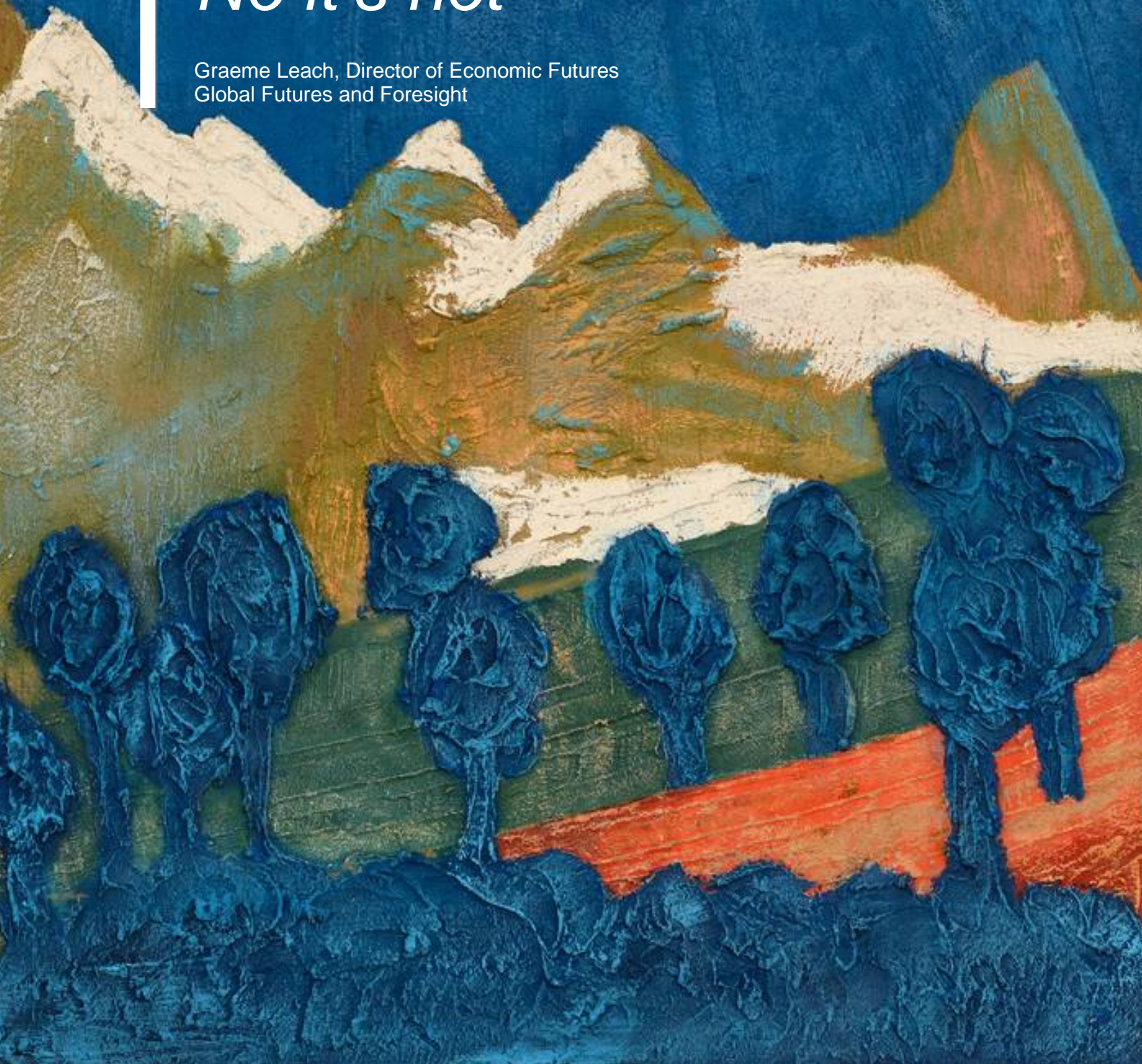


This time it's different *No it's not*

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Global Futures
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This time it's different. No it's not.

1. Introduction

Books with titles such as *The Second Machine Age*ⁱ, and *The 4th Industrial Revolution*ⁱⁱ, suggest that we are on the cusp of revolutionary technological change, with profound implications for employment.

