The UK's productivity problem – *the role of innovation and R&D*

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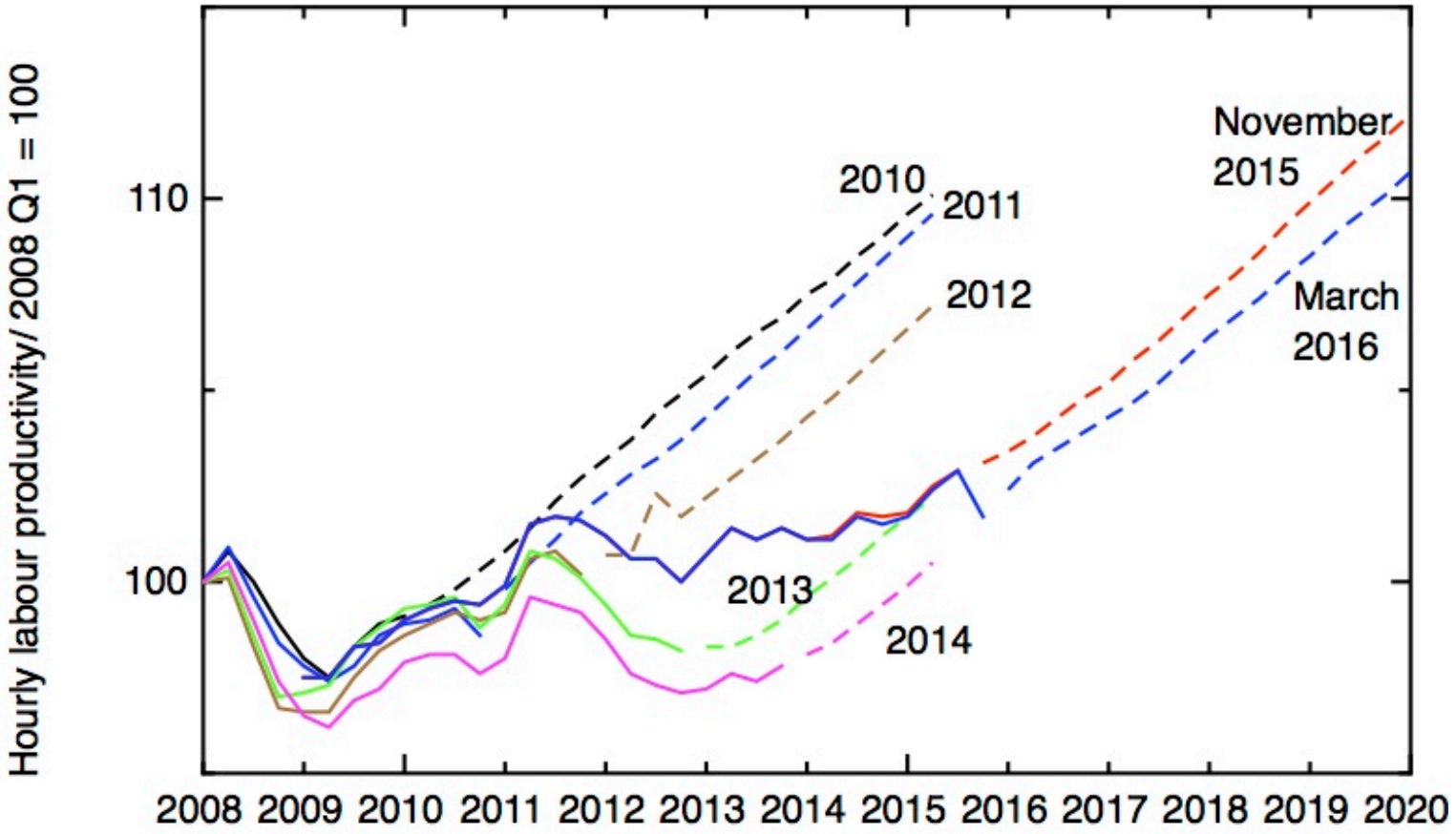
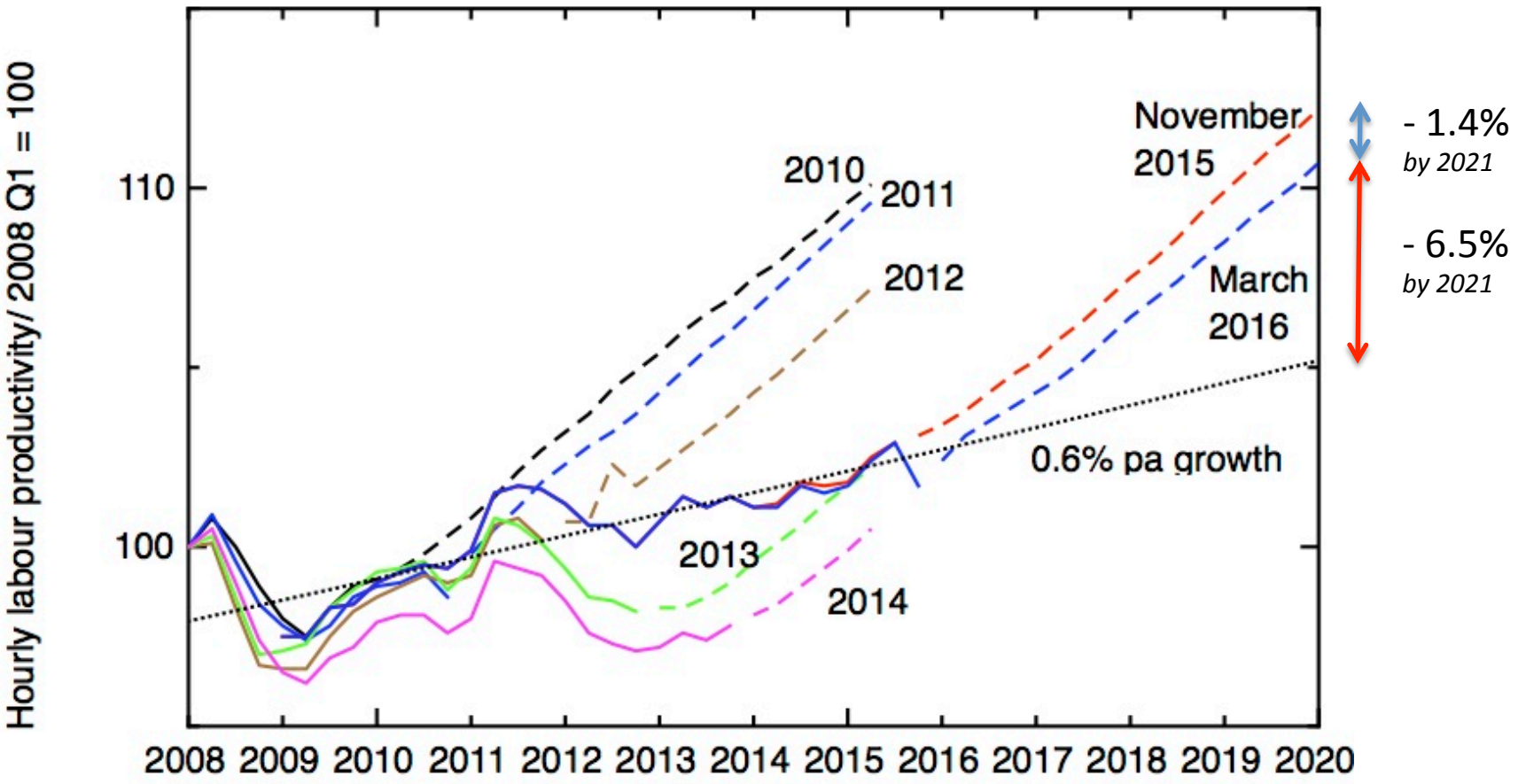
Waiting for the upturn

