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

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Techno-pessimism

Techno-pessimism comes in two flavors.

- One is Gordon's technological slow-down hypothesis that maintains that most of what could be invented has been, and that future innovation will have a much more limited effect on humankind (and will be too weak to forestall the other headwinds he foresees).
- The other is the apocalyptic hypothesis that foresees a world in which people, in some way or another, have been replaced and displaced by machines, mostly by some combination of robots, artificial intelligence, and more sinister ways in which intelligent non-humans of our own creation will create some hazy form of dystopia. Many well-known names share this concern, including Elon Musk, Nick Bostrom, Bill Gates and Stephen Hawking.

The good news is that those pessimistic predictions cannot *both* be right.

The even better news is that they can both be wrong.

Leaving aside the more speculative predictions of various Kurzweilian singularities or machines-eat-men dystopias, I will discuss briefly the concern that technological progress will affect labor markets in a radical and potentially catastrophic way.

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

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, forthcoming, but many others, e.g. Alexopoulos and Cohen, 2017; not to mention Vinod Khosla)

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If technological progress continues at the pace of the past 200 years (or faster)

What would happen to work?

Would widespread technological unemployment be a real possibility and people reduced to vapid and bored drones?

Such a dystopian world is described almost invariably as dreary and devoid of meaning.

The best literary treatment is in Vonnegut (1974) and a 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. Among modern economists, good discussions are Frey and Osborne, 2013, Bessen (2015, 2017), and Brynjolfsson and MacAfee (2011, 2014).

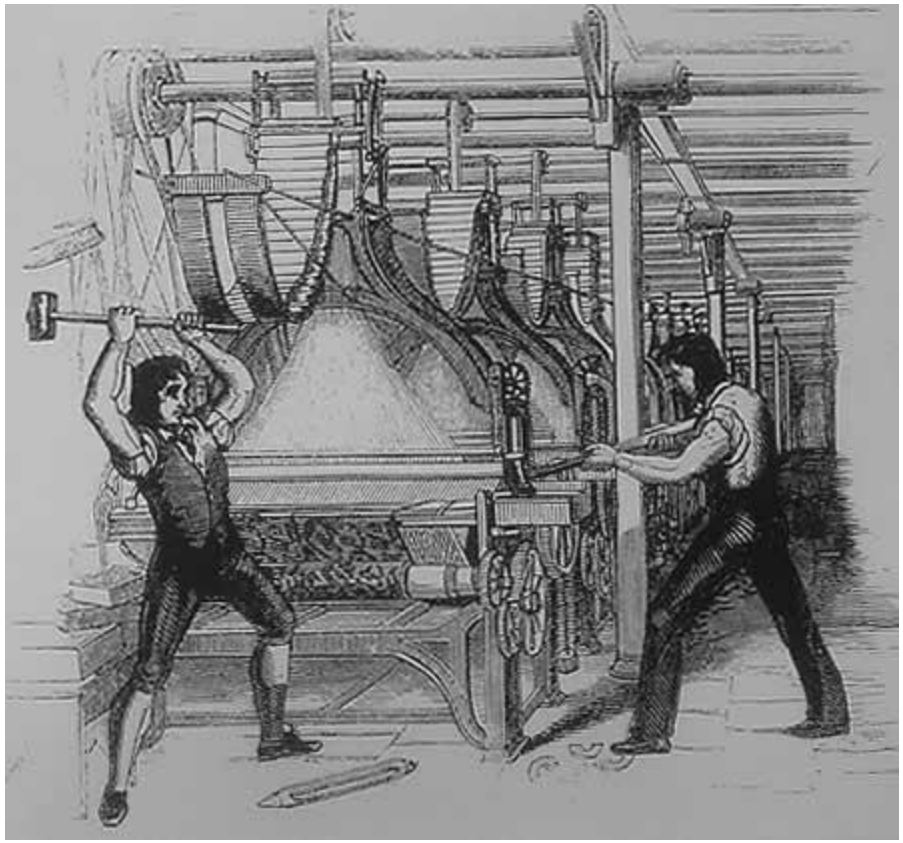
An Economic Historian's First Reaction:

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 strongly resisted technological progress and mechanization.