Futurologist Rohit Talwarⁱⁱⁱ, says that: *“Within the next 5 years, 20% of all jobs that exist today will have been automated away. By 10 years, that could be at least 50%, and by 20 years 80%. If you look at the Fortune 500, there are an awful lot of dead men walking.”*

Are these the wild words of a futurologist divorced from the constraints of economic analysis? Or are they the perceptive musings of a futurologist in touch with reality?

Over recent years clear dividing lines have opened up between those who foresee massive technological change (technology optimists) and technological

unemployment (unemployment pessimists), and those who see the opposite, a world of far more limited technological change (technology pessimists) and consequence for technological unemployment (unemployment optimists).

Or is this an artificial divide, with the possibility of an optimistic outcome in both technology and technological unemployment? All too often, nowadays, technology optimism and technological unemployment optimism are treated as mutually exclusive (see Box 1), when economic history suggests otherwise. If we are to break with the technology lessons from economic history, we need very good reasons to do so.

The question of the future impact of technology on employment and unemployment is so significant it is almost on a par with the question, do we face a utopian or a dystopian future?

Box 1 **Technological unemployment pessimists**

Recent and historical quotes:

“Technological change is now leading to unprecedented levels of technological unemployment.” **Jeremy Rifkin in *The End of Work*.**

“The jobless future.” **Martin Ford in *Rise of the Robots*.**

“It may seem paradoxical that faster progress can hurt wages and jobs for millions of people, but we argue that’s what’s been happening.” **Erik Brynjolfsson & Andrew McAfee in *Race Against the Machine*.**

“... a much darker picture of the effects of technology on labour is emerging. In this picture, highly educated workers are as likely as less educated workers to find themselves displaced and devalued.” **Nobel Laureate, Paul Krugman in *Sympathy for the Luddites*.**

“The reason we have job losses, is we’re so successful in technology.” **Nobel Laureate, Joseph Stiglitz**

“Self-driving vehicles threaten to send truck drivers to the unemployment office. Computer programs can now write journalistic accounts of sporting events and stock market movements. There are even computers that can grade essay exams with reasonable accuracy ... increasingly machines are providing not only the brawn, but the brains too.” **Tyler Cowen, *The Great Stagnation*.**

“The economic challenge of the future will not be producing enough. It will be providing enough good jobs.” **Lawrence Summers, former US Treasury Secretary.**

“We’re setting up a situation where better technology in the long-term means more unemployment ... that may lead to political and social chaos.” **Jaron Linier, *Who Owns the Future*.**

“Brain work may be going the way of manual work.” **The Economist.**

Historical quotes:

“The opinion entertained by the laboring class, that the employment of machinery is frequently detrimental to their interests, is not founded on prejudice and error, but is conformable to the correct principles of political economy.” Also that: *“the substitution of machines for human labour is often very injurious to the class of labourers ... the same cause which may increase the revenue of the country, may at the same time render the population redundant.”* **David Ricardo, writing at the end of the Post-Napoleonic Depression.**

“ [Technological unemployment] ... 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.” **John Maynard Keynes, popularising the phrase technological unemployment in the 1930s.**

“ ... the major domestic challenge of the sixties: to maintain full employment at a time when automation is replacing men.” **President John F Kennedy, in 1961, when creating the Office of Automation & Manpower in the US Government.**

2. The robots are coming

It's easy to imagine the sci-fi movie. Hoards of people fleeing the oncoming robots, and a billboard advertisement, which reads: *"They're coming for your jobs, and to a cinema near you."* Images of robots capture a visceral fear of the dehumanization of economic activity.

But are the robots coming for our jobs? Or more precisely, will the technological advances in automation we're now seeing, lead to a net reduction in employment?

Dire predictions of the employment effects of technology have been perennial, throughout the ages, and according to one wit go back at least to the creation of the wheel. However, it has also been the case that economists, whilst dallying at times with a negative view (e.g. Ricardo and Keynes, see Box 1), have generally held a positive view of the employment effect of technology.

Economists have railed against the so-called 'lump of labour fallacy,' the idea that there is a limited amount of work to be done, and that the more that is done by machines, the less that can be done by people, thereby creating technological unemployment.