Successive Office of Budgetary Responsibility predictions



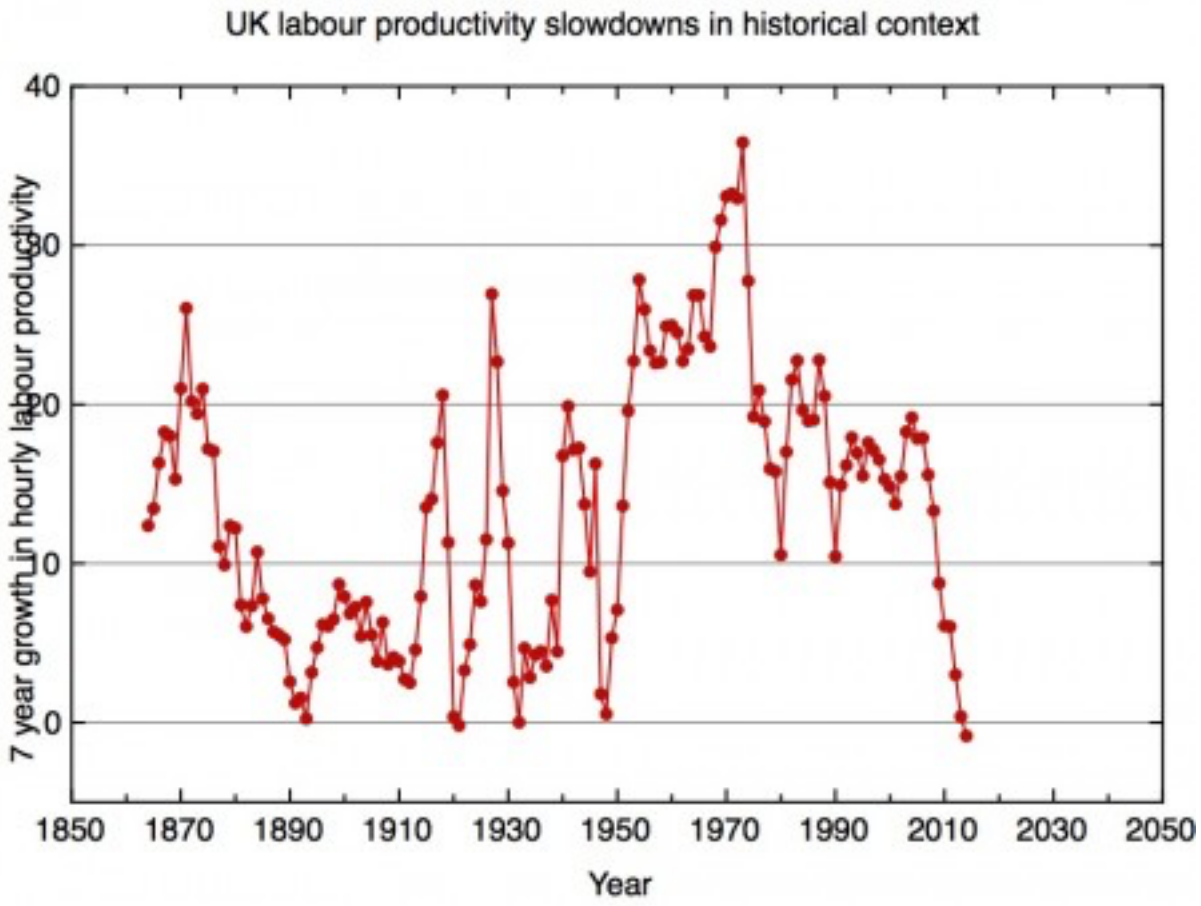
Sources: Oct 2015 OBR Forecast Evaluation Report, March 2016 OBR Economic and Fiscal Outlook.

If the upturn doesn't come?



