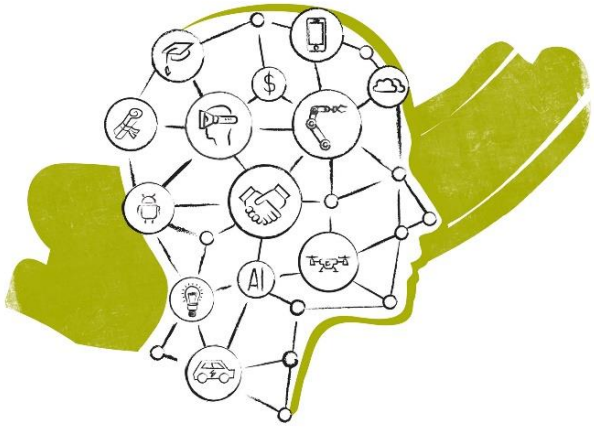
Will machines replace humans in the future of work?



Webinar
Thursday 30 July 2020, 3pm

With Dave Heatley
New Zealand Productivity Commission

NEW ZEALAND
PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa

techweek2020
27 July - 2 August

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To understand the future, it's best to start with the past

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I'll start with history

- People have long worried about tech replacing jobs
- But technological unemployment hasn't happened
- Why not?

Then look at the tech fueling current concerns

- How does the latest tech (AI etc.) differ from "old" tech?
- Is this time different?

Has COVID-19 trumped the tech crisis?

- Will COVID-19 delay or stimulate new tech?

Jobs, tech and existential threats

Jobs are central to our lives

- Our income, status & personal identity
- A threat to jobs is an existential threat

Looking backwards, tech change is awesome

- Which century would you prefer to be born into?

Looking forwards, tech change is scary

- Bad stuff could happen

If machines do human jobs, cheaper or better

- Will there be jobs left for people?

Robots take jobs – popular logic

Robots perform human jobs at lower price

Employers replace workers with robots

- to cut costs & increase profits

Workers' skills are no longer valuable

- they face unemployment or a lower-paid job

Remaining jobs are either

- high skill & well paid (robot supervisors); or
- low skill, poorly paid & precarious

So robots create misery & inequality

20th Century headlines: Machines will replace humans

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THE NEW YORK TIMES, SUNDAY, FEBRUARY 26, 1928. XX 3

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

By EVANS CLARK.

A FEW days ago the General Motors Corporation reported the [illegible] called public attention to serious unemployment throughout the State: not since the depression of 1921, it was disclosed, have conditions been as bad.

The people of the United States—in the shadow of a Presidential election—are presented with a social paradox as serious as it is dramatic. At a time when American prosperity has become an [illegible]

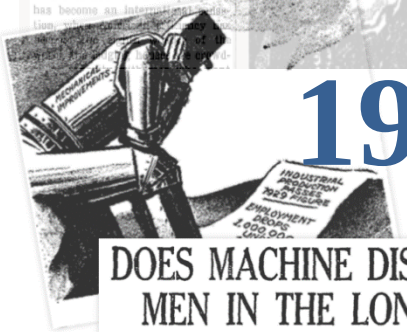
have gone far to make construction a machine industry instead of a collection of hand trades. One gasoline crane takes the place of ten or twelve laborers. The hod-carrier has disappeared before the invasion of the material hoist. In concrete construction building materials are mixed, like dough, in a machine and literally poured into place without the touch of a human hand. The Ohio figures record these results: with 15 per cent. fewer men employed, contractors put up 11 per cent. more square feet of finished buildings last year than in 1923.

Coal Mined by Machines.

Coal mining, popularly thought of as a highly skilled manual trade, is fast being transformed into a factory routine. Already 71 per cent. [illegible] is coal is [illegible] coal com-

1928

1940

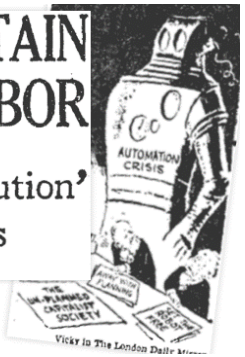


DOES MACHINE DISPLACE MEN IN THE LONG RUN?

1956

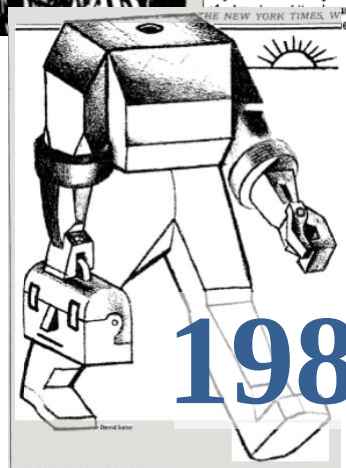
AUTOMATION IN BRITAIN STIRS UNREST IN LABOR

Workers See 'Robot Revolution' Depriving Them of Jobs



Vicky in The London Daily Mirror

1980



David Sutor

DETROIT — Technological innovation is widely billed as a miracle cure for the United States' economic doldrums. Its aftereffects, however, may be far from benign. The introduction of revolutionary new technologies such as robots — versatile computer-controlled mechanical arms — raise two painful possibilities: sizeable losses of jobs and a deteriorated quality of working life.

The threat of lost jobs, although also dependent on social and economic factors, is especially critical. Auto makers are already buying robots in record numbers, despite a downturn that has resulted in 250,000 indefinite

A Robot Is After Your Job

By Harley Shaiken

proportionate impact on a few key industries. Robots that begin work tomorrow will still be on the job in

What does history tell us about this threat?

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Not all promised tech arrives

- Where is my flying car?