Commenting on the lesson from economic history, that technology has been positive for employment, Bank of England Chief Economist, Andrew Haldane, has written^{iv}: *"Perhaps unusually, the historical data tell a remarkably consistent story."* Haldane cites the stability of the UK employment rate since 1750, despite wave after wave of new technology.

Whilst dire predictions have yet to come to pass, there is also an increasingly

prevalent view that 'this time it's different' and that we may be on the cusp of the age of mass technological unemployment. This would be a seismic shift and break with economic history. The economic and social consequences of such a shift would surely be dramatic, challenging the existing order. But should we be scared, or are the quotes in Box 1, an example of crying wolf?

One might argue that the legacy of a financial crisis induced Great Recession, was always going to be a sluggish recovery (hence extraordinary monetary policy), and that technological unemployment fears will retreat as the recovery lengthens. This point of view harkens back to the technological unemployment views expressed by David Ricardo, after the Post Napoleonic-depression in the early 19th century, and the popularization of the term technological unemployment, by John Maynard Keynes in the 1930s. In other words, depressions or deep recessions, at times of profound technological change, raise fears of a technological explanation for unemployment. But those fears then recede with eventual economic recovery.

Or is this economic view far too sanguine, with the possibility that politics is already reflecting a profound economic shift, with the rise of Donald Trump and Bernie Sanders in the USA and Jeremy Corbyn in the UK? In this 'polarised' world, technology may be tantamount to a regressive tax on the unskilled and lower paid, and not only them.

The Nobel Laureate, Paul Krugman, has pondered the potential nightmare of millions of highly qualified, indebted

students, with no jobs to go to, and how the push for more education may create as many problems as it solves.

One widely quoted study^v by Frey & Osborne, published in 2013, found that 47 percent of workers in the US had jobs at high risk of automation. Replicate studies in Japan and the UK, put the comparable figure at 49 and 35 percent respectively. Former US Treasury

Secretary, Larry Summers, has said that he no longer believes that technological progress is necessarily positive for employment.

So is the lump of labour fallacy exactly that, a fallacy, or might it be correct after all? Will economic history repeat itself, or is it the case, that 'this time it's different?'

3. The Neo-Luddite narrative

The term Luddite is taken to mean someone who resists adopting new technology. The origin of the term goes back to Nedd Ludd, an Englishman who encouraged workers to smash textile machines during the Industrial Revolution.

Throughout this report, we describe the contemporary application of the original term, as the Neo-Luddite narrative (NLN). The NLN, is advocated by many, who agree that whilst the lesson from economic history is that technology is net positive for employment, nevertheless believe that ‘this time it’s different.’

We have identified 10 key themes associated with the NLN, focused on the US economy:

- The speed and pace of change, with the idea that even though technology is creating new jobs, it is destroying old ones faster.
- A focus on the declining share of labour in US National Income since 2000, after hovering between 60-65% over the previous 50 years.
- The widespread displacement of labour by capital – man by machine – as mass automation becomes a reality.
- Technology is eating its way up the occupational ladder i.e. the impact of automation will reach much higher up the income scale, into professional and skilled occupations.
- There will be an extreme polarization of the labour market, and hollowing out of the middle, with future growth in both highly skilled highly paid employment (non-routine cognitive), and low paid low skilled employment (non-routine manual), with large-scale employment loss in routine cognitive and routine manual employment. This is based on the idea that most jobs can be broken down into a series of routine tasks, and that technology has reached the point (or will soon) where it can automate vast swathes of routine work.
- There will be nowhere to run. Agricultural workers migrated into manufacturing in the 19th century. Manufacturing workers migrated into services in the 20th century. Where will services workers go when their jobs are automated in the 21st century?
- Indications of a Great Decoupling underway, with a breakdown in the historical relationship between productivity and employment. This is the assertion that the historic relationship between productivity and employment growth has broken down since 2010, with a widening gap, as rising productivity hasn’t been matched by employment growth. This follows the previous decoupling, highlighted much earlier in the 1980s, between productivity and wage growth in manufacturing.
- The idea that whilst technology historically created new

employment opportunities to undertake the tasks which couldn't be automated (e.g. maintaining the machines), this factor will be much weaker in the

future due to connectivity and the Internet of Things, leading to a world of far less downtime and far more efficiency in the use of resources. Management gurus, such as Michael Porter, have argued that whilst the impact of technology on productivity to date has been disappointing, the situation is about to change (because of the Internet of Things), and^{vi} *"things are going to get interesting."*

- A widening distribution of income being attributed to a technological displacement of jobs. Behind this idea is the view that the root-cause of employment loss in the advanced economies is technological, as opposed to factors such as globalization and offshoring.