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

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 found employment as railroad engineers, electricians, telegraph operators, department store clerks, and other occupations that were not imaginable in 1825. Or they migrated to the U.S.

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But in the US things were not much better

In the United States employment in farming essentially vanished

Labor Force, Selected Characteristics, 1800-2000
(Percentage of the labor force)

Year	Agriculture	Manufacturing	Domestic Service	Clerical, Sales, Service[a]	Professions	Slave	Nonwhite	Foreign Born	Female
1800	74.4	Na	2.4	na	na	30.2	32.6	na	21.4
1850	55.8	13.8	5.4	4.8[b]	3.0[b]	21.7	23.6	24.5[b]	19.6
1900	30.7	20.8	5.5	14.1	4.7	0.0	13.4	22.0	20.8
1950	12.0	26.4	2.5	27.3	8.9	0.0	10.0	8.7	27.9
2000	2.4	14.7	0.6	38.0[c]	15.6	0.0	16.5	10.3[c]	46.6

Nor did manufacturing pick up the slack

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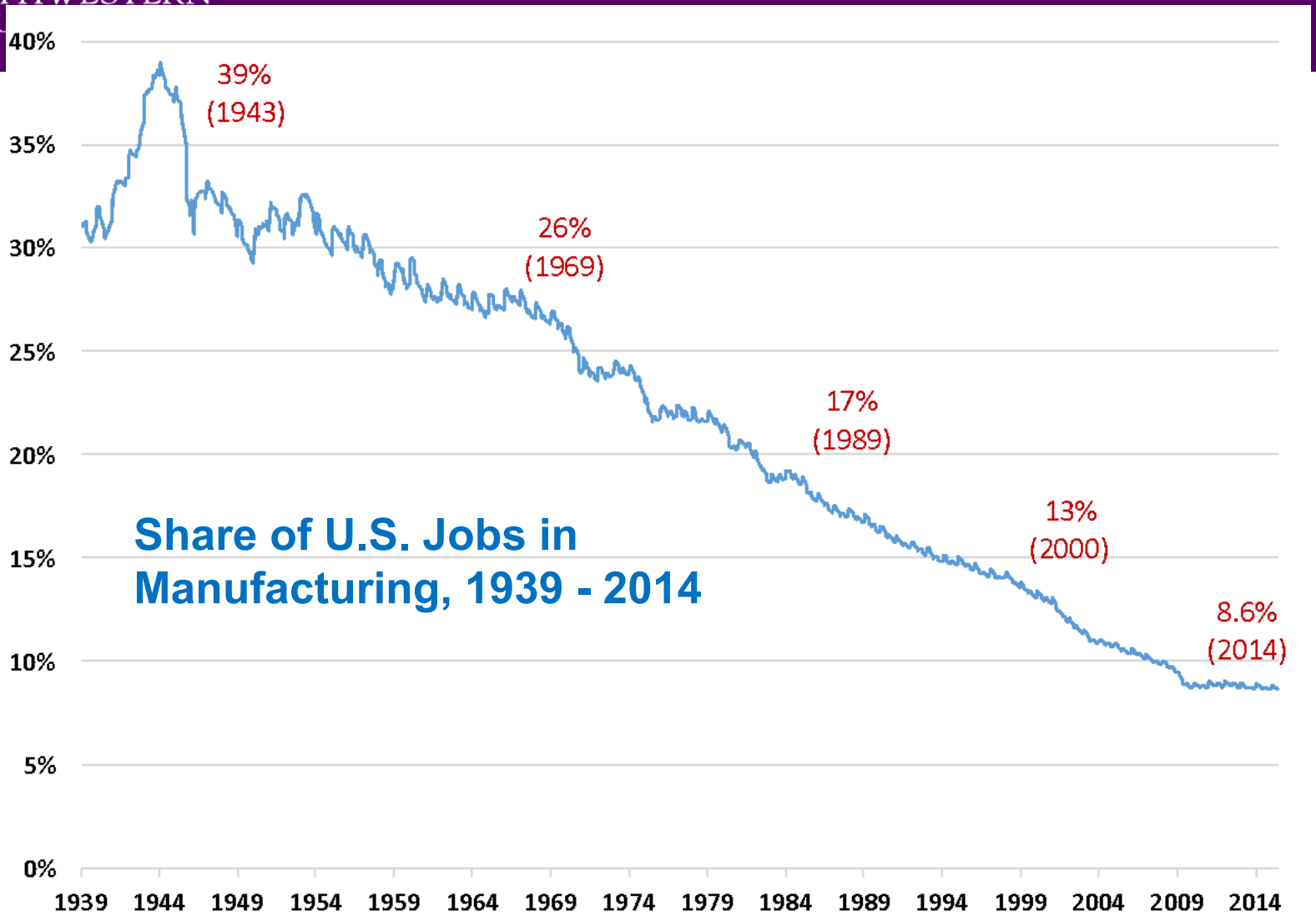
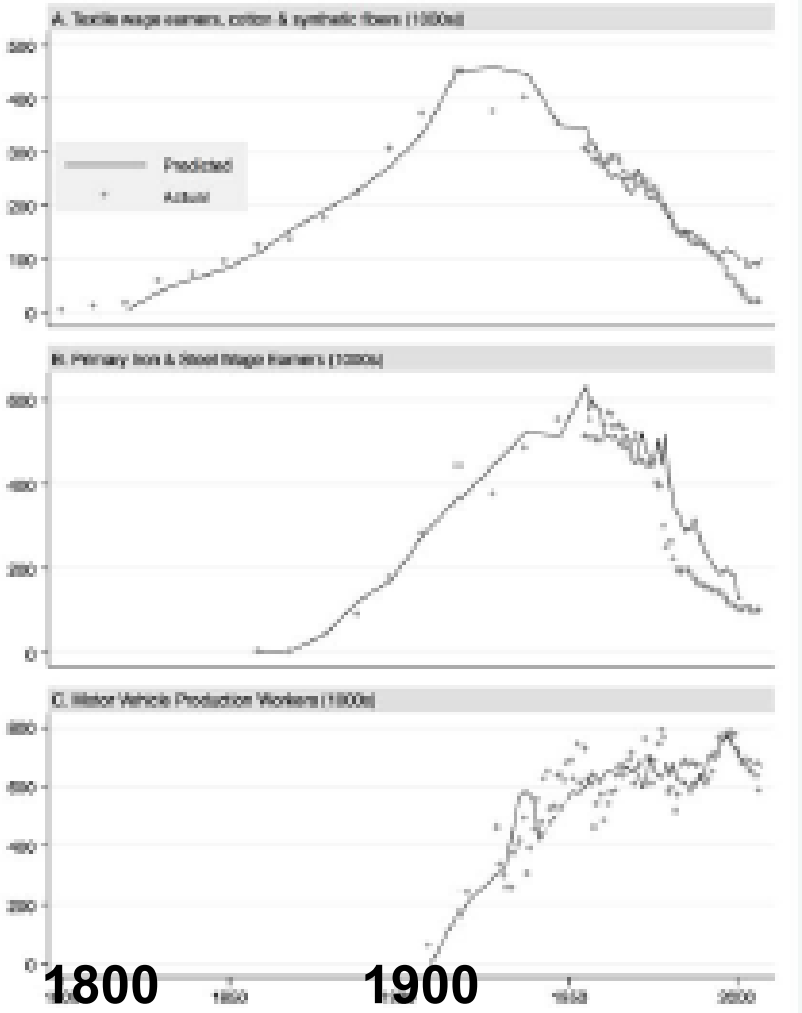