Tech change is normal

- So is labour market change
- People adapt, individually and collectively
- But sometimes very disruptive for individuals

Technological unemployment has not occurred

- Over time, tech has created as many jobs as it destroyed

Robots create jobs – economic logic

Tech can augment labour

- spreadsheets made accountants more productive, increasing the demand for accountants

Tech lowers costs

- reducing the price of consumer goods & services
- consumers buy more, creating jobs

Tech creates new markets & occupations

- e.g. search engine optimisers, social media influencers & data scientists

So why fear the robots?

21st Century headlines: Machines will replace humans

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SCIENCE

Jobs Created and Displaced **2010**

The pattern by which new technologies and high-tech businesses create jobs across the economy is well established.

Robot Makers Spread Global Gospel of Automation **2013**

OPINION **2015**

The End of Work?

When robots start doing all the work,

Most Americans See Artificial Intelligence as a Threat to Jobs (Just Not Theirs) **2018**

AUTOMATION NATION

Evidence That Robots Are Winning the Race for American Jobs

2017

Soon a Robot Will Be Writing This Headline **2020**

What has sparked the fears this time?

Significant theoretical & practical advances in machine learning (ML) from around 2009

- invigored tech evangelists, who saw solutions to the long-standing failure of AI to live up to earlier promises
- ML underlies a new wave of tech, e.g. robots, software bots & autonomous vehicles

Re-ignited age-old concerns

- Frey & Osborne put precise numbers on the effects in 2013

47% of US jobs would be lost to automation in 1–2 decades

Does machine learning make humans redundant?

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ML made advances with some “hard” problems

- e.g. image recognition, voice recognition & language translation

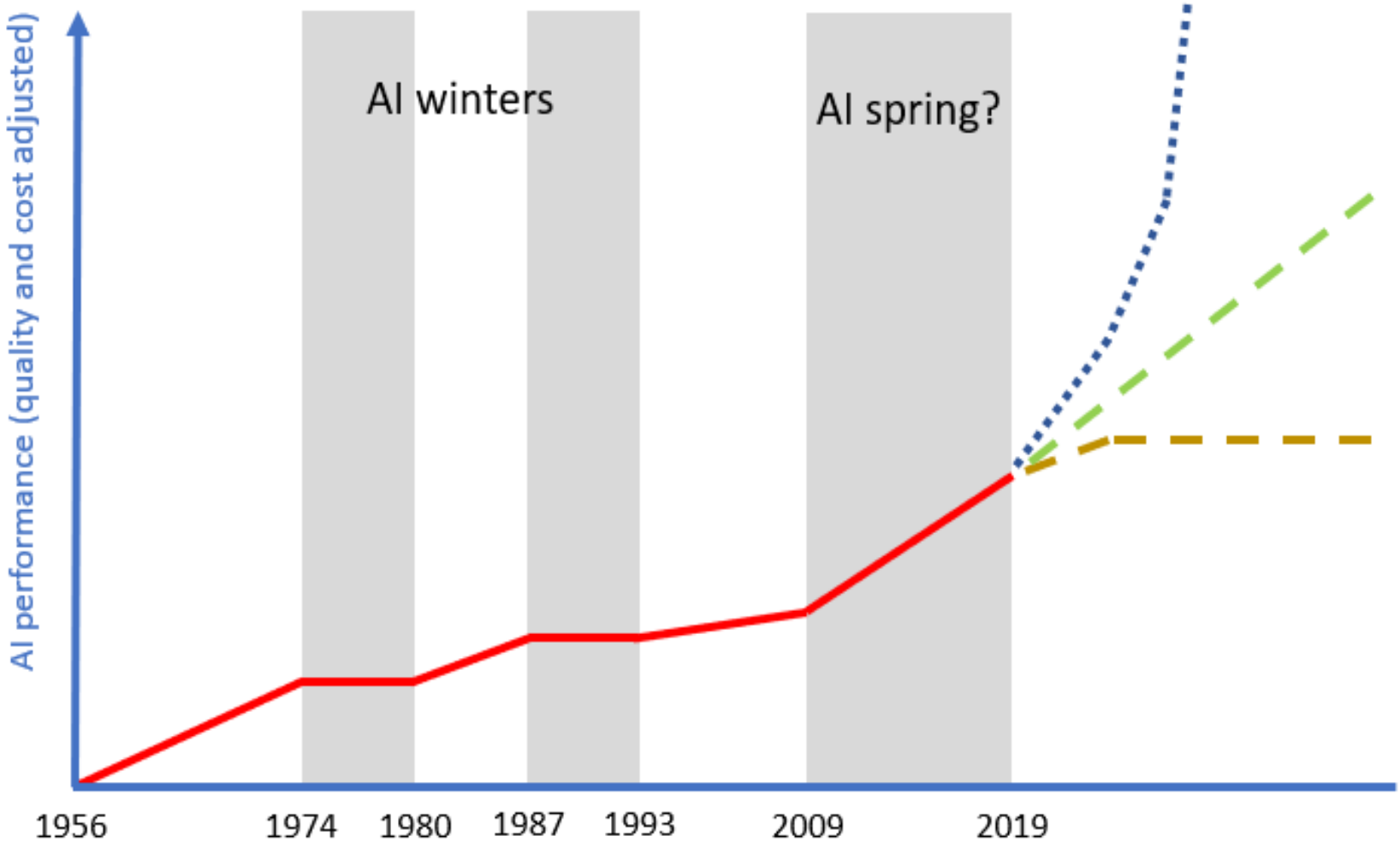
ML is very good at interpolation

- Deciding what to do with situations well represented in its training dataset

But poor at extrapolation

- Dealing with novel situations outside its training
- Humans are good at this
- Computers still struggle with tasks a 4-year old finds easy

Flat, linear or exponential? Which path will AI follow?