Artificial intelligence and deep learning could bring an age where machines

learn faster than men, thwarting the potential for up-skilling and leading to a permanent skills mismatch and technological unemployment.

In the bleakest version of the NLN, argued by leading US academics such as Jeffrey Sachs and Laurence Kotlikoff, the rise in productivity due to future technology, will make our children worse off in aggregate, because the replacement of workers by robots will shift income to the robot's owners, most of whom will be living in retirement, off investment income.

Given that the retired are assumed to save less than those below retirement age, there will be less overall saving, and this would lower investment in physical capital. And because younger age cohorts will be worse off, they won't be able to invest as much in personal human capital, reducing that as well. All decidedly unpleasant.

There is however an alternative interpretation, based on a much more optimistic assessment of the outlook for both technology and employment.

4. Always look on the brighter side of life

The brighter side potential can be seen in 5 key arguments associated with a more positive interpretation of the employment impact of technology:

- The potential for replacing repetitive, mundane, dangerous or unpleasant work with more fulfilling roles – lousy for lovely. A century ago there were 1.3 million miners in the UK, now there are only a few thousand. Education, up-skilling, and being able to adapt and innovate, will enable labour to continue to stay ahead of capital. The obvious transmission mechanism here is ‘within job variation’, and the potential for automation to free-up labour time to perform other tasks. In the UK, Bank of England analysis^{vii} suggests that two-thirds of the jobs created since 2010 have been in full-time and highly skilled professions.
- The potential for absorbing the benefits of future productivity gains in either higher pay and/or lower working hours.
- The potential for overcoming Baumol’s Cost Disease, where sectors which do not increase productivity, still have to increase wages, to retain labour. These are people facing sectors such as health and education. This refers to the US economist William Baumol’s identification of the constraints on service sector productivity growth in certain areas e.g. in teaching and nursing, where it is difficult to increase patient-nurse or pupil-teacher ratios, because of the

inherent human factor. In contrast, in the second machine age, technology penetrates deep into the service sector, and breaks the historic hold of Baumol’s Cost Disease.

- The potential for onshoring and repatriating economic activity previously shifted overseas. This would be facilitated by highly productive capital making onshoring more competitive than offshoring.
- The possibility that we are entering an age of stronger productivity and growth due to the macroeconomic impact of general-purpose technologies.
- Research^{viii} by the Kauffman Foundation shows that over the past 25 years almost all US private sector jobs creation has been in businesses less than 5 years old. Existing firms are net job destroyers.
- The ultimate bright side perspective has probably been expounded by Ray Kurzweil^{ix} in his book, *The Singularity is Near*, where he argues the pace of innovation will soon grow exponentially, and that we are close to a world of super-abundance.

We’ll now examine the micro and macro case for ‘this time it’s different.’ Our essential conclusion is no it’s not.

Microeconomic analysis leads to an optimistic interpretation of the outlook for technology, and macroeconomic

analysis leads to an optimistic interpretation of the outlook for technological unemployment. We can have both. We can have our cake and eat it. However, this is not to argue that technology is going to launch productivity into the stratosphere. Vast swathes of non-routine cognitive and manual work will remain impervious to substitution by capital.

The micro case - routine versus non-routine

Research shows that employment in routine manual and routine cognitive tasks has declined over recent decades, whilst for non-routine manual and non-routine cognitive tasks employment has risen.

Martin Ford argues that most jobs can be broken down into a series of routine tasks and that we now have the capability to automate these tasks, with profound negative consequences for all routine occupations. These are tasks with well-defined procedures, which can be replicated by sophisticated algorithms. But this is more than just automation, it is the capacity for machines to talk to and learn from each other.