Federal Reserve Bank of St. Louis



Textile workers

Iron and Steel wage-earners

Motor Vehicle Production workers

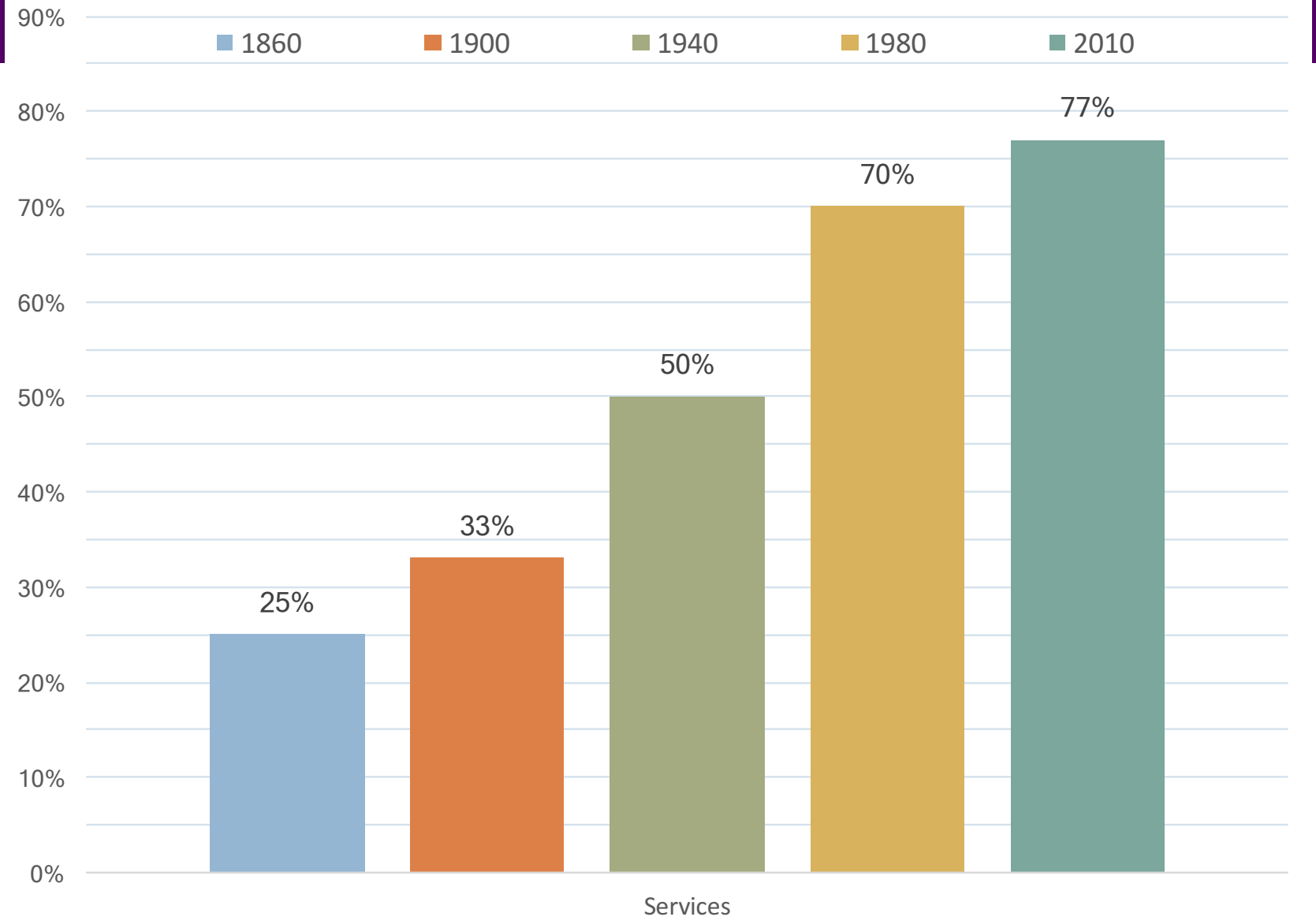
Courtesy of James Bessen

And yet…

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)

So far, evidence for technologically-induced long-term massive unemployment is non-existent. The main reasons are, first, the growth of services and second, that the productivity growth was relentless but slow.

Share of U.S. Employment in Services,1860 – 2010



Johnston 2012

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 in services may not keep up with job destruction.