The historical context

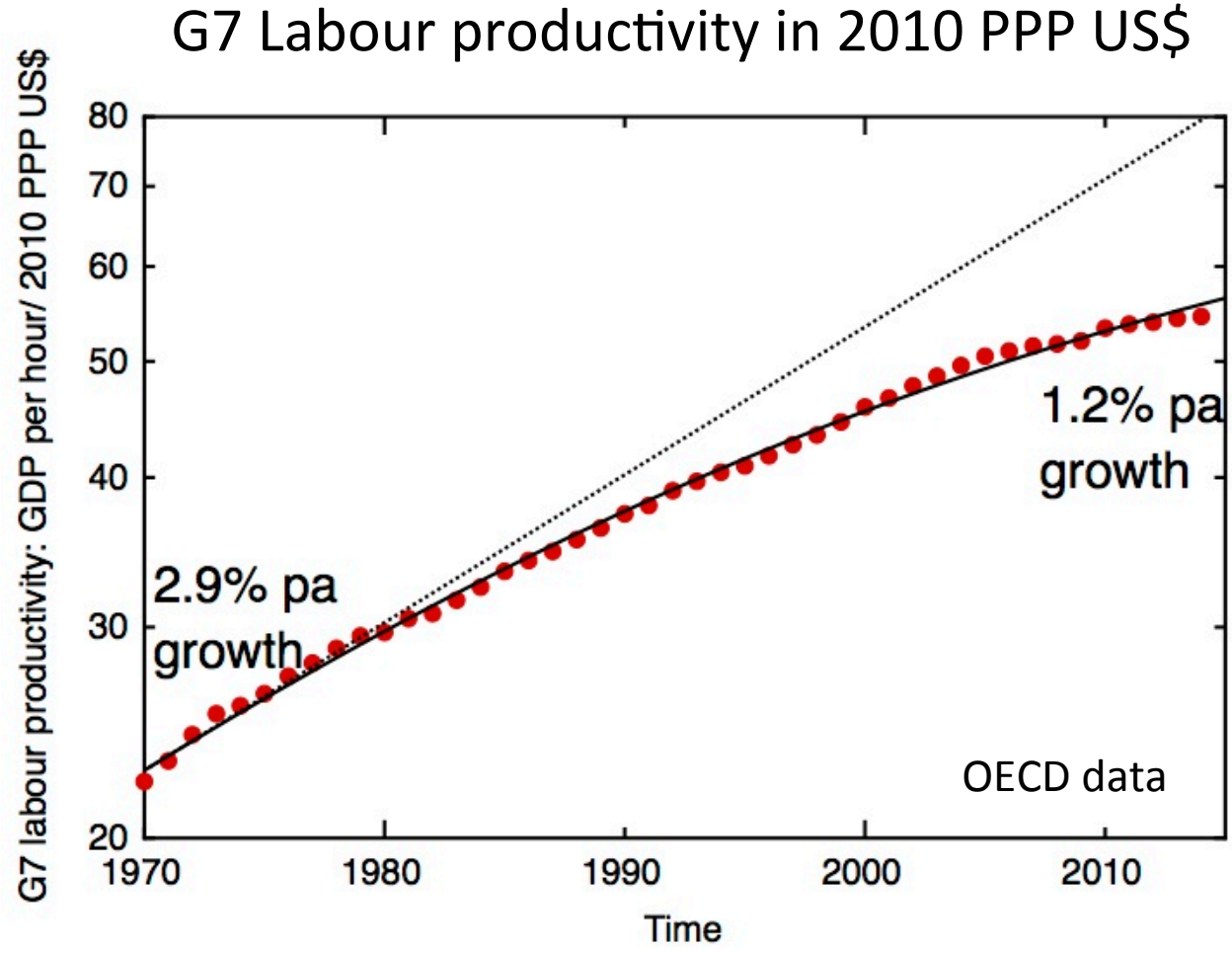
Two world wars, a depression – and now



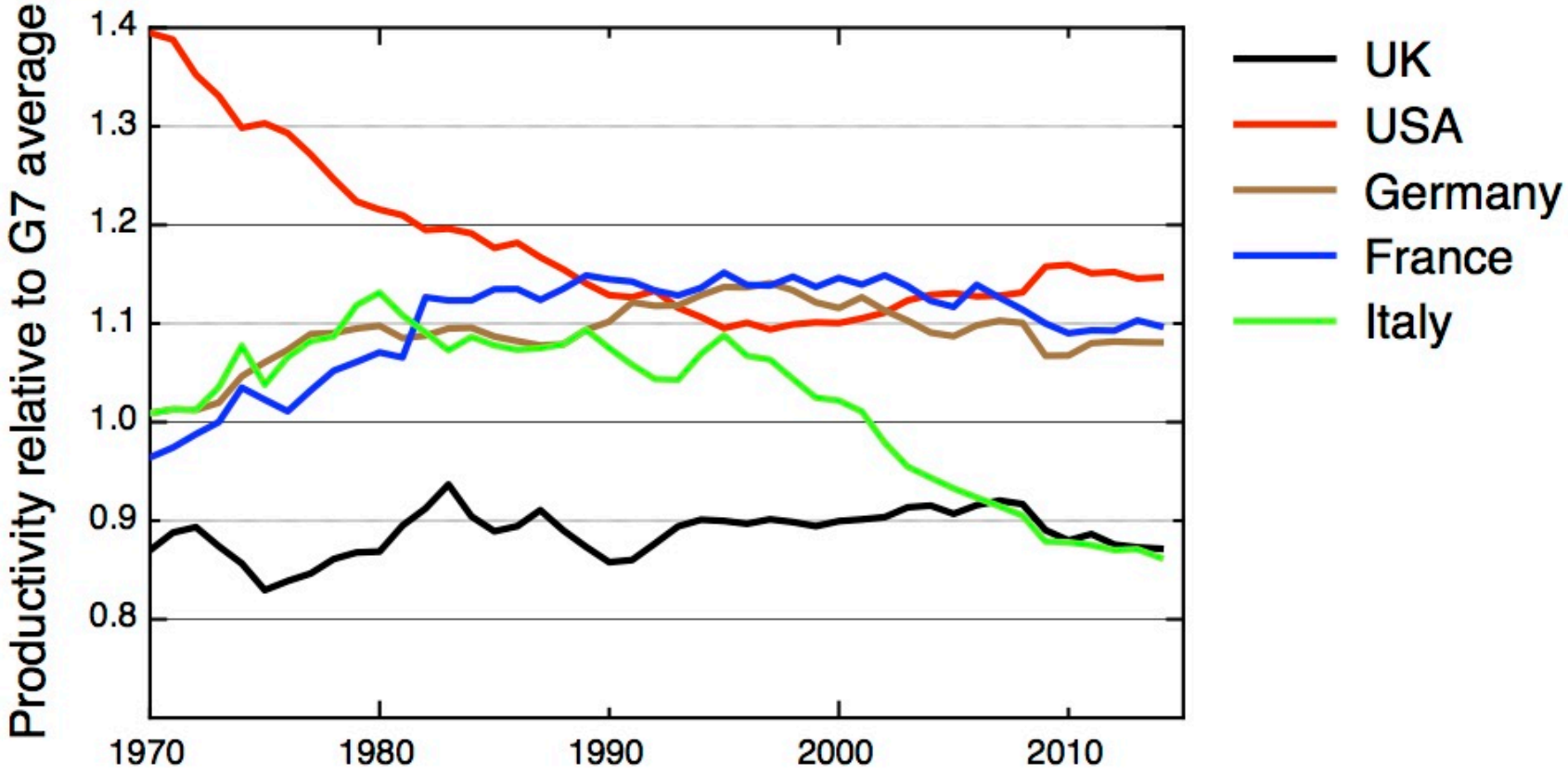
Seven year growth in hourly labour productivity.

Data from Hills, S, Thomas, R and Dimsdale, N (2015) "Three Centuries of Data – Version 2.2", Bank of England.

Productivity growth is slowing throughout the developed world



But the UK is a chronic underperformer



The Solow growth model including technological progress

$$Y(t) = F[K(t), L(t), A(t)]$$

Growth Accounting

- Control the measured economic growth for changes in capital stock and labour inputs
- What's left is called *"total factor productivity"*
- Interpreted by economists as a measure of *"innovation"*