It is the routine characteristic, which determines the vulnerability to automation, whether it is in routine cognitive or routine manual tasks. And the reasoning behind the view that technology will eat its way up the occupational ladder, is examples of hitherto skilled/highly skilled tasks already being taken on by a machine, and the perceived future potential for these technologies.¹

¹ Examples include medical diagnostics, medical robotics, X-ray interpretation and the para-legal discovery process.

The Osborne & Frey study, cited above, found that 47 percent of US jobs were at high risk of potential automation.

Commenting on the outlook over the coming decade, Frey & Osborne stated: *“Most workers in transportation and logistics occupations, together with the bulk of office and administrative support workers and labour in production occupations, are likely to be substituted by computer capital.”*

Subsequent work by the Bank of England, using the same methodology, put the UK at risk figure at 35 percent. A replicate study in Japan suggested that 49 percent of the workforce was susceptible to automation.

However, we're not there yet. Today's robots remain highly limited in their functionality and power of reasoning. There is still a yawning gap between the potential impact of automation, and the reality in the near future. But as we can see from examples such as the advanced stage of driverless car testing by Google, what was once science-fiction, is now firmly rooted in reality.

Of course, tasks susceptible to automation, does not mean that they will definitely be automated. Future wage levels (the cost of labour) and the price of the new automated kit (the cost of capital goods) also have to be considered. Will the vast secular fall in the price of computing seen over recent decades, exemplified in Moore's Law, be maintained into the future?

Notwithstanding these cautions, Martin Ford and others, do set out a persuasive case that at least from a microeconomic perspective, technological advances

mean that the impact of technology will be felt far wider and deeper, and perhaps sooner than we think, in the future.

However, should technological optimism be combined with optimism or pessimism with regard to technological unemployment? This is the question to which we now turn.

The macroeconomic case for optimism

Is technology really destroying jobs faster than it's creating them? Given the technological pre-eminence of the United States, one would expect to see the employment and unemployment impact of technology to be most pronounced there. But there is no secular upward trend in unemployment and/or downward movement in employment. Long-term tracking shows employment and unemployment moving in response to cyclical developments, without a secular trend, and with the US unemployment rate currently standing at around 4% at the time of writing. US employment and unemployment data show no evidence that 'this time it's different' and that technological change is destroying jobs faster than it is creating them.

Of course, when we talk about the impact of technology on employment, we have to be mindful that the headline numbers are net, derived from two separate flows of job creation and destruction. Here again, however, there is no evidence of a shift in the rate of job destruction relative to job creation over recent decades - according to Bureau of Labor Statistics figures relating to business employment dynamics.

Examining figures for total employment, omits the potential for significant

geographical variation in unemployment due to skills mismatches, as jobs are lost in one part of the country, but created in another. This is the political opportunity presently being exploited by Donald Trump and Bernie Sanders in the US. As we will see, however, where manufacturing employment loss has occurred in the US, the primary (but not exclusive) explanation is almost certainly overseas outsourcing, not technology.

Displacement and replacement effects

The lack of any secular upward trend in unemployment or downward trend in employment, should not surprise us. Economic theory suggests a twofold impact of technology on employment:

- Displacement effects.
- Replacement effects.

The displacement effect is the first round impact of the introduction of a new process or product innovation – what we might call 'the new kit'. This first round effect reduces employment in the company purchasing the new kit (because the motivation for the investment was to raise productivity and reduce costs). The size of this displacement effect will depend on the elasticity of substitution between labour (existing workers) and capital (the new kit).