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

But some observations are in place.

One is that labor-saving *process* innovation and "classical" productivity increase may make some workers redundant as they are replaced by robots and machines who can do their jobs better and cheaper.

This could get a lot worse if AI will also replace workers who are trained and skilled in medium human-capital intensity jobs such as drivers, legal assistants, bank officials. So far the evidence for that is mixed to weak. But it could change, depending on what happens to demand and output as prices fall and quality improves. What counts is demand elasticities w.r.t. price and w.r.t. product quality (including user-friendliness).

But *product* innovation (unlike process innovation) is likely to create new jobs that were never imagined. Who in 1914 would have suspected that their great grandchildren would be video game designers or cyber security specialists or GPS programmers or veterinary psychiatrists?

What kind of jobs may we expect in 2050? We should concede that our imaginations fall short here.

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But we can make some guesses:

- The ageing of the population will continue apace, so geriatric services, medicine, pharmaceuticals, and personal care will become an even bigger occupation. Technology will allow seniors to live at home longer and enjoy new forms of leisure activities.

- People in rich industrialized countries (and many poor ones) are likely to continue to have fewer children. Hence we are likely to invest a great deal more in the *quality* of education of our youth, especially toddlers and pre-kindergarten. And, one suspects, the pet industry will do well.

- Those sectors are unlikely to be taken over entirely by "robots." As is widely recognized, digital technology is already making human services more efficient, e.g. through "telemedicine" or pharmacy automation. This suggests a wider range of complementarity between labor and automation than the fearmongers suggest. WebMD and similar sites do not really make doctor's visits (or doctors) unnecessary, they mostly mean that patients are more knowledgeable when they talk to their doctors. Driverless cars will become like pilotless planes.

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What we do know with certainty is this:

The transitions will NOT be painless and they never were.

That is --- as we all know --- because human capital is “putty-clay”; it is not “malleable.” Steel workers or truck drivers cannot become orthopedic surgeons or kindergarten teachers just because that is where their services are now needed.

The dynamic is likely to be that machines pick up more and more routine jobs (including mental ones) that humans used to do.

At the same time new tasks and functions will be preserved and created that *only* humans can perform because they require instinct, intuition, imagination human contact, tacit knowledge, *fingerspitzengefühl,* or some kind of *je ne sais quoi* that cannot (yet) be mimicked by smart algorithms.

But let's take a worst-case analysis

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

How much will people work?

It is hard to say, in part because the boundaries between work and leisure have become 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 they will work until the marginal utility of labor = 0.

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 more time volunteering (though their number has been declining slightly in recent years).

But if people do not work, what will they do? It is striking that the technological revolution in leisure has been most dramatic.

The improvement 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 and video games coupled to HD flat screens have arisen almost *de novo* in the past century and especially in recent times.

So have electronic forms of social capital such as Facebook, Twitter, Instagram, blogs, Reddit, chatrooms, and similar ways in which digital technology has affected human interaction.

Aguiar, Hurst et al., 2017 have suggested that technological progress in leisure goods has affected the LFP rates of prime-aged males hooked on videogames.

If this argument holds up, we may see a great deal of more people dropping out of the labor force because of the promise of VR entertainment, which may revolutionize video games and turn them into MVE's (Multisensory Virtual Experiences).