Growth accounting for the UK

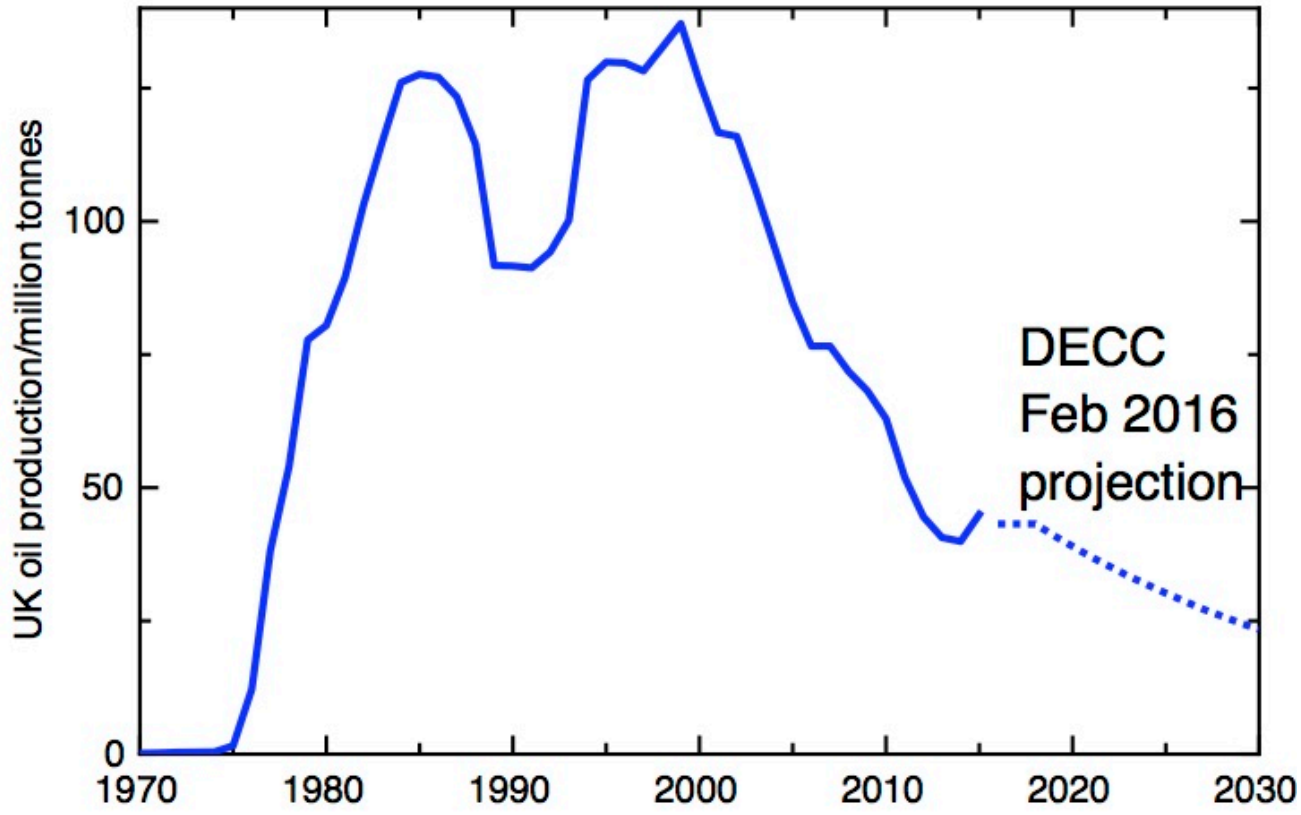
Imperial College London
BUSINESS SCHOOL

Accounting for the UK productivity puzzle:
a decomposition and predictions

Peter Goodridge, Jonathan Haskel, Gavin Wallis

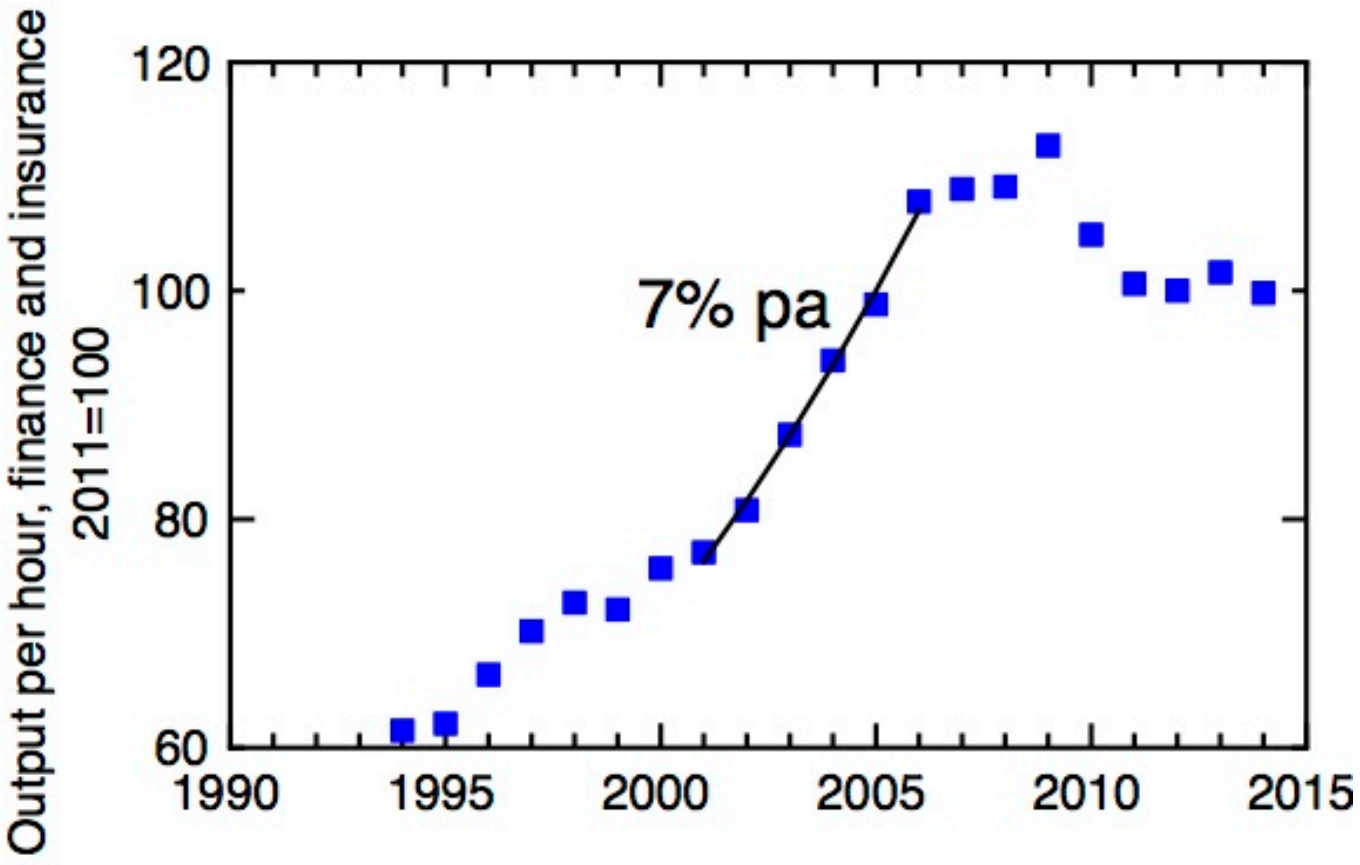
- Key findings:
  - not capital shallowing
  - not shifts from more to less productive sectors
  - A problem of *total factor productivity* – across all sectors
  - 1/3 of the puzzle accounted for by weakness in two sectors
    - Oil and gas
    - Financial Services

Peak Oil UK



Actual and projected production of oil in the UK mainland and continental shelf.
Data: DUKES 2015 and projection: DECC Oil and Gas Projections

Peak Bank UK



Labour productivity in the UK's finance and insurance sector, ONS data.

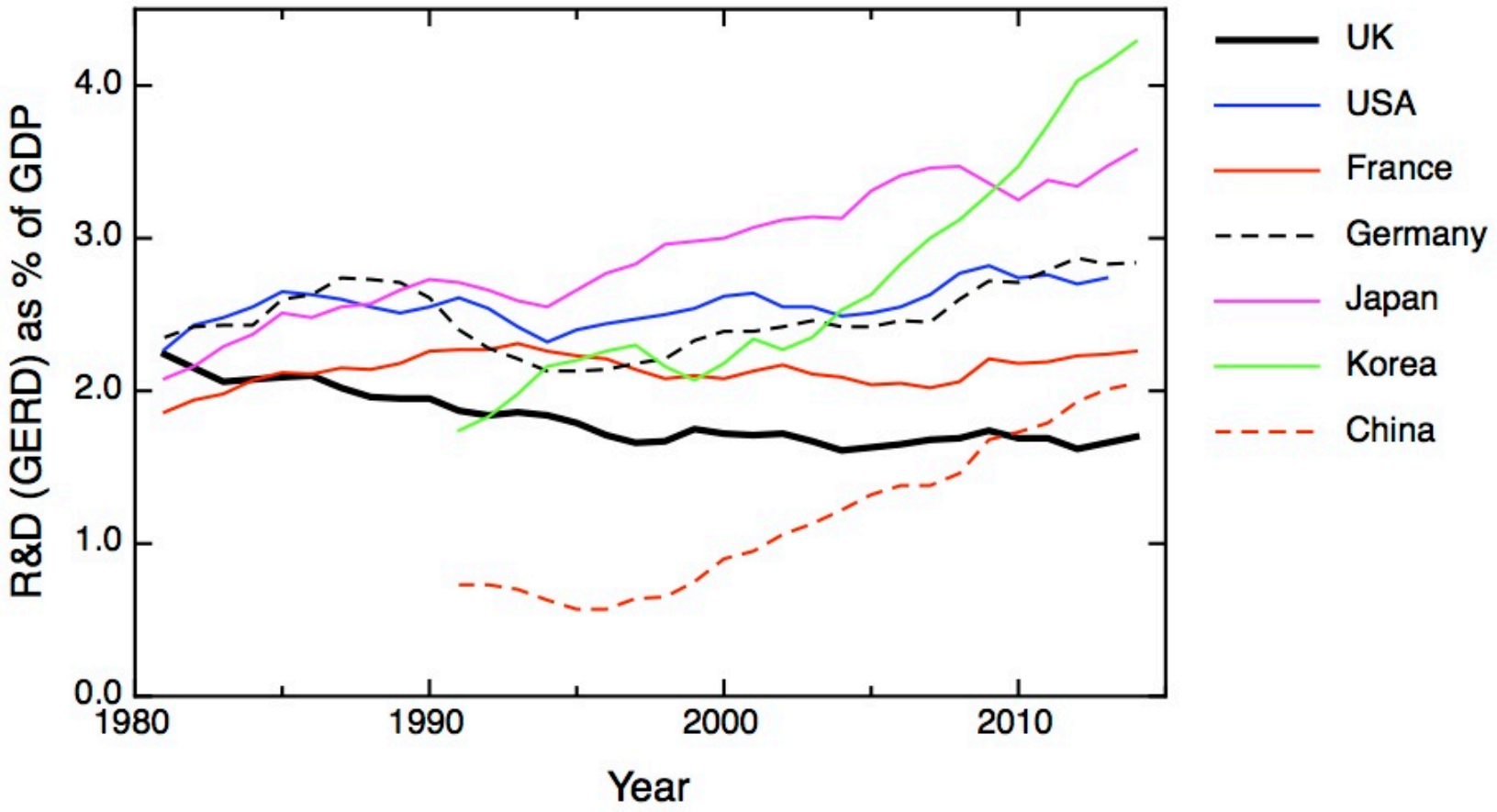
Twin headwinds for the UK economy

- Much productivity growth from 1990-2008 driven by North Sea oil and gas and financial services
- North Sea oil now declining fast – will not be replaced by fracking
- Financial services sector now smaller and more heavily regulated
- Productivity growth in other sectors needs not just to recover to pre-crisis levels, but to achieve a higher level to compensate for these headwinds

So, why might we have an innovation problem?

