The Festival of Social Science at NIESR

Inaugural Prais Lecture on Productivity: How not to miss the productivity revival once again

Bart van Ark, Chief Economist at The Conference Board, New York

Monday 4th November 2019 17.30-18.30pm

#NIESRFestival #ESRCFestival

National Institute of Economic and Social Research
How not to miss the productivity revival once again

Inaugural Prais Lecture on Productivity by Bart van Ark
November 4th 2019
Honouring Sig Prais (1928-2014)

• Sig’s experience with business of his family gave him insights into productivity, management and work organisation which was later to become a focus of his research.

• Initially his focus was on productivity and industrial structure, moving to a closer analysis of the role of vocational training in productivity improvements in the 1980s.

• On the basis of his cross-country comparisons of education and training systems, he concluded that poor quality and education were at the root of the UK’s productivity problem and were internationally acclaimed.

Source: Heather Rolfe, NIESR, 5 August 2018, https://www.niesr.ac.uk/blog/remembering-professor-sig-prais
How not to miss the productivity revival once again?

1. THE DIAGNOSIS (especially for the last 10 years)

*Why haven’t we seen a productivity revival (in the UK and beyond) “yet”?*

- Macro level: drivers of growth, measurement, fiscal and monetary policy
- At a sector level: technological change, digital transformation
- At a micro level: reallocation and dispersion (e.g. between firms and regions), management and skills

2. THE FUTURE

*What might bring about a productivity recovery?*

- Growth projections
- Some policy implications
Underlying work


THE DIAGNOSIS

Why haven’t we seen a productivity revival? (in the UK and beyond) “yet”?
The “Great Productivity Slowdown” since the mid-2000s

Global GDP per person employed, annual and trend, 1995-2019, %

Source: The Conference Board Total Economy Database, April 2019
(https://www.conference-board.org/data/economydatabase/)
Emerging markets are a critical driver of the productivity slowdown – mature economies are stuck at slow growth

Trend Growth of GDP per person employed using HP filter, major regions, 1970-2019, %

Note: Trend growth rates are obtained using HP filter, assuming lambda=100; Regional labor productivity growth rates are aggregated using shares in nominal PPP converted GDP.
Source: The Conference Board Total Economy Database, April 2019
What has caused the Great Productivity Slowdown?

- Emerging markets, in particular China, running out of catching-up potential
- The global financial crisis
  - Slow demand
  - Weak investment
  - Too low interest rates
  - Failing fiscal policies
- Increased regulation
- The Productivity Paradox of the New Digital Economy:
  - The New Digital Economy (NDE) is diffusing rapidly but are not being absorbed that quickly in business models
  - Slow adaptation of employee skills and management skills to requirements of new technology, innovation and business models
Since mid-2000s, labour productivity growth slowed everywhere, but UK productivity gap widened again

UK growth driven by employment increase but slowdown in capital intensity and qualitative growth sources

Decomposition of GDP and labour productivity growth, aggregate economy, UK, in %

<table>
<thead>
<tr>
<th>Year</th>
<th>UK GPD Growth, %</th>
<th>UK, LP Growth, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996-2007</td>
<td>3.0</td>
<td>2.2</td>
</tr>
<tr>
<td>2008-2012</td>
<td></td>
<td>-0.1</td>
</tr>
<tr>
<td>2013-2018</td>
<td>1.9</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Note:** labor quality refers to change in educational attainment, capital quality refers to shifts from non-ICT to ICT capital services

Source: The Conference Board, Total Economy Database, 2019
UK has lagged other countries on qualitative sources of growth in past decade

Decomposition of labour productivity growth, aggregate economy, in %

Note: labor quality refers to change in educational attainment, capital quality refers to shifts from non-ICT to ICT capital services.
Source: The Conference Board, Total Economy Database, 2019
The TFP gap relative to United States and Germany is now bigger than it was in 1995

Source: Penn World Tables 9.1
The New Productivity Paradox hinges on the productivity challenges from distinctly different new technologies, innovation patterns and applications in New Digital Economy

The Old Digital Economy (1980s-mid 2000s)
Digitization driven by the rise of the PC and the internet as key drivers of greater business efficiency, creating access for individuals to digitization and the beginning of e-commerce.

The New Digital Economy (as of mid 2000s)
Digitization driven by a combination of mobile technology; ubiquitous internet access; shift toward cloud, and more recently artificial intelligence and robotics.

Digital Transformation

1st: The Industrial Revolution
2nd: Steam and Railways
3rd: Steel and Heavy Engineering
4th: Energy and Combustion Engine
5th: Digital Age

Based on Carlota Perez
Six things business does differently in the New Digital Economy

1. They're buying more digital services as those services get cheaper.

2. They're doing more data analytics.

3. They're spending more on knowledge-based assets like training and design.

4. They're intensifying their recruitment of tech-savvy workers.

5. They're forging new partnerships with suppliers and researchers.

6. They're putting new emphasis on their own resilience and agility.

Source: Navigating the New Digital Economy (The Conference Board, 2016)
The shift from investment in ICT assets to spending on ICT services is clearly visible but at different times and speeds.