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

Leontief, noted in his essay on technological unemployment 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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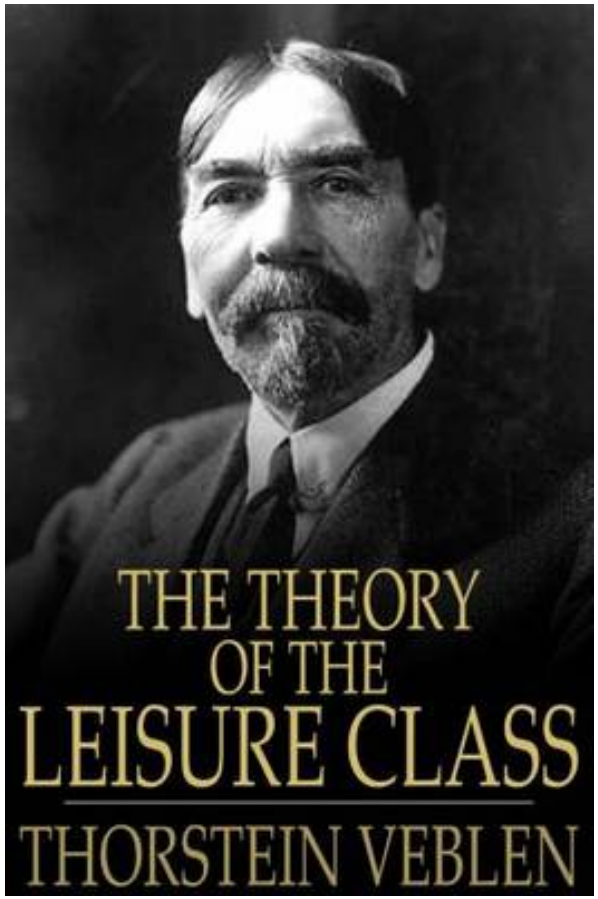
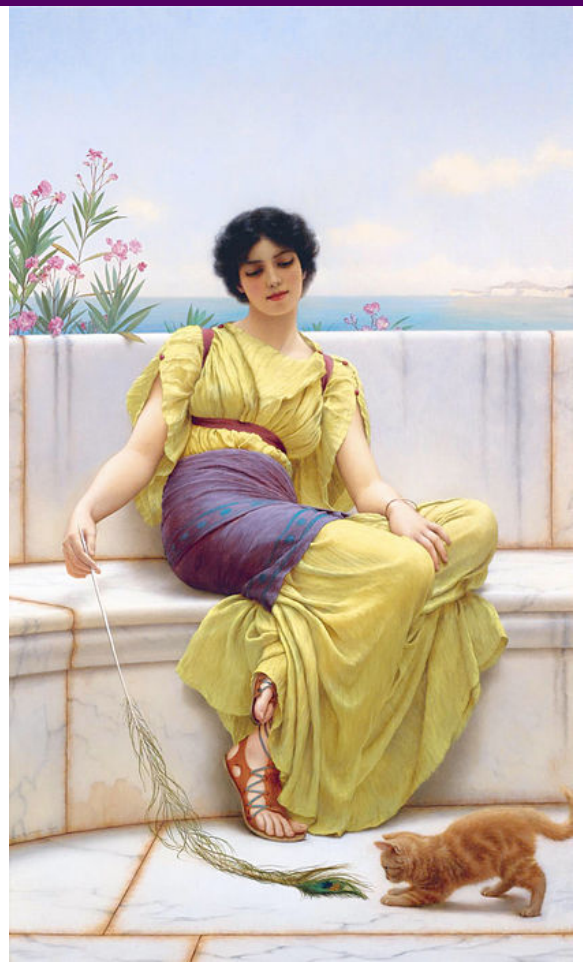
Again, this issue is far from new:





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

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

He 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!"

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In the limit…

If we were to reach a state of technological development, still very remote, in which what we call “work” will undistinguishable from leisure (like College Professors) but will not get paid,

That, of course, raises very serious questions of income distribution and of the equality of ownership of the “means of production.”

These may require a radical new approach to economics.

Technology and Institutions

If this techno-optimist scenario holds up, will the new world be utopian or dystopian?

The blessings of an ever-more-bountiful technology are a bit like a major oil discovery: a huge windfall for an economy.

But societies can treat it like Norway or Canada and become a progressive welfare state in which most share in the blessings, or like Russia or Nigeria where the revenues are stashed away for the benefit of a small kleptocratic oligarchy.

This is where politics and policies comes in. The issue is not so much a matter of “whether there will be jobs” but how the plenteousness of science and ingenuity will be distributed to all of humankind.

If nothing is changed from current trends, Keynes’s utopian vision may not come to pass, *not* because of there not being enough fruits on the tree but because of growing popular opposition to an economic system seen by most as unfair and benefiting too few.

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Thank you

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