Little evidence of technological unemployment over long term
Pickup in real wages lagged productivity during the 1st IR

Engels’ Pause - Growth in output per worker exceeds real wage growth

Source: A Millennium of Data, Bank of England. Note: series are ten year moving averages
Technology impacts labour market through...
Technology impacts labour market through **destruction**...
Technology impacts labour market through **productivity**...
Technology impacts labour market through creation...
Could this time be different?

4th Industrial Revolution replacing heads not hands?
Jobs with tasks at risk of automation: huge range of estimates

- 50%: Frey & Osborne (2017)
- 30%: PwC (2016)
- 9%: Arntz et al. (2016)

Technology adoption lags decreasing over time

Technology adoption lag is a mean estimated lag in cross-country technology diffusion.

This time it’s faster?

1st IR (54 years)
2nd IR (66 years)
3rd IR (34 years)
4th IR? (12 years)

Annual change in sectoral employment shares (pp)

-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0

Expanding
Shrinking

1817-1871
1871-1937
1973-2007
2018-2030

Agriculture & Mining
Manufacturing
Services

11
Technology driving labour share down globally

Source: IMF April 2017 WEO. Notes: the chart shows the labour share and relative price of investment across advanced economies.

UK inequality high but stable
Technology polarising labour market

Technology polarising labour market

<table>
<thead>
<tr>
<th>Institution</th>
<th>Effect</th>
<th>Examples</th>
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<tbody>
<tr>
<td><strong>Enabling institutions</strong></td>
<td>Transformed the skill base of workers</td>
<td>Spread of primary, secondary, tertiary and technical education</td>
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<tr>
<td><strong>New insurance institutions</strong></td>
<td>Supported those displaced</td>
<td>Unemployment insurance, universal healthcare, state pensions, child benefit</td>
</tr>
<tr>
<td><strong>Labour market institutions</strong></td>
<td>Influenced provisions and shared the surplus</td>
<td>Friendly Societies, Trade Unions, Co-operatives, minimum wages</td>
</tr>
<tr>
<td><strong>Employers</strong></td>
<td>Created environments to help employees thrive</td>
<td>“Model Villages” (providing housing, schooling and recreation), higher pay (Ford’s $5 initiative), occupational pensions</td>
</tr>
</tbody>
</table>
Business

• Identify skills mismatches and adopt anticipatory talent management strategies
• More effective workforce training, as skill set of existing employees is rate limiting factor of technology adoption
• Corporate re-training programmes for workers to be retained by company and returned to workforce
• Providers of general purpose technologies explore opportunities to maximise job-creating, augmented intelligence
Labour market institutions

• Balance labour mobility with appropriate protection of workers in new, non-standard jobs
• Taylor Review of modern working practices suggests people working for platform-based companies be classed as dependent contractors
• Embrace technology-enabled solutions to improve matching and bridge skills gaps
• Enhance benefits and data portability (including reputational histories of dependent contractors)
• Incentives for human capital and physical investment
Enabling institutions

• Successive IRs developed primary, secondary and tertiary education
• Could 4IR lead to quaternary education?
  • Institutionalise re-training in mid-career
  • Integrated with social welfare system
• Universal support schemes for retraining
  • The UK’s Flexible Learning Fund and New Enterprise Allowance
  • Singapore’s SkillsFuture programme
Financial system

• New payment solutions for distributed commerce and real-time P2P transactions
• More effective, platform-based finance for SMEs
• Data-based financing for intangibles
• More efficient cross border transactions and trade finance through better payments plumbing and robust digital IDs
• Expand impact investing to build social capital consistent with new labour market
Monetary policy
Potential inflationary consequences

- Lower labour demand relative to supply
- Increase in structural unemployment from skills mismatches and other frictions
- Changing worker bargaining power due to increased automation

Graph showing excess demand and excess supply with inflation on the y-axis and supply-demand on the x-axis.
The Future of Work

2018 Whitaker Lecture, Central Bank of Ireland

Mark Carney
Governor

14 September 2018