Computer services and ICT investment as a % of GDP

**UNITED STATES**

**UNITED KINGDOM**

**GERMANY**

Note: Synthetic output refers to value added + value of digital intermediate inputs.
Source: Bureau of Economic Analysis; Eurostat; German Statistical Authority; EUKLEMS; The Conference Board
Most US industries are increasing their ICT service content more than their ICT investment


Note: Synthetic output refers to value added + value of digital intermediate inputs. Changes are measured as 2007-2014 (annual average) minus 1999-2006 (annual average).

Source: Bureau of Economic Analysis, The Conference Board
Share of intangibles in UK GDP stabilized since mid 2000s but shifted further to economic competencies (brand, org. cap, training)

Rise in ICT Assets and Knowledge Based Assets are complementary – do they create spillovers together?

Changes in intangible and ICT services intensity, United States, 2008–2013 relative to the 1997–2007 average

Note: Knowledge Based Assets refer to design, brand, organizational structure, firm-specific employee training, and management of companies.

Intangible capital contributions to labor productivity growth have held up while “residual TFP” growth has slowed

<table>
<thead>
<tr>
<th>NACE SECTORS</th>
<th>Used in this study</th>
<th>OECD (2018)*</th>
<th>Van Ark et al (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Agriculture, forestry &amp; fishing</td>
<td>LDIU</td>
<td>LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>B  Mining &amp; quarrying</td>
<td>LDIU</td>
<td>LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>10-12  Food, beverages &amp; tobacco</td>
<td>LDIU</td>
<td>LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>13-15  Textiles &amp; leather</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>16-18  Wood, paper, printing &amp; media</td>
<td>MDIU</td>
<td>M-HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>19     Coke &amp; petroleum products</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>MIIU</td>
</tr>
<tr>
<td>20-21  Chemicals</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>MIIU</td>
</tr>
<tr>
<td>22-23  Rubber &amp; plastics; non-metallic mineral</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>MIIU</td>
</tr>
<tr>
<td>24-25  Basic metals &amp; metal products</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>26-27  Electrical &amp; optical equip.</td>
<td>DP</td>
<td>M-HIGH</td>
<td>IP</td>
</tr>
<tr>
<td>28     Machinery &amp; equipment n.e.c.</td>
<td>MDIU</td>
<td>M-HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>29-30  Transport equipment</td>
<td>MDIU</td>
<td>HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>31-33  Other manufacturing</td>
<td>MDIU</td>
<td>M-HIGH</td>
<td>LIIU</td>
</tr>
<tr>
<td>D-E    Electricity, gas &amp; water supply</td>
<td>LDIU</td>
<td>LOW</td>
<td>MIIU</td>
</tr>
<tr>
<td>F      Construction</td>
<td>LDIU</td>
<td>LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>G      Trade</td>
<td>MDIU</td>
<td>M-HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>H      Transportation &amp; storage</td>
<td>LDIU</td>
<td>LOW</td>
<td>MIIU</td>
</tr>
<tr>
<td>I      Accommodation &amp; food services</td>
<td>LDIU</td>
<td>LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>58-60  Publishing &amp; broadcasting</td>
<td>DP</td>
<td>M-HIGH</td>
<td>IP</td>
</tr>
<tr>
<td>61     Telecommunications</td>
<td>DP</td>
<td>HIGH</td>
<td>IP</td>
</tr>
<tr>
<td>62-63  IT &amp; information services</td>
<td>DP</td>
<td>HIGH</td>
<td>IP</td>
</tr>
<tr>
<td>K      Financial &amp; insurance activities</td>
<td>MDIU</td>
<td>HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>L      Real estate activities</td>
<td>LDIU</td>
<td>LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>M-N    Professional services</td>
<td>MDIU</td>
<td>HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>O      Public administration &amp; defence</td>
<td>MDIU</td>
<td>M-HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>P      Education</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>Q      Health &amp; social work</td>
<td>LDIU</td>
<td>M-LOW</td>
<td>LIIU</td>
</tr>
<tr>
<td>R      Arts, entertainment &amp; recreation</td>
<td>MDIU</td>
<td>M-HIGH</td>
<td>MIIU</td>
</tr>
<tr>
<td>S      Other services</td>
<td>MDIU</td>
<td>HIGH</td>
<td>LIIU</td>
</tr>
</tbody>
</table>


UK received largest productivity benefits from most intensive digital using industries – US strength only in digital producers

Labour productivity growth contributions from digital-producing and most and least intensive-using sectors, in %

Source: Van Ark, Erumban and de Vries, 2019
UK performance on digital usage aligns with positive TFP growth

Source: EUKLEMS update 2019, WIIW, Vienna
Alignment of intensive digital usage and productivity growth not as good in