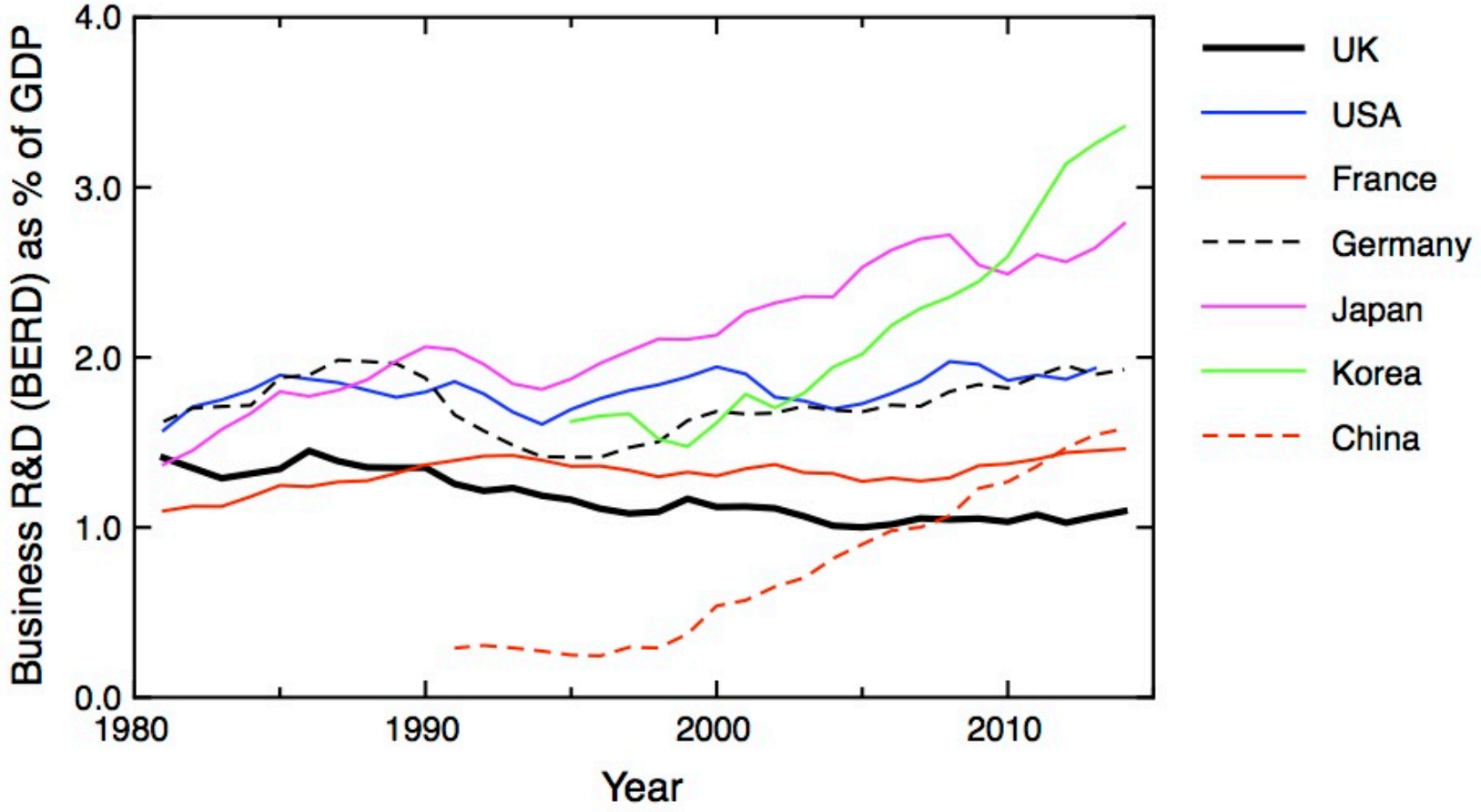
- What economists call *"innovation"* isn't the same as innovation
- And innovation isn't always the result of research and development
- Innovation includes
  - learning from experience,
  - suggestions from users,
  - copying better practices from competitors,
  - transferring new technologies from other sectors
  - more effective ways of organising and distributing work
- Nonetheless…

Our dismal R&D trajectory



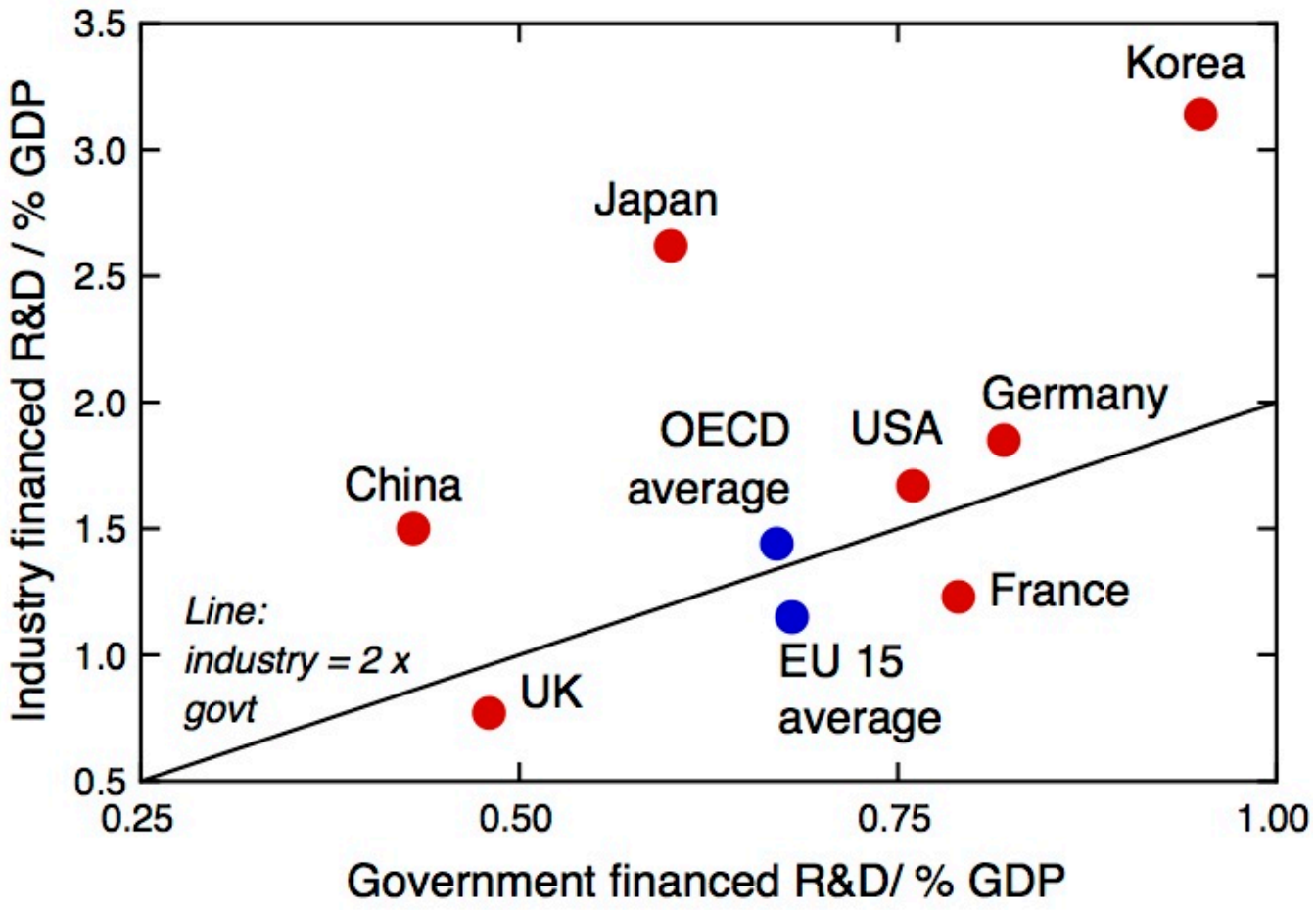
- *Research intensity of selected countries, expressed as gross expenditure on research and development as a percentage of GDP. Data: OECD main science and technology indicators, January 2016.*

Focus on business R&D



Business enterprise R&D intensity of selected countries, expressed as a percentage of GDP. Data: OECD main science and technology indicators, January 2016.