What's more … this time people also claim

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Tech is changing *faster than ever before*

- It will overwhelming the labour market's ability to adapt

This tech replaces human cognition

- Whereas old tech replaced muscle and dexterity

This tech replaces services-sector jobs

- Previous tech stripped primary and manufacturing jobs, but services soaked up excess labour
- Now no "untapped" sectors remain

This tech fragments work and workplaces

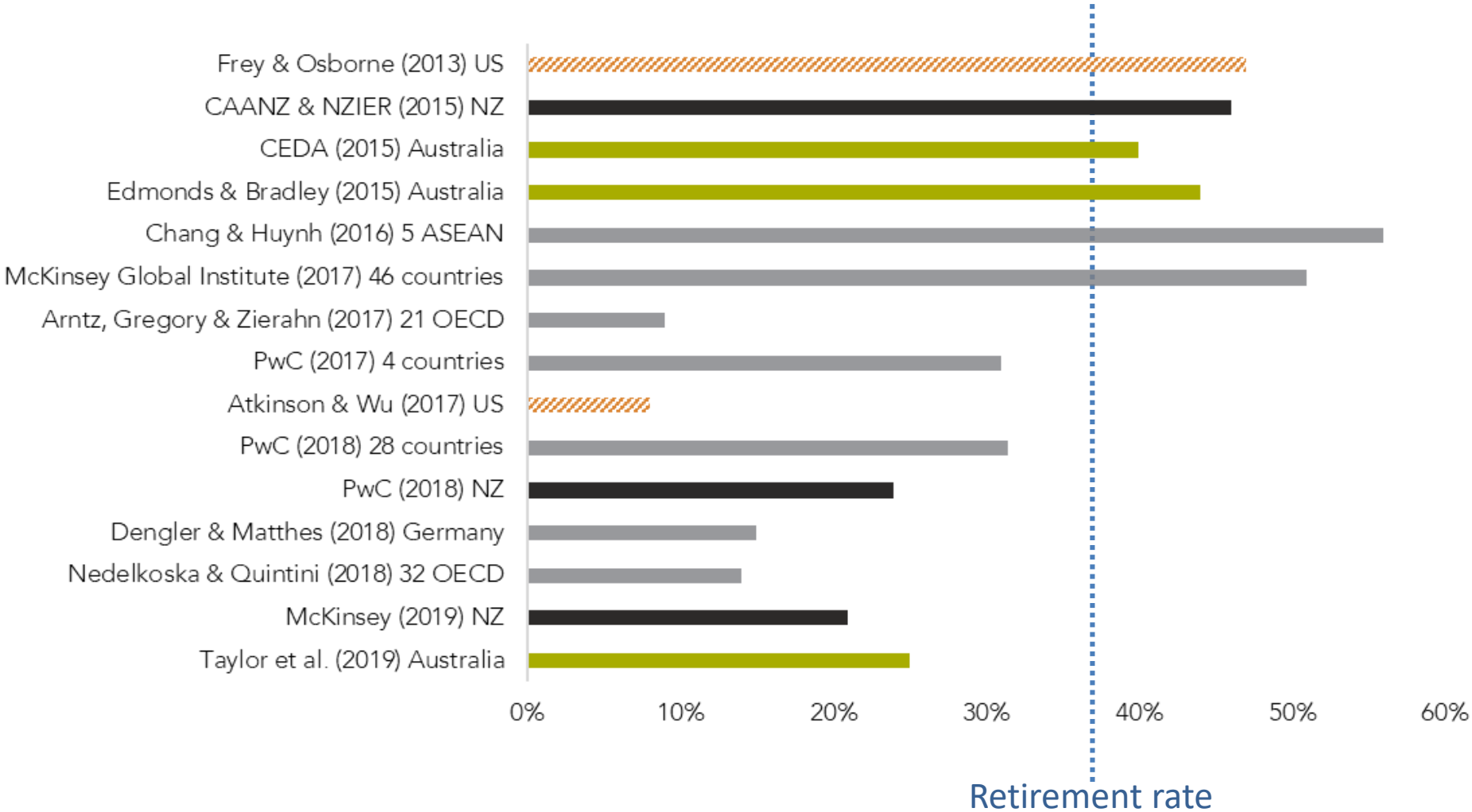
- Alienating and disempowering workers

How best to test the claims?

The Productivity Commission's inquiry sought to answer:

- Are the predictions of labour market disruption credible?
- How is the rate of tech change best measured?
- How does the current rate compare with the past?
- How does tech affect the labour market?
- Has the labour market been affected?
- Is tech "disruption" imminent?

A new "industry": predictions of jobs at risk from automation in next 10-20 years



Are these predictions based on robust methodology?

