have won for him, to live wisely and agreeably and well."

"We shall do more things for ourselves than is usual with the rich to-day, only too glad to have small duties and tasks and routines… Three-hour shifts or a fifteen-hour week may put off the problem for a great while. For three hours a day is quite enough to satisfy the old Adam in most of us!"

Thank you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