The initial negative impact on the purchaser is where most commentary on the employment effects of technology stops. Stopping at this point misses the fundamental point, however, that 5 other employment effects also arise from the introduction of a new product or process technology. These are the replacement effects, which we term the technology multiplier:

- The first round replacement effect raises employment in the new kit producer. New technology is not ex-nihilo, arising from nothing. It has to be imagined, designed, funded, built, marketed and sold. All this creates employment, the scale of which will be determined by the domestic and international market potential for the product or process.
- The second round replacement effect on the new kit user will depend on the price elasticity of demand for that company's product or service. If the new kit purchased results in a significant cost saving (assuming a competitive market where cost gains are largely passed on to consumers) and price reduction in the kit user's product or service, then an elastic demand curve could result in higher employment and/or wages in the new kit user.
- The second round replacement effect on the new kit producer's sector, as a result of new entrants, creating new enterprises in the wake of the new product or process technology.
- The second round replacement effect on other producers is created by the price reduction for the new product or process increasing real income across the whole economy, thereby increasing the demand for goods and services generally.
- The employment effects above are then amplified through the impact on employment in the supply-chain (indirect employment) and the expenditures of those in

employment (induced employment).

The total employment effect will depend on: (1) The elasticity of substitution of labour for capital – to what extent are these factors of production substitutes or complements (discussed below). (2) The market potential for the new product or process technology and how scale-able it is. (3) The scale of the cost saving and the elasticity of demand for the products and services of those purchasing the new product or process technology i.e. to what extent will it boost their own revenues.

In order to take a pessimistic view of future technological unemployment, the displacement effect on unemployment needs to outweigh all 5 subsequent replacement effects on employment. We believe this is a very big ask, and we can therefore take an optimistic view of the future impact of technology on unemployment.

Savings from productivity gains flow back to the economy in 3 ways, via lower prices, higher wages or higher profits, and these flows increase economic activity. Indeed, it is tempting to argue, that at least in theory, the bigger the displacement effect the bigger the replacement effect.

Perhaps one of the reasons why people struggle to accept the economic evidence, relates to the images we see on our TVs. We see the news clip of the factory closure, but not the jobs created elsewhere. It's also the case that we simply don't know what the jobs of tomorrow will look like. People can visualize the robot walking away with their job, but they can't envisage the jobs which technology might bring, because they are as yet unforeseen. Technology changes the composition of

employment. But we can't find evidence that technology is leading to a new profound negative impact on total employment.

There is also strong evidence for the ability of technology to boost spending power and employment in many traditional occupations in personal services. A study by Deloitte^x on the relationship between jobs and the rise of technology, trawled through Census data for England and Wales, going back to 1871. Their conclusion was that rather than destroying jobs, technology has been a "*great job-creating machine.*" So the economic evidence to date, together with economic theory, support the notion that technology is good, not bad for employment.

5. Should we be concerned about the declining share of labour in GDP?

Another concern raised in recent years, possibly related to the technological revolution underway, is the declining share of labour income and rising profit share in GDP. The share of labour compensation in US National Income has fallen to levels not seen since the 1950s, having hovered in a stable 64-67 percent range for most of the past 50 years. The decline in the labour share has been evidenced in most advanced economies, but we focus here on the US evidence.

It's complicated, but when you allow for methodological and measurement issues the drop is greatly reduced.

Moreover, some research suggests that all the rise in the share of capital can be explained by rising housing values. On top of this, the labour share in the service sector has continued to rise, with the overall labour share declining because of a precipitous drop of around 10 percentage points in the labour share in manufacturing.

Whilst there is clearly a degree of uncertainty as regards the precise source of the declining share of labour, there is enough evidence to conclude that a lot more is going on than simply technological change.

Conclusions

Economic history teaches that the long-term employment effect of technological change is positive. But in recent years the conventional wisdom has been challenged by those arguing that 'this time it's different' and that we are facing an age of mass technological unemployment. If true, the consequences of such a shift would be dramatic, challenging the existing economic and social order.

GFF challenges the revisionist school, what we term the Neo-Luddite narrative. When examining the micro and macro case for 'this time it's different' our essential conclusion is: No it's not.

The Neo-Luddite narrative suggests that an optimistic view of both technology and technological unemployment is mutually exclusive. We disagree, arguing that you can have both - have your cake and eat it.

Economic theory suggests a twofold impact of technology on employment: (1) Displacement effect – rising unemployment. (2) Replacement effects – rising employment.

In order to take a pessimistic view of future technological unemployment, the displacement effect on unemployment needs to outweigh all 5 subsequent replacement effects on employment. We believe this is a very big ask, and that as a result, we can take an optimistic view on the future impact of technology on unemployment. The 5 replacement effects combine to form what we call the technology multiplier.