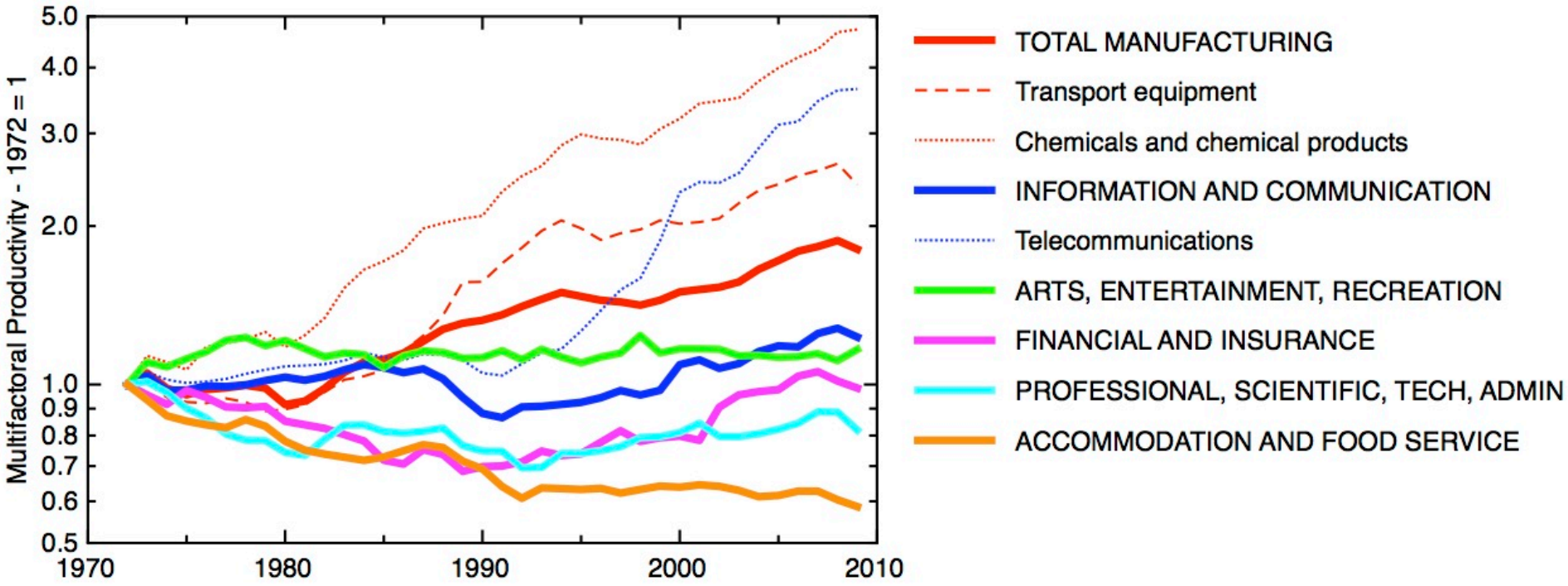
Public R&D "crowds in" business R&D – do we get the business R&D we deserve?



What about sectoral shifts?

- R&D is important for manufacturing and ICT…
- …but does R&D matter in a service based economy?

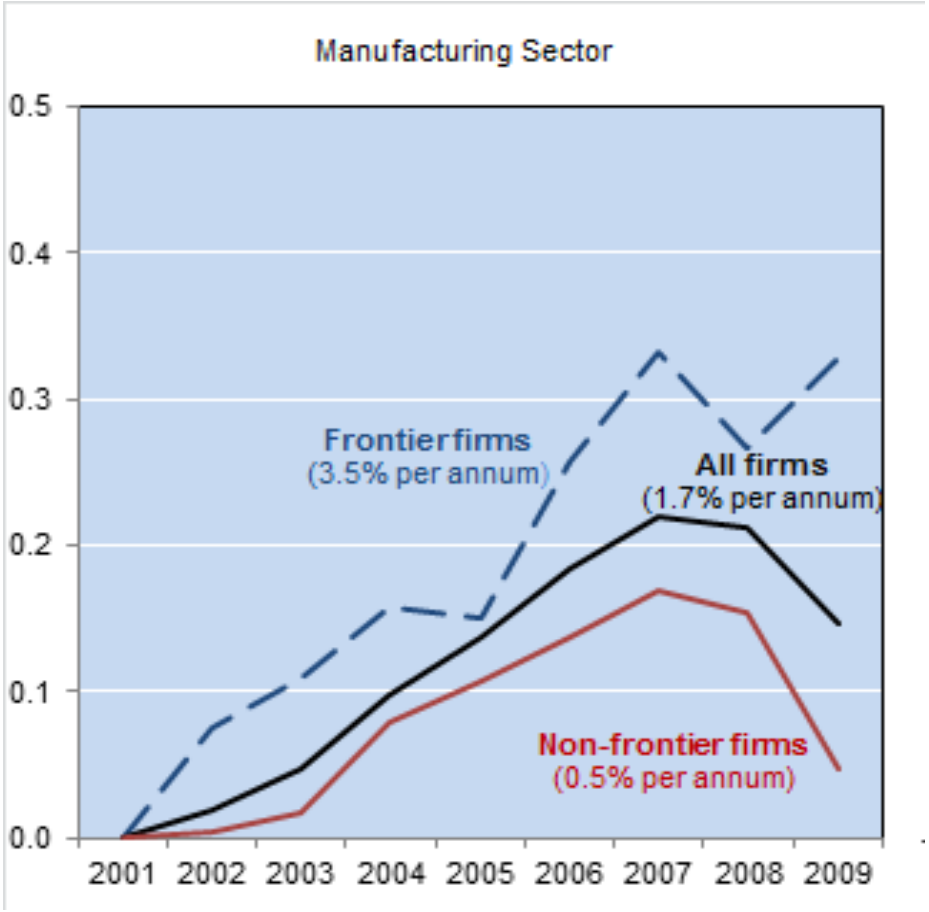
Drivers of UK total factor productivity growth over the medium term



Multifactor productivity growth in selected UK sectors and subsectors since 1972.
Data: EU KLEMS database, rebased to 1972=1.

What about dispersion within sectors?

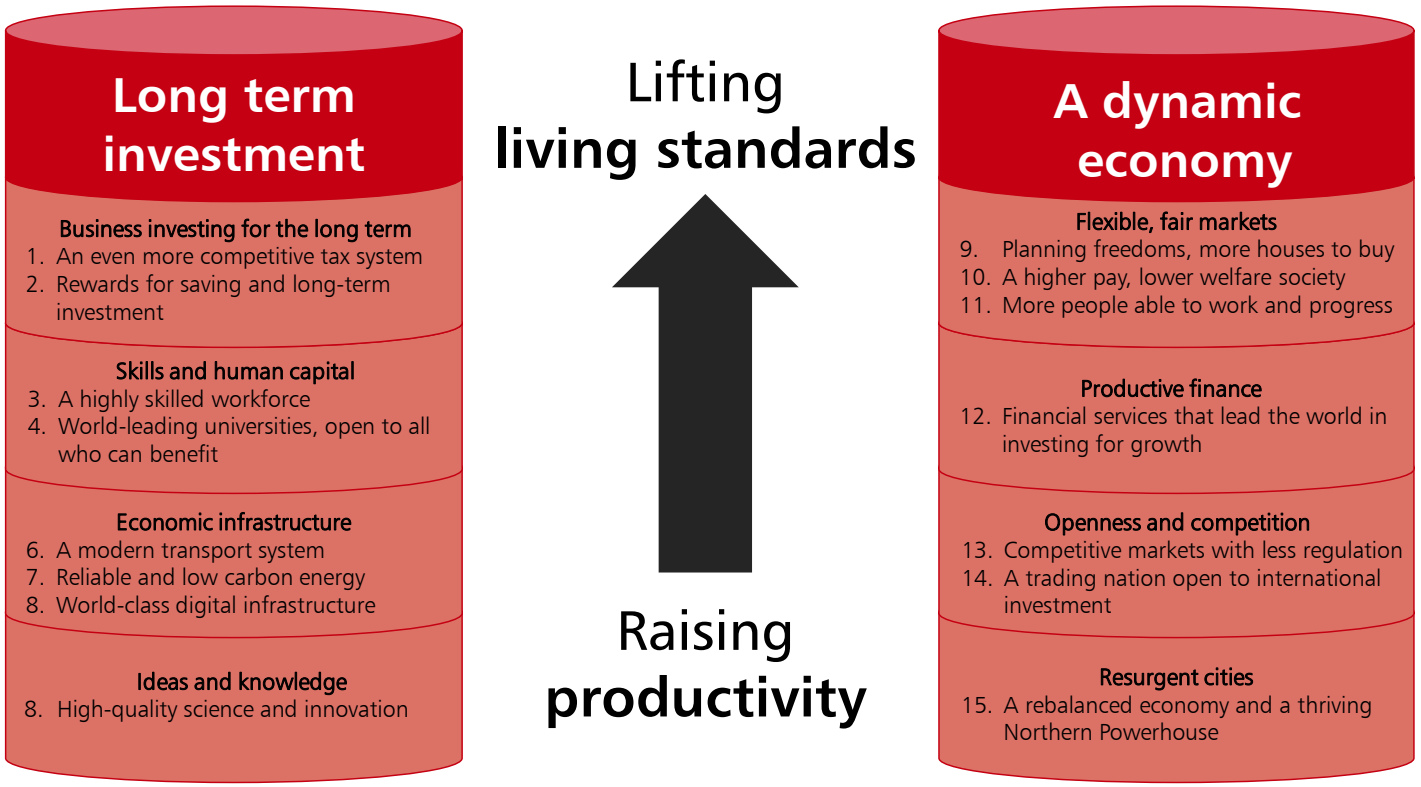
- Globally, a gap has opened up between firms at the technology frontier and the laggards



"Firms at the global productivity frontier are on average 4-5 times more productive than non-frontier firms in terms of MFP, while this difference is more than 10 times with respect to labour productivity"
OECD Future of Productivity Report, 2015

The Government's view

Chart iii: A framework for raising productivity



Source: HM Treasury

The Productivity Plan: *"Fixing the Foundations, creating a more prosperous nation"*
HM Treasury, July 2015

Remember this?