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These studies

1. predict new tech adoption rates
2. assign automation probabilities to specific occupations
3. combine these with existing occupational counts to estimate the proportion of jobs that would be "disrupted"

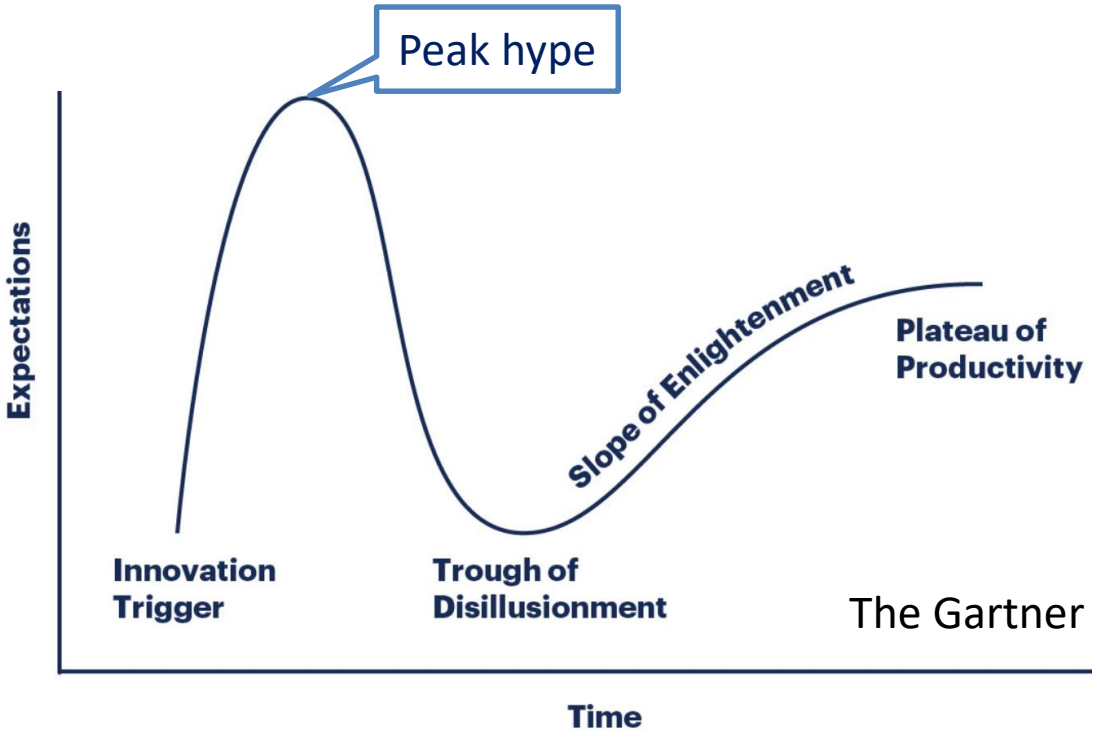
But they typically

- base adoption rates on observations of *successful* tech, ignoring the less successful
- conflate "could be automated" with "will be automated"
- assume no price changes or second-round economic effects

Their results are highly dependent on assumptions

How fast is tech changing?

Tech hype is an unreliable guide



The Gartner Hype Cycle

The reality of new tech

New tech needs investors & customers

- Promoters make outlandish claims, competing for attention

Very few technologies live up to their hype

- e.g. Segway, Google Glass, nuclear fusion, Apple Newton

Expert systems drove an earlier round of AI hype

- Would have replaced doctors etc. with decision rules
- Much hype in the 1980s, but faded completely from sight

Tech typically ends up addressing a narrower market & penetrating it more slowly than early predictions - or failing completely

So what is a better indicator of the speed of tech change?

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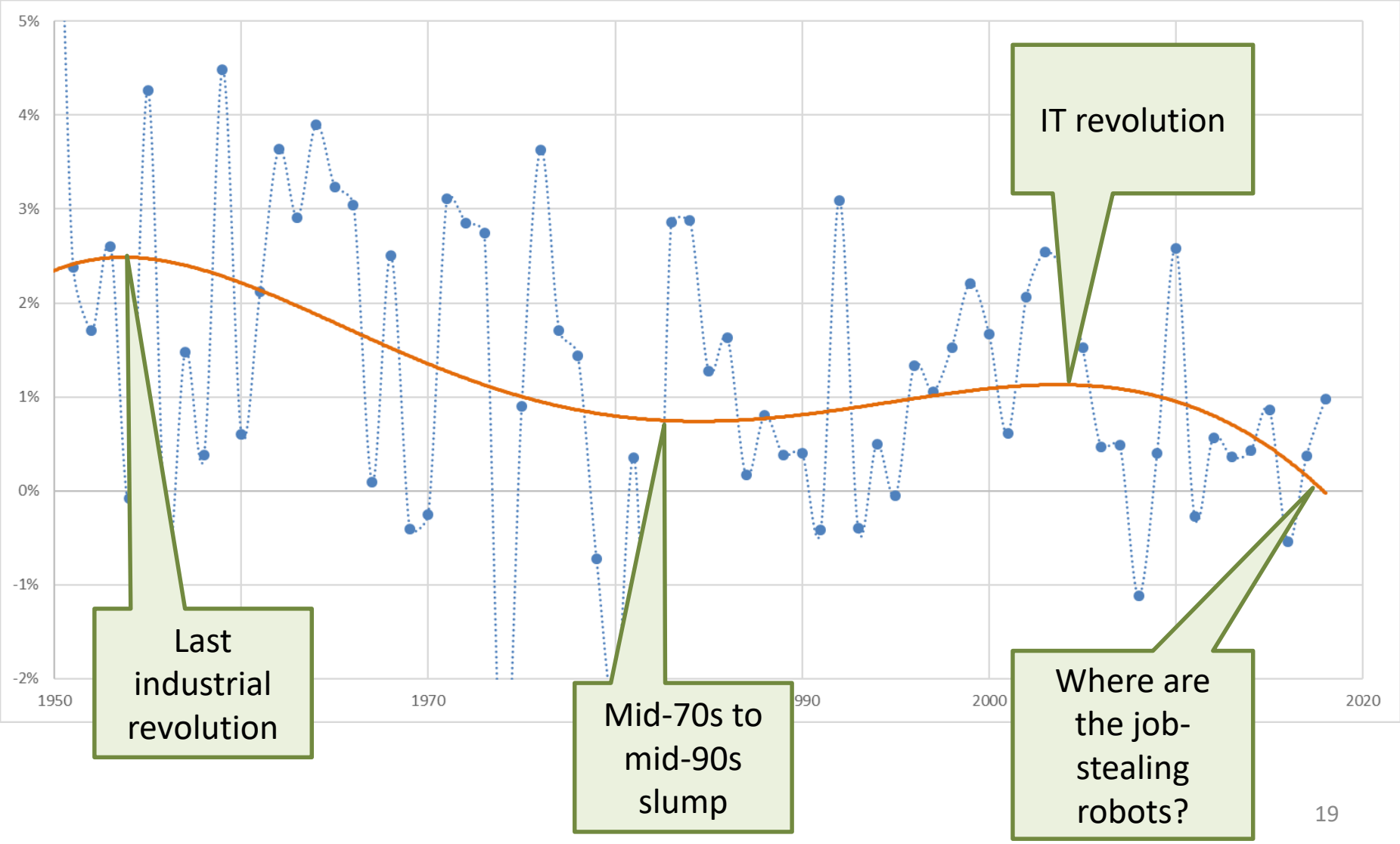
- Falling tech prices increase the productivity of capital
- Substitution of labour with tech increases the productivity of remaining labour
- Augmenting labour with tech also increases labour productivity
- New business models and input combinations increases multi-factor productivity
- So **productivity growth** is a useful indicator of the **gains realised** from tech adoption