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Period</th>
<th>Aggregate labor productivity growth rate (%)</th>
<th>Cumulative value added share of industries with positive contributions to labor productivity growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Digital Producing</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2003-2007</td>
<td>1.2</td>
<td>75.9</td>
</tr>
<tr>
<td></td>
<td>2013-2017</td>
<td>0.8</td>
<td>66.8</td>
</tr>
<tr>
<td>United States</td>
<td>2003-2007</td>
<td>1.7</td>
<td>78.1</td>
</tr>
<tr>
<td></td>
<td>2013-2017</td>
<td>0.6</td>
<td>45.3</td>
</tr>
<tr>
<td>Germany</td>
<td>2003-2007</td>
<td>1.4</td>
<td>74.3</td>
</tr>
<tr>
<td></td>
<td>2013-2017</td>
<td>1.0</td>
<td>64.9</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2003-2007</td>
<td>2.0</td>
<td>62.6</td>
</tr>
<tr>
<td></td>
<td>2013-2017</td>
<td>1.1</td>
<td>72.0</td>
</tr>
</tbody>
</table>

Source: Van Ark, Erumban and de Vries, 2019
In New Digital Economy innovation competencies of workforce go beyond STEM

- STEM
- Adaptability/Flexibility
- Autonomy
- Empowerment
- Decision Making
- Cooperative teams and group interaction
- Creativity
- Mistake handling
- Learning culture
- Conflict Handling
- Enterprising
- Deal With External Customers

Data on the innovation competencies of 772 U.S. occupations, across all business functions

Innovation Potential of Occupations Dashboard
Physicists as well as HR managers, sales managers, and marketing managers have high innovation potential.

Occupations in services sector have highest innovation competencies

Innovation potential of occupations (IPO) score by industry UK, 2017

Source: Van Ark, Erumban and De Vries, 2019; The Conference Board Innovation Potential project; UK Office of National Statistics
Majority of industries exhibit positive change innovation competencies and productivity (47% of VA; 55% of hours)

Average productivity growth 2007-2017 and innovation potential score in 2017

Source: Van Ark, Erumban and De Vries, 2019; The Conference Board Innovation Potential project; UK Office of National Statistics
Insights on why we have missed a productivity revival since the mid-2000s

- **Global:**
  - Productivity growth has dropped off globally, especially through weak TFP growth which has shown little sign of recovery so far.
  - While no single explanation, one important reason is the slow process of digital transformation translating itself into productivity growth.

- **UK relative performance:**
  - At aggregate level UK TFP growth has weakened beyond that of other countries (US, Germany, NL).
  - However, UK has performed relatively well in most intensive digital using industries.
  - UK has advantage in intangible investment which have stabilized labor productivity growth, but not much evidence of TFP spillovers.

- Skills and competencies are broad-based, underlying the need for a diverse intangible investment strategy.
THE FUTURE

What might bring about a productivity recovery?
US productivity growth shows some signs of recovery but UK doesn’t follow suit – as yet

Note: 4 quarter moving averages of year-over-year estimates, up to Q2-2019

Source: Bureau of Labor Statistics, ONS
Decomposition of UK GDP growth shows productivity recovery to be a tall order to return to past growth rates

Note: Contributions are in log points, GDP growth rates are presented as percent changes

Source: The Conference Board Global Economic Outlook 2020 (October 2019)
To even remain at growth rate of past decade, qualitative growth sources need to recover to up 1/3rd of UK growth.

Note: Contributions are in log points, GDP growth rates are presented as percent changes.

Source: The Conference Board Global Economic Outlook 2020, October 2019
Qualitative growth in other countries is projected to account for about half of GDP growth

Growth projections and contributions of growth drivers, aggregate economy, 1996-2029, in %

Note: Contributions are in log points, GDP growth rates are presented as percent changes

Source: The Conference Board Global Economic Outlook 2020, October 2019
Some observations for productivity-enhancing policies and strategies

- There is no silver bullet for accelerating productivity growth
- The combination of a slow transition to the new digital economy and limited effectiveness of tangible and even intangible investment puts the focus on innovation and knowledge-based strategies
- A broad-based and diversified education and training strategy, including intermediate and vocational skills and life-long learning, is needed to respond to labor force challenges
- Three critical needs for successful innovation and knowledge-based strategies:
  - Develop a long-term strategy to deal with systemic changes of the New Digital Economy
  - Make sure mission- and diffusion-oriented innovation policies are aligned
  - Focus on productivity that can deliver “good” jobs
We are still in the Installation Phase of the New Digital Economy

Installation phase
- Creative destruction
- Exploration of new markets
- Battle of new paradigm with the old
- Supply “push”
- Growth confided to small sectors

Frenzy period – sometimes followed by crisis

Deployment phase
- Creative construction
- Consolidation & expansion of new markets
- Widespread acceptance
- Demand “pull”
- Wide benefits for the economy

Source: based on Carlota Perez, *Technological Revolution and Financial Capital. The Dynamics of Bubbles and Golden Ages*, (Cheltenham, United Kingdom, Edward Elgar Publishing Limited), 2002
The Festival of Social Science at NIESR

Inaugural Prais Lecture on Productivity: How not to miss the productivity revival once again

Bart van Ark, Chief Economist at The Conference Board, New York

Monday 4th November 2019  17.30-18.30pm

#NIESRFestival   #ESRCFestival