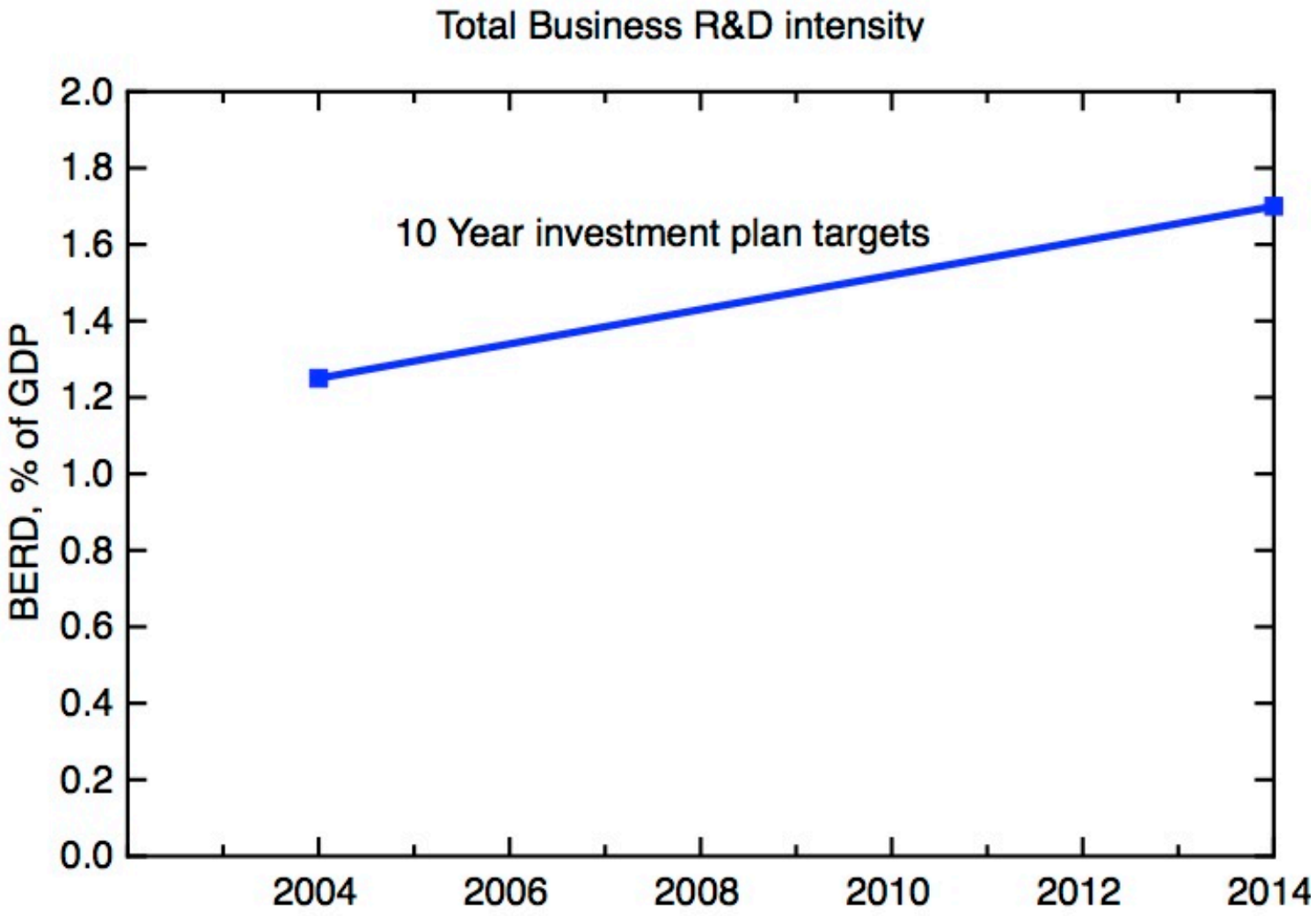
Science & innovation
investment framework
2004 - 2014

The 2004 target for business R&D

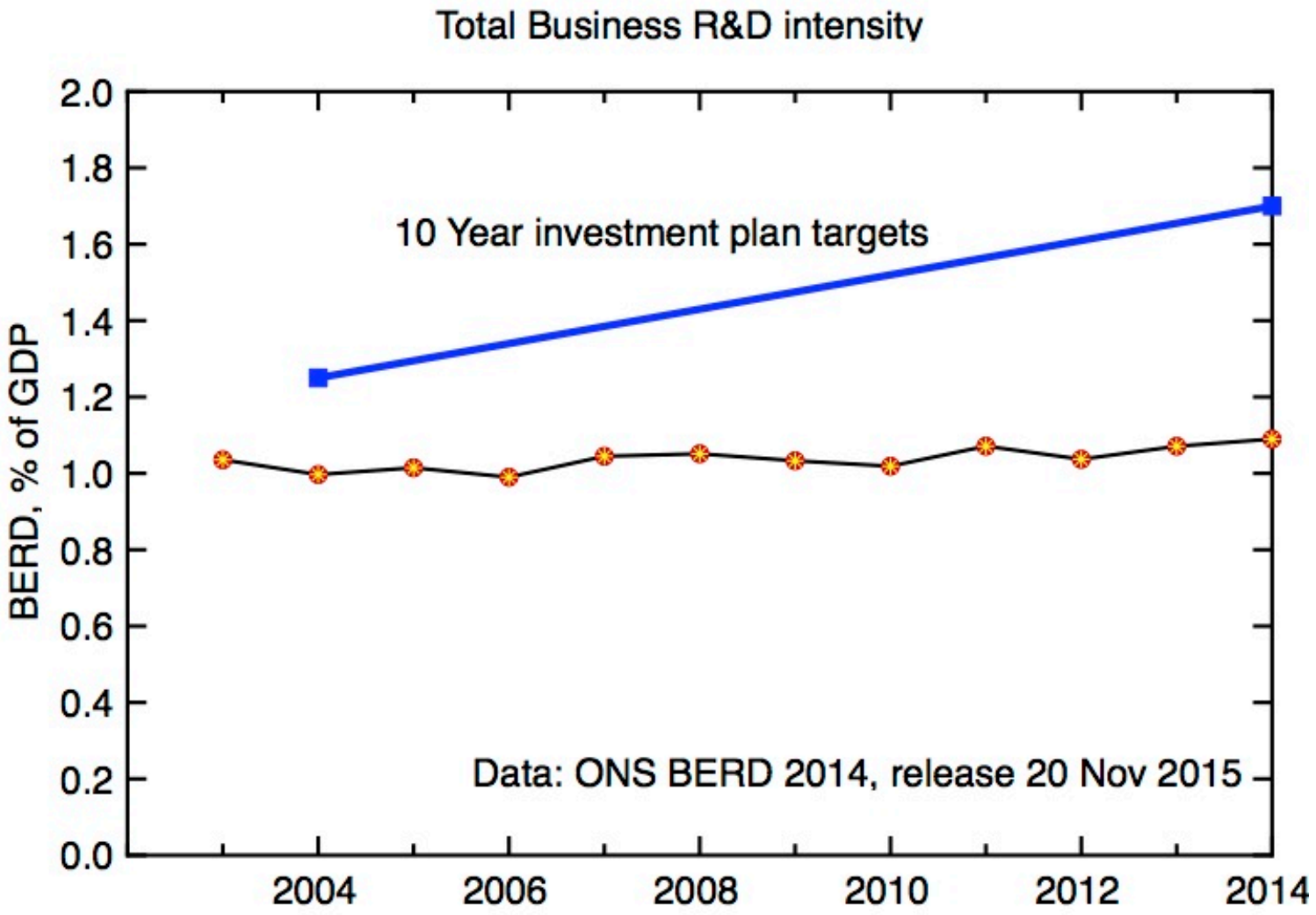
Increased business investment in R&D, and increased business engagement in drawing on the UK science base for ideas and talent:

- Increase business investment in R&D as a share of GDP from 1¼ per cent towards goal of 1.7 per cent over the decade
- Narrow the gap in business R&D intensity and business innovation performance between the UK and leading EU and US performance in each sector, reflecting the size distribution of companies in the UK

The 10 year investment plan target



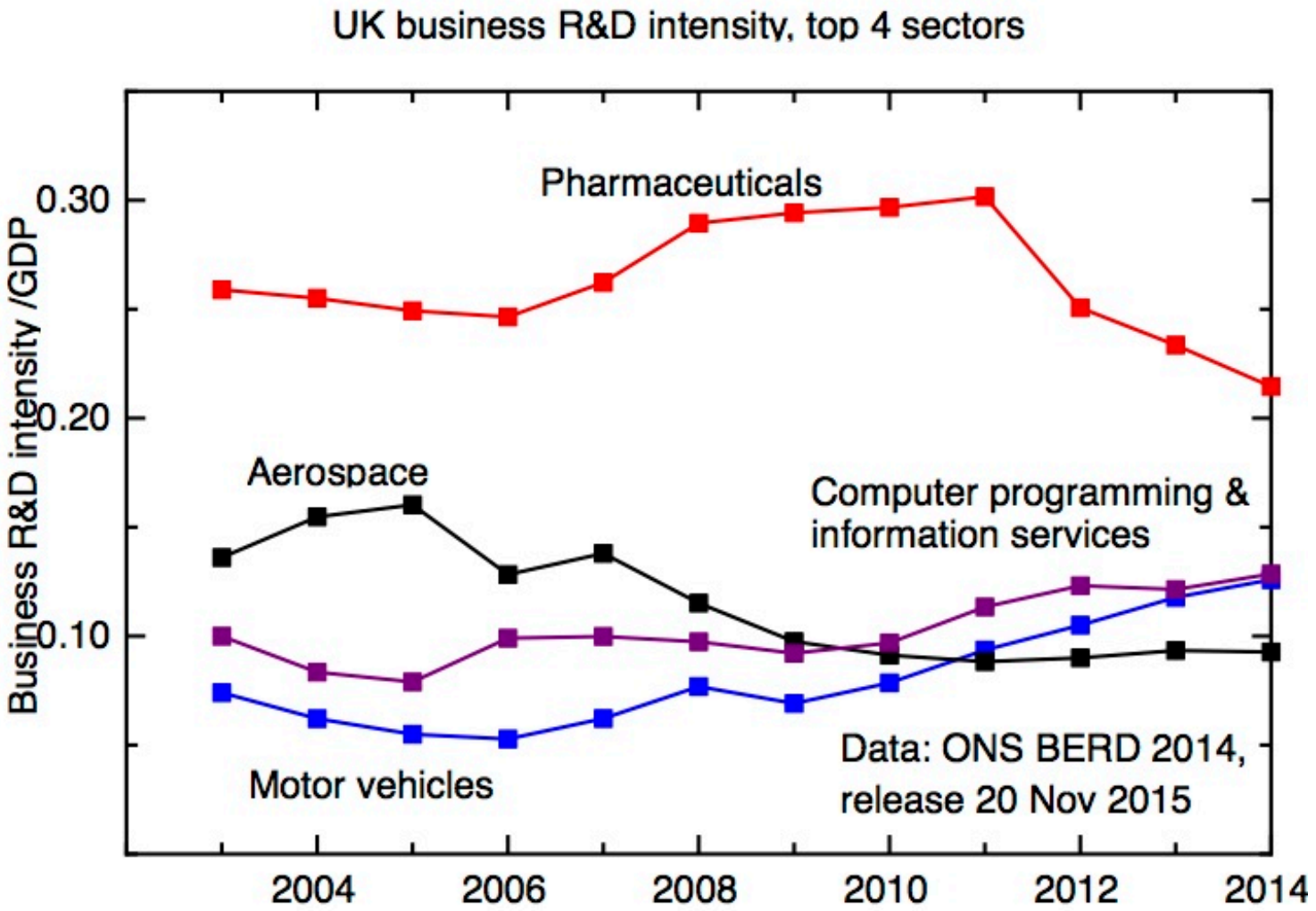
A decade of flat BERD



Relatively constant overall industry R&D intensity conceals some big sector movements

- **Pharmaceuticals**, 22% of R&D
  - **Down 15%** since 2008 in real terms
- **Aerospace**, 9% of R&D
  - **Down 14%** since 2008
- **Computer programming & info**, 10.9% of R&D
  - **Up 24%** since 2008
- **Automotive,** 11% of R&D
  - **Up 60%** since 2008

Sectoral shifts in BERD



Supply side innovation policy

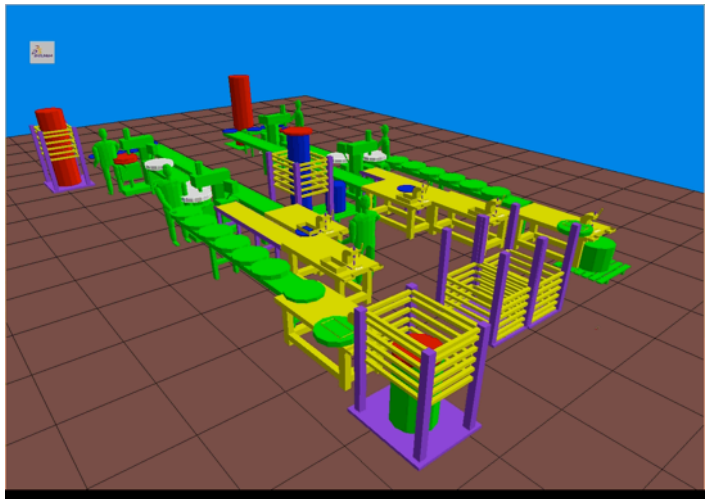
- More than a decade of innovation policy has focused on the *supply side*
  - Strong basic science base
  - Supply of well-trained people
  - Encouragement of business-university links
  - Better commercialisation of University IP
  - Generalised incentives for business R&D through R&D tax credits (to correct market failure)
- All good – but is it enough?

Building innovation capacity and speeding up the diffusion of technologies

- Key role of translational research facilities
  - Academia, Large firms at the tech frontier, SMEs (typically in supply chains) as equal partners
  - Focus on know-how, learning by doing and process improvement, as much as protectable IP
  - Translational research at industrial scale
  - Responsibility for skills development at all levels as well as innovation
- O'seas models include Fraunhofers, Taiwan's ITRI etc
- UK's Catapults should have this as an aspiration

The University of Sheffield's Advanced Manufacturing Research Centre with Boeing

The digital future of manufacturing



Flexible
Reconfigurable
Customisable

Driven by data analytics
Using new materials & manufacturing techniques
Heavy use of automation and robotics

User involvement in design
Capturing more of the value chain

"Industrie 4.0"

Focus of Sheffield/Lancashire Science and Innovation Audit

Creating the demand for innovation

- Where does the UK Government most urgently need innovation to happen to control public expenditure and meet policy objectives?
  - Energy
  - Healthcare Technology
- Government needs to be much more active in procuring not just innovative products, but innovation itself

Further reading…

- Two working papers by RAL Jones from Sheffield Political Economy Research Institute:

  The UK's innovation deficit and how to repair it
  http://speri.dept.shef.ac.uk/2013/10/30/speri-paper-no-6-the-uks-innovation-deficit-repair-it/

  Innovation, research, and the UK's productivity crisis
  http://speri.dept.shef.ac.uk/2016/04/14/new-speri-paper-innovation-research-and-the-uks-productivity-crisis/

- My blog: http://www.softmachines.org
  (also includes more about Transhumanism than you probably want to know)

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