Productivity growth is slowing - US data, 1949–2018



If tech was accelerating, we might expect to see labour-market effects

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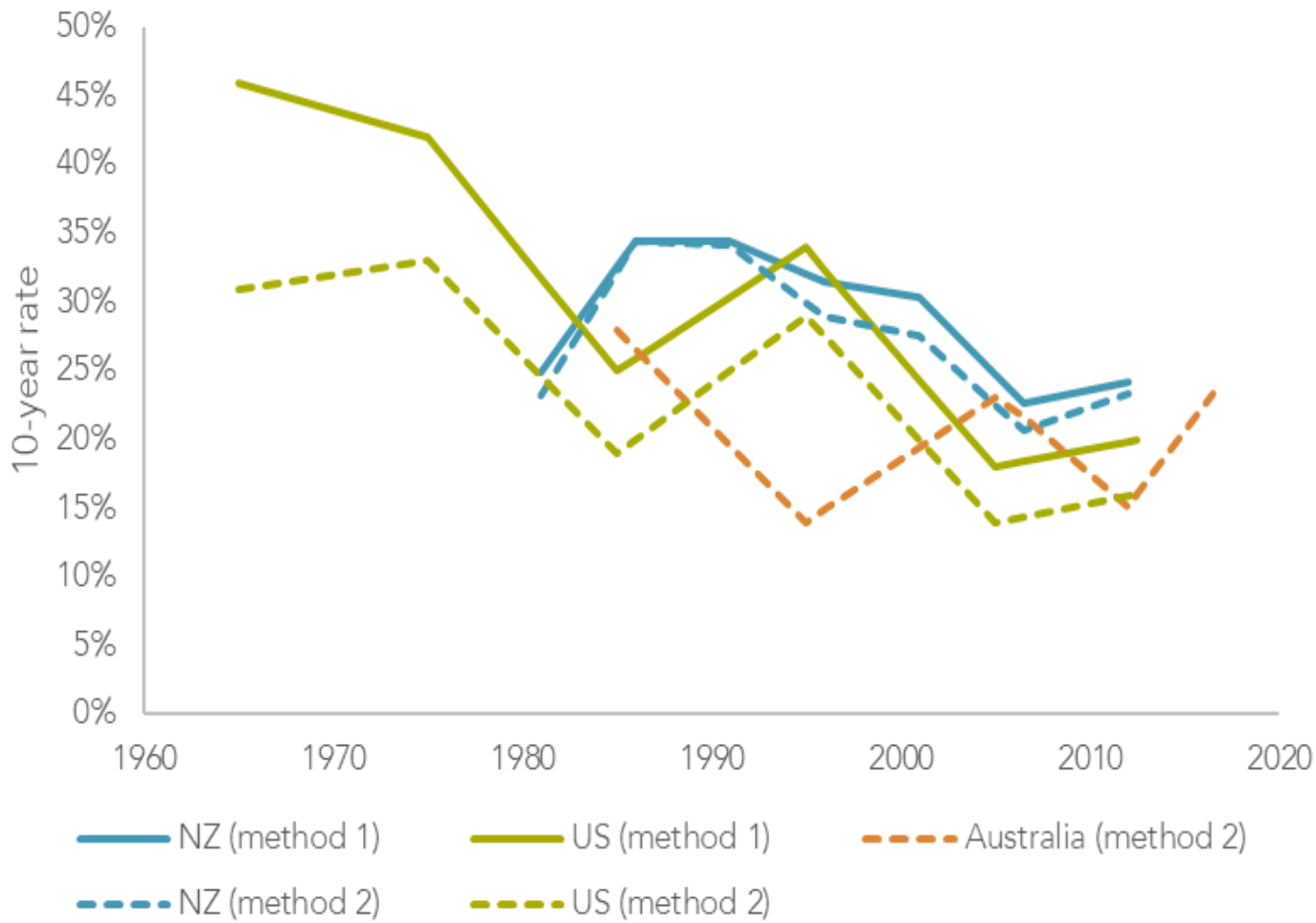
- Increasing occupational drift (people moving in to or out of occupations as jobs expand or shrink)
- Rising unemployment
- Falling labour-market participation
- Workers with depreciated skills taking longer to find work
- Older people exiting the labour market, as they have outdated skills and lower returns to retraining
- Slowing job-to-job movement, as workers hang on to their current jobs
- More short-term, part-time, casual or “gig” work