However, this is not to argue that technology is going to launch productivity into the stratosphere. Vast swathes of non-routine cognitive and manual work will remain impervious to substitution by capital. It is the routine characteristic, which determines the vulnerability to automation, whether it is in routine cognitive or routine manual tasks. Technology will change the future composition of employment.

Given the technological pre-eminence of the United States, one would expect to see the employment and unemployment impact of technology to be most pronounced there. But we cannot find any US evidence that 'this time it's different' and that technological change is destroying jobs faster than it is creating them.

The employment losses seen in US manufacturing have little to do with technology, and much more to do with outsourcing overseas.

The views expressed by the economist David Ricardo, after the Post-Napoleonic depression in the early 19th century, and John Maynard Keynes, in the 1930s, show that depressions, at times of profound technological change, raise fears of a technological explanation for unemployment. But those fears then recede with eventual economic recovery. We may or may not experience the same effect as the recovery from The Great Recession lengthens.

About the author

Graeme Leach is Director of Economics at Global Futures and Foresight. He is one of Britain's leading economists and a former Chief Economist and Director of Policy at the Institute of Directors (IoD), where he was also a member of the Board. Graeme represented the IoD in economic discussions with the Chancellor and 10 Downing Street. He is a visiting professor of economic policy and a senior fellow of the Legatum Institute in London. He is also a member of the IEA Shadow Monetary Policy Committee (SMPC).



Graeme has spent a lifetime in economics, futures and foresight, having started his career at The Henley Centre for Forecasting.

Over recent decades Graeme has made 100s of speeches on the future economy and megatrends, in more than 25 countries across the globe.

Graeme has also undertaken 100s of live television and radio interviews on BBC News, Sky News, Radio 4's Today Programme and others. Over the past 5 years he has written a weekly column for the City AM newspaper and numerous articles for the Daily Telegraph.



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About Global Futures and Foresight

Global Futures and Foresight is a research and consulting firm that helps organisations be better prepared to embrace change, innovate and develop new strategies and solutions and helps clients to avoid the risk of being blindsided by external disruptive change.

The GFF has been engaged by some of the most prestigious firms from around the world including: The European Commission, NATO, BBC and financial services firms including HSBC, Lloyds/TSB, Atom Bank, RBS, Lloyds, More Than, e-sure, Travelers, Allianz, QBE and Lloyds syndicates along with many other prestigious firms including CSC, Unisys, Cisco, Microsoft, Siemens, Deloitte, Ernst & Young, PWC, Linpac, Kraft, Heinz, John Lewis, Roche, Philips, Ogilvy etc. He is also a regular lecturer at business schools across Europe.

The GFF is a Futures Framework supplier of futures methods and insights to the UK government via the Department for Business, Energy and Industrial Strategy.

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About Marcela Lopez, Artist (Front cover by Marcela).



Marcela Lopez, Colombian artist with European influences based in UK. Commissions and artwork for sale. My subject matter is landscape. Using my hands I choose plaster to capture the movement of water and trees on wooden boards. Through my artwork I intend to invite viewers to a peaceful moment of reflection. I see my artworks gently brightening up any space and being a source point of serenity and comfort.

ⁱ The Second Machine Age: Work, Progress and Prosperity in a time of brilliant technologies, E. Brynjolfsson and Andrew McAfee, 2018.

ⁱⁱ The Fourth Industrial Revolution, Klaus Schwabb, World Economic Forum, 2017.

ⁱⁱⁱ <https://fastfuture.com/wp-content/uploads/The-Future-of-Business-v2c.pdf>

^{iv} <https://www.bankofengland.co.uk/-/media/boe/files/speech/2018/ideas-and-institutions-a-growth-story-speech-by-andy-haldane>

^v https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

^{vi} <https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition>

^{vii} <https://www.bankofengland.co.uk/-/media/boe/files/speech/2015/labours-share>

^{viii} <https://www.kauffman.org/resources/entrepreneurship-policy-digest/the-importance-of-young-firms-for-economic-growth/>

^{ix} The singularity is near – When humans transcend biology, Ray Kurzweil, 2005.

^x <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/finance/deloitte-uk-technology-and-people.pdf>