Does the growth of the service sector and the digital economy create new measurement challenges?

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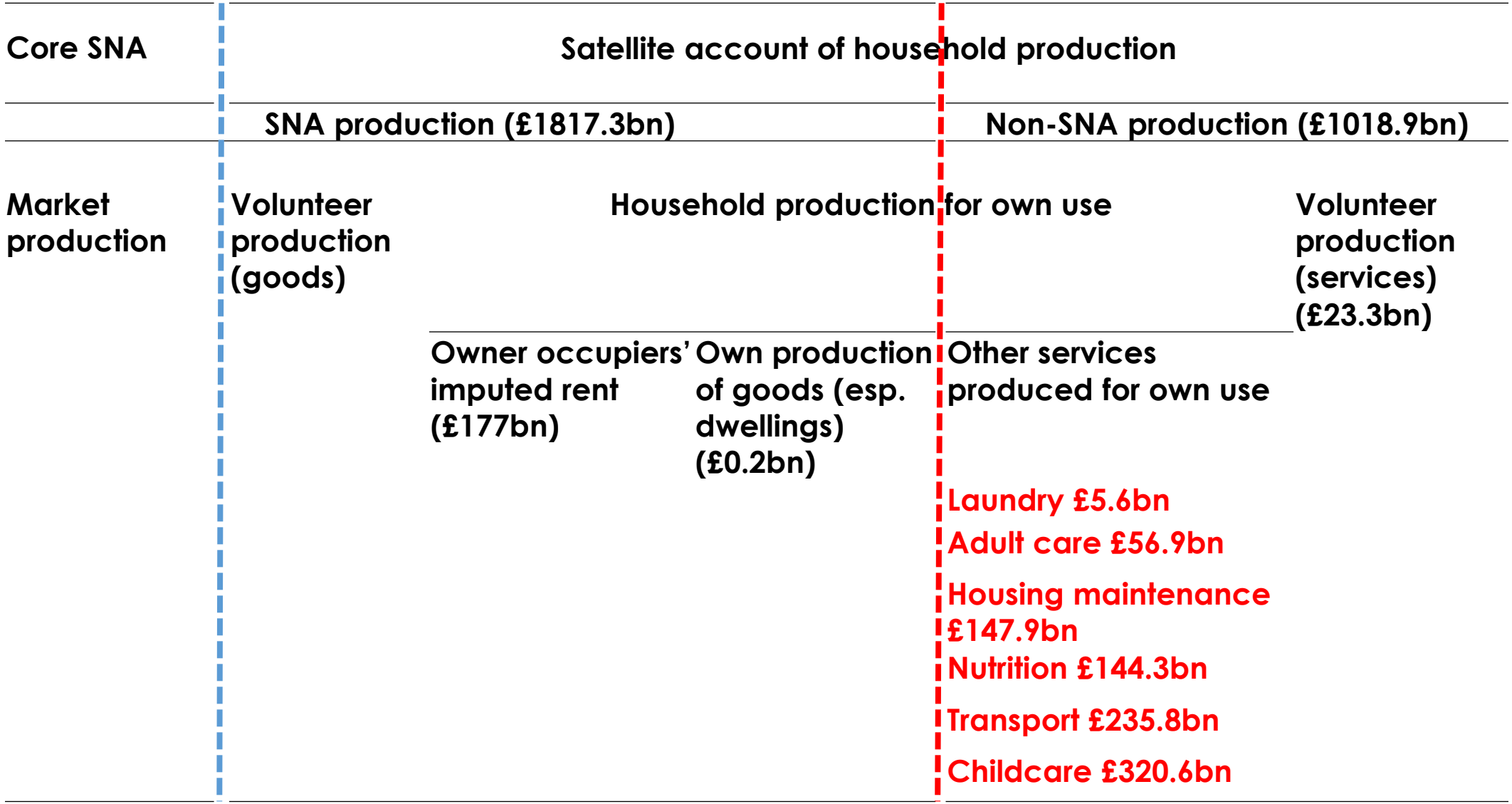
Measuring economic activity