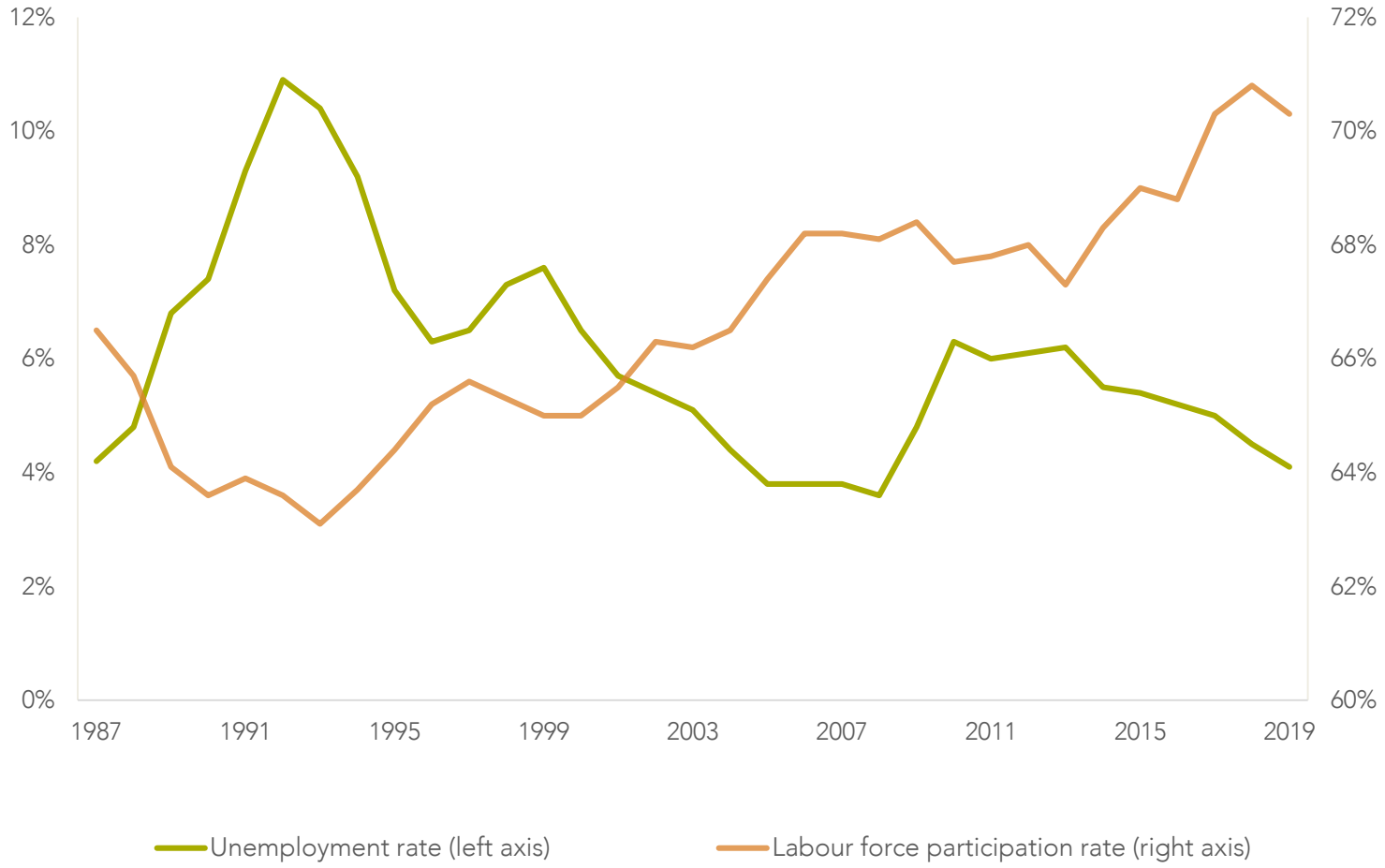
What do we find in the NZ, Australian and US data?

US occupational drift is slowing, 1850–2015

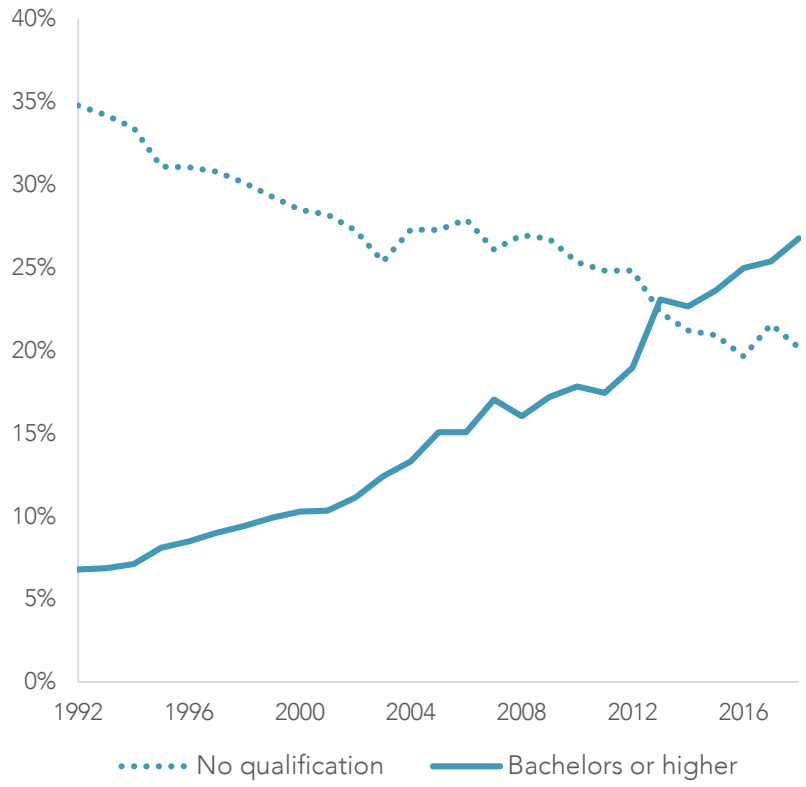
Occupational drift has slowed in NZ and Australia, 1960s–2010s

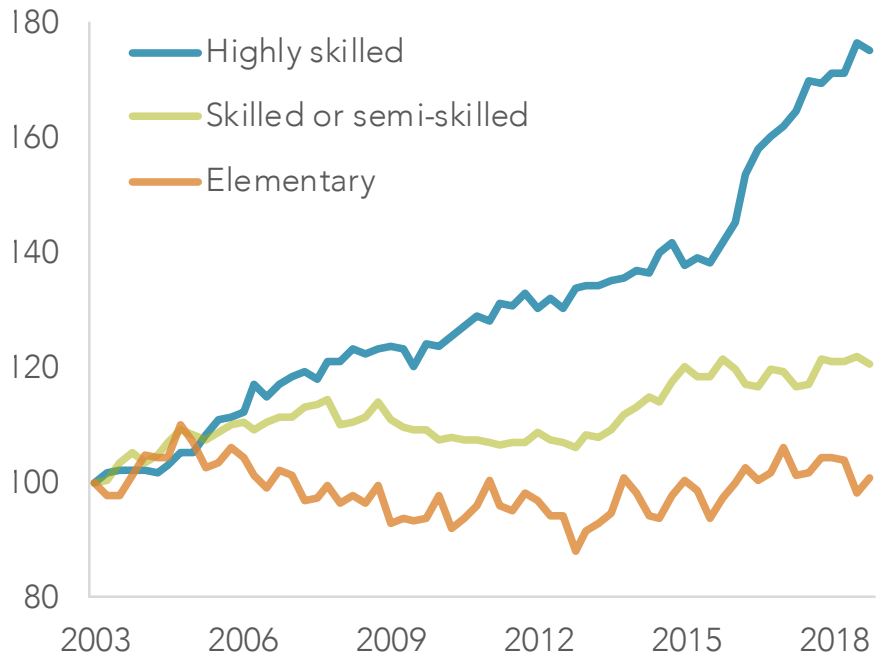


2019 unemployment near a 40-year low, participation at historic highs in NZ

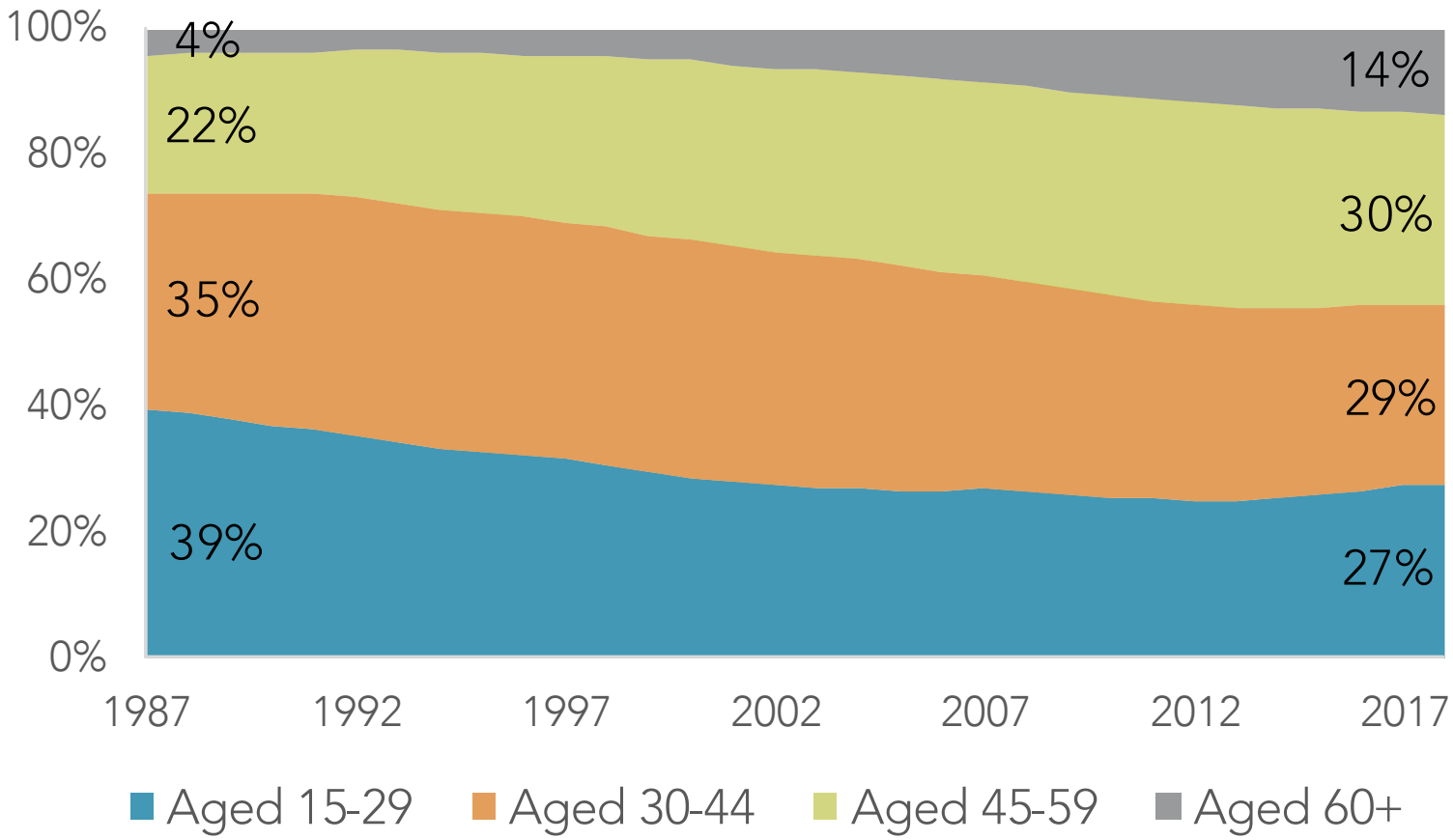


More workers are highly-qualified, but low-skilled jobs did not disappear in NZ





Older workers are increasing, not reducing, their share of NZ jobs



Work arrangements didn't change much either …

No evidence of increasing casualisation, self-employment or other "non-standard" work

Despite high profile examples, most non-standard work is not platform-mediated "gig" work

- Platform work is growing, but from a very small base
- People tend to do platform work for short periods and for supplementary income, not as a main job

Back to the predictions: Are they just running late?

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Now 7 years into Frey & Osborne's 10-20 year prediction frame

- We *should* have seen something by now
- It could be just delayed, but more likely both the tech and its labour-market effects were over-hyped

Early predictions relied on what have turned out to be overly optimistic uptake of (e.g.) autonomous vehicles

- These turned out to be a much harder technical problem than people thought a few years back
- Many now predict no widespread use before 2030s (or 2040s…)
- Jobs have expanded, not contracted, in truck driving, taxis, etc.

Summary

Tech change has slowed, not accelerated over recent decades

- Predictions of widespread unemployment from tech change are not supported by the data
- Tech disruption is not imminent

Slowing tech change is problematical, because