- SNA framework developed in 1940s for a predominantly industrial economy with nationally-based firms
  - Real GDP: deflate nominal value added by suitable price index
  - *"[W]hat we call "real" magnitudes are not completely real; only the money magnitudes are real. The "real" ones are hypothetical."* (Schelling, 1958)
- Some particular measurement issues:
  - Where should the production boundary be?
  - Handling quality change and new products (not considered here)
  - Inadequate measurement of services with insufficient detail
  - Digital economy ⇒ new business models and disintermediation
  - Ease of geographical redenomination of production

Where should the production boundary be?

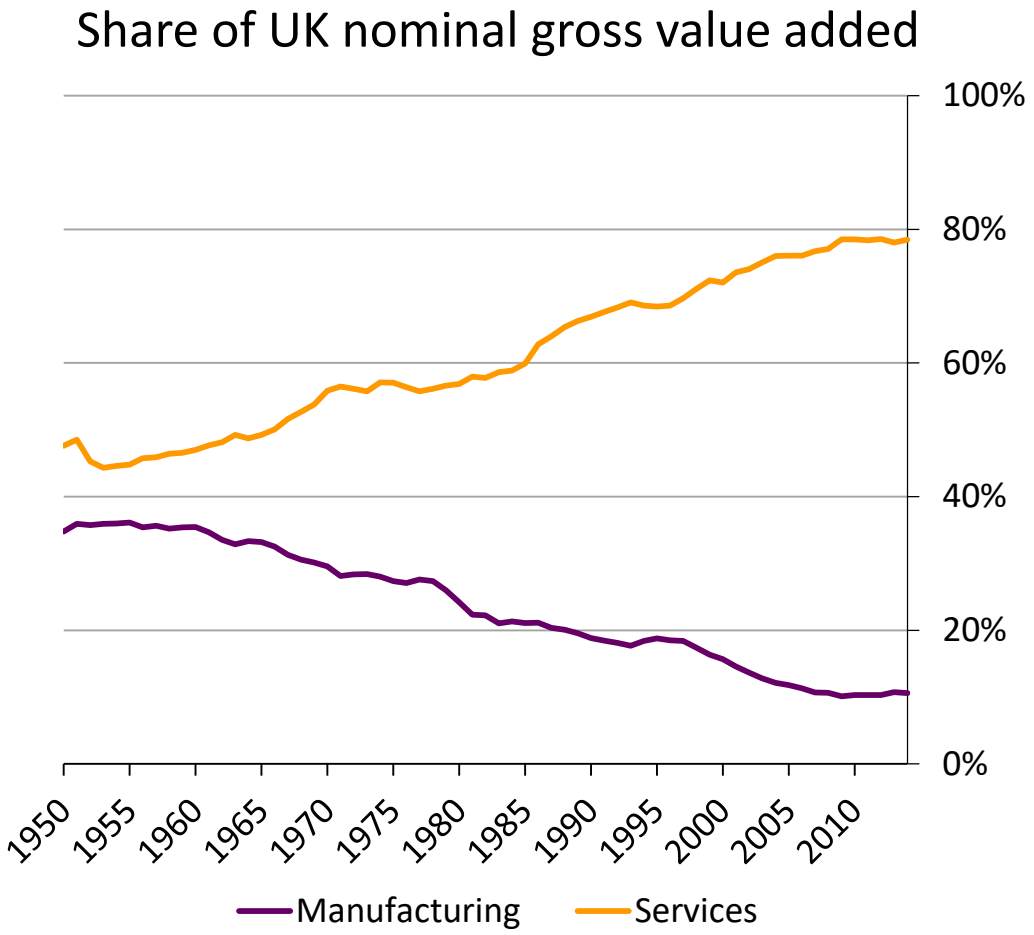
- GDP predominantly value added in market economy, but:
  - *Includes* public services (measured by *in*puts – some work on measuring public sector output directly but not yet in SNA)
  - *Excludes* (most of) home production (in AEs, mainly services)
    - ➢ Problem when activities shift across boundary
    - ➢ So *include* elements that are large and where substitution is easy (e.g. renting v. owner-occupation)
    - ➢ Relevant for some digital services (see below…)
- Location of boundary is a matter of pragmatism *not* principle

UK household satellite account, 2014



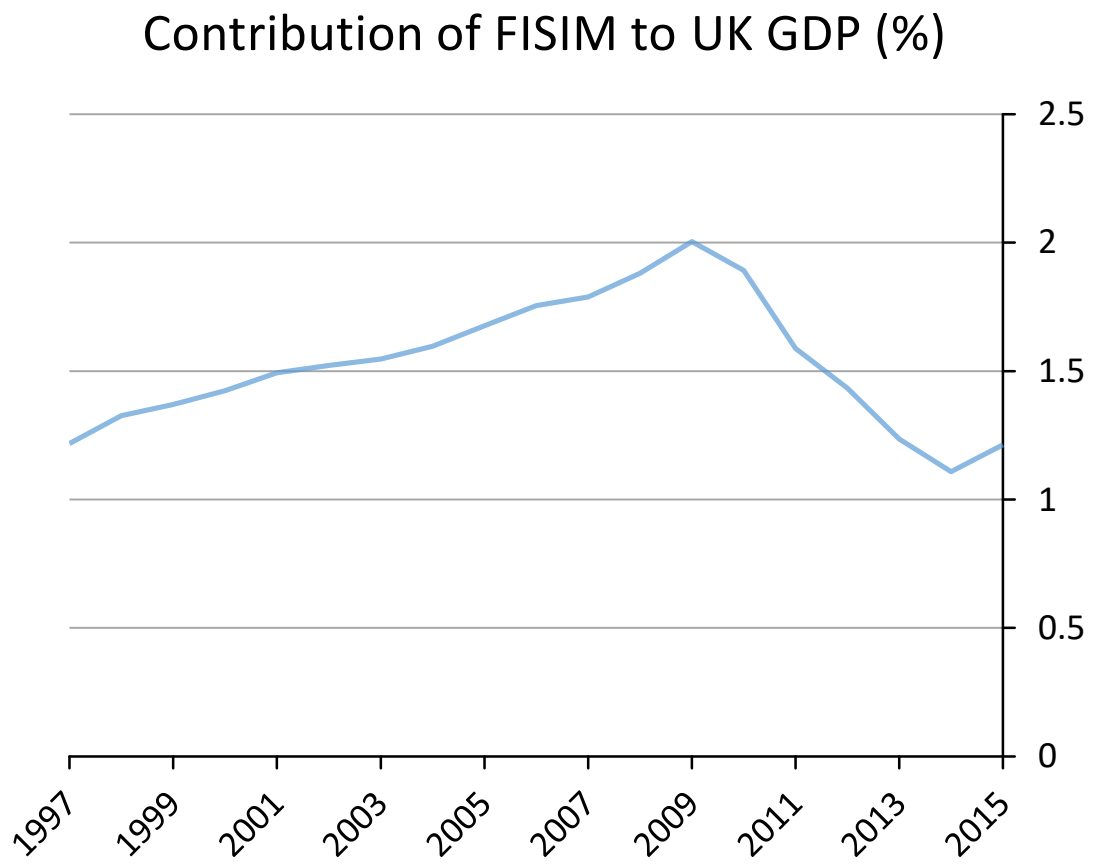
Measuring services: Inadequate granularity

- Services measured in insufficient detail relative to manufacturing
- Services much larger in Advanced Economies but each account for ≈ 40% of SIC industries
- It was ever thus: *1871-85 UK Statistical Abstract* had ≈ 200 pages on agriculture and just 12 on industry!
- Services often heterogeneous and tailored to customer ⇒ harder to track a representative price



Measuring services: Financial services

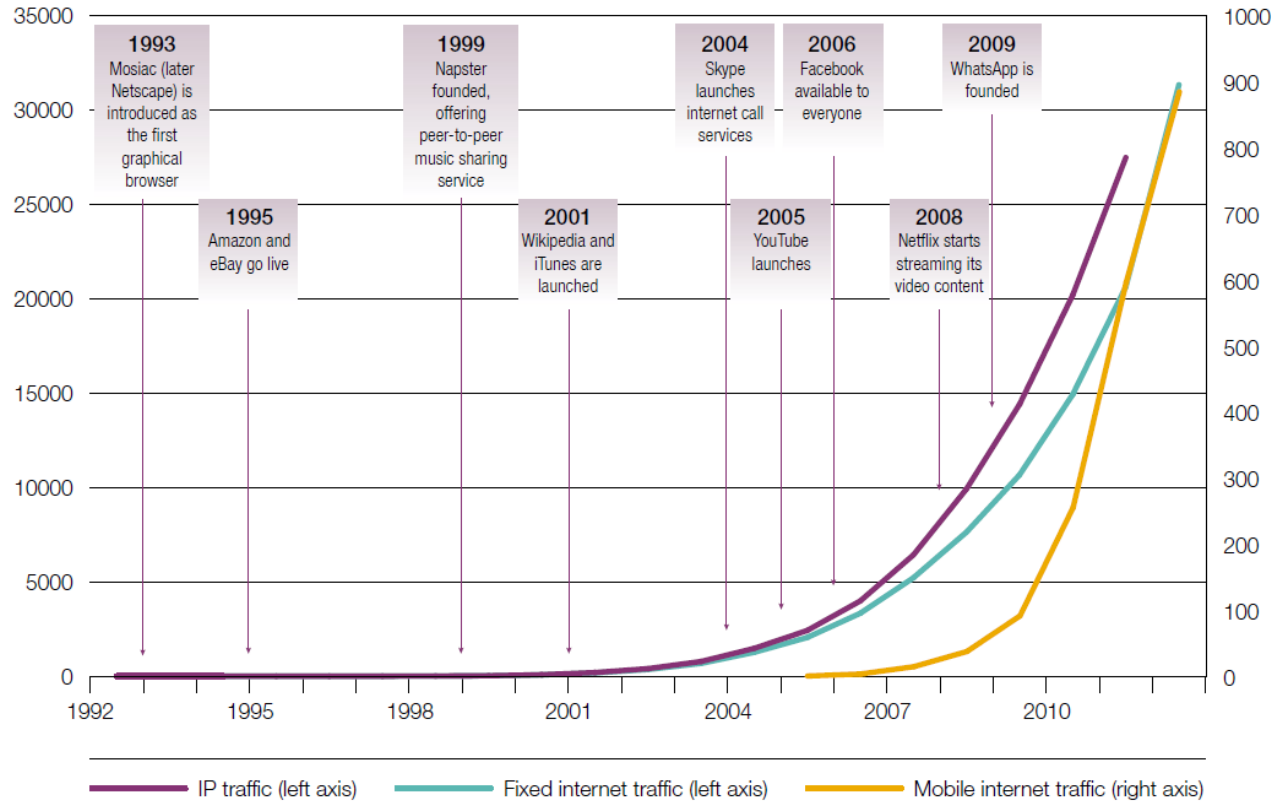
- Services provided for a fee captured naturally but also include a measure of implicit financial services provided (FISIM)
- Evaluated by multiplying stocks of deposits & loans by spreads relative to marginal funding rates
- Contribution reflects swings in bank balance sheets and spreads around GFC (peaks in 2008Q4!)
- But does not reflect associated variation in systemic risk



The digital economy

- The basic puzzle:
  - The past decade has seen a huge expansion in data transfer…
    - …and in activities conducted on line…
    - …but it does not show up in IT industry outputs or affected industries
  - Moreover, recorded productivity growth has slowed in many countries

Global internet traffic trends



Notes: Petabytes per month. Aggregating from multiple sources and applying usage and bitrate assumptions, Cisco Systems, a major network systems company, has published the following historical Internet Protocol (IP) and internet traffic figures.

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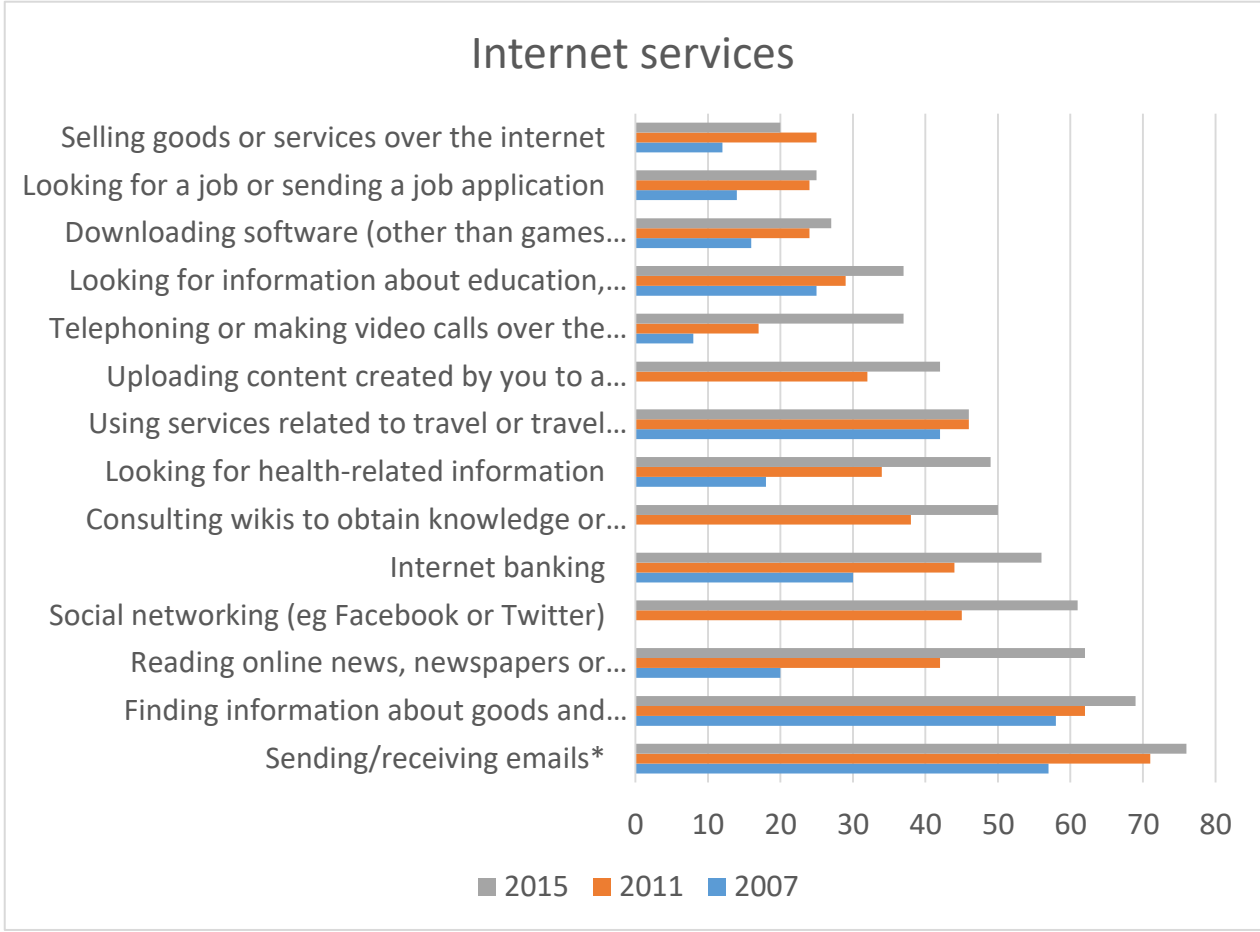

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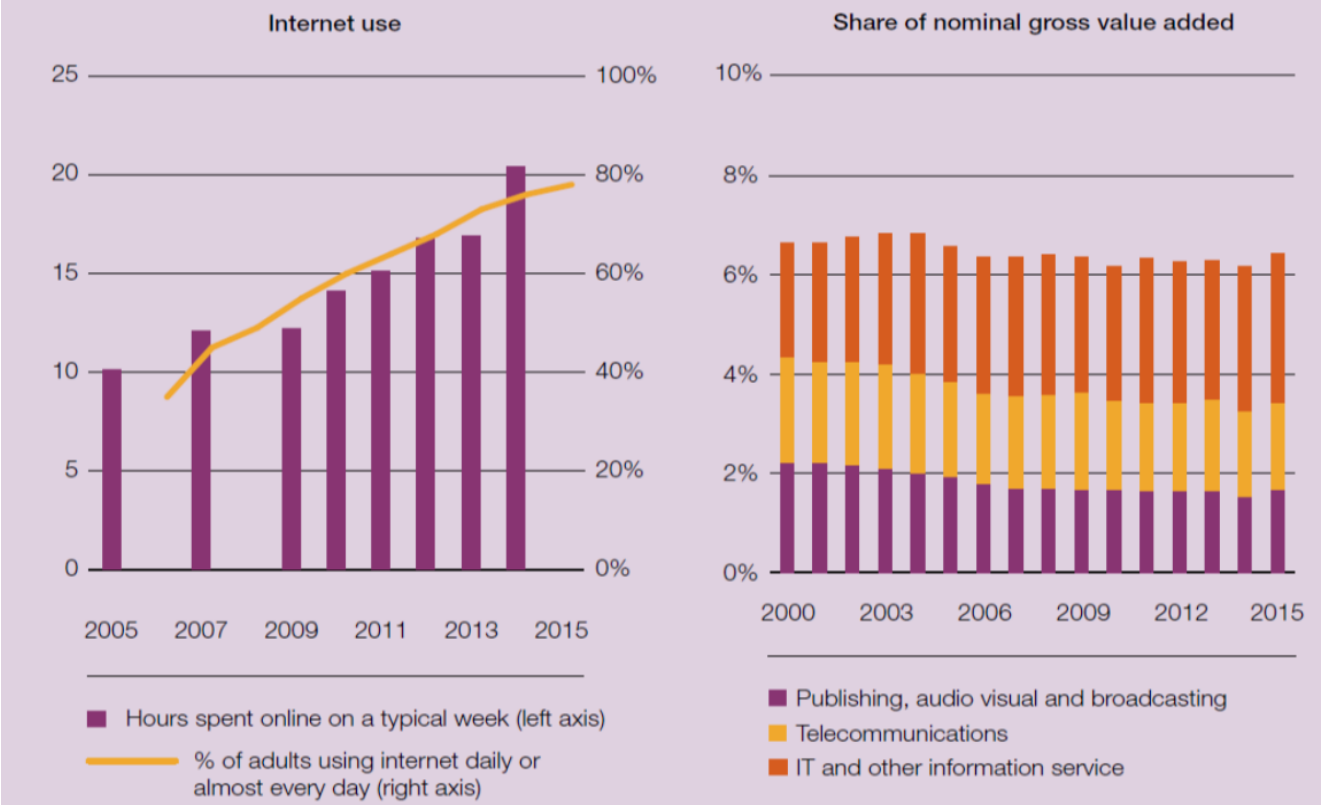