- More & faster tech adoption improves living standards
- Slow productivity growth does not build individual & collective resources needed to deal with other threats

Has COVID-19 trumped the robot crisis?

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Until early 2020, NZ enjoyed a long period of high labour market participation and falling unemployment

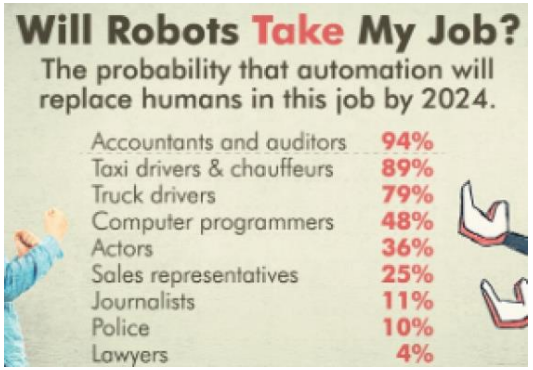
- This clearly is no longer the case
- Unemployment has risen sharply, and will rise further as wage and business subsidies are withdrawn

Those worried about robots offered career advice

- Prefer jobs with human-to-human interaction
- Prefer service industries – hospitality, tourism
- Avoid accounting, driving, computers, …

Sounds poor advice for a COVID-19 crisis!

- Choose the crisis you prepare for with care …



Recovering from COVID-19

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Deep recessions change incentives and prices

- Business investment falls
- Wages fall, making labour more cost-competitive with tech
- It is easier for employers to get skilled, reliable workers

Expect *slowing* tech development and adoption

Working from home is the COVID-19 "new normal"

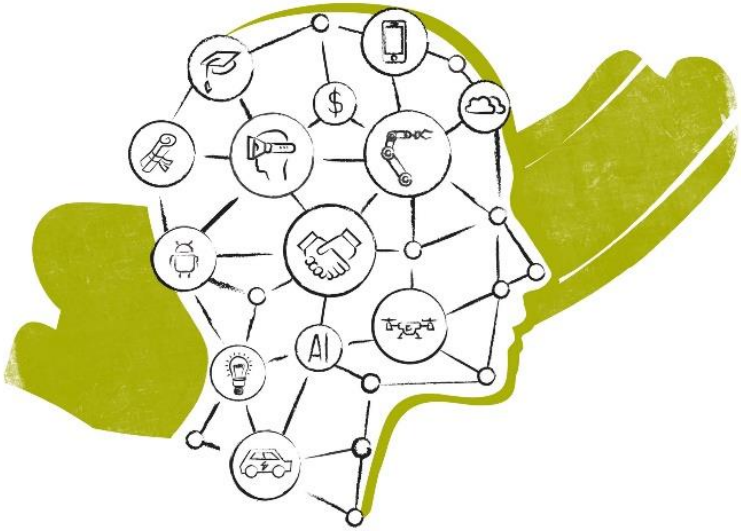
- But it may not stay that way
- The world rewards solving complex problems, which works best with co-located teams

Supporting displaced workers very important

- As are economic conditions where businesses can again thrive

Thank you

Questions



www.productivity.govt.nz/inquiries/technology-and-the-future-of-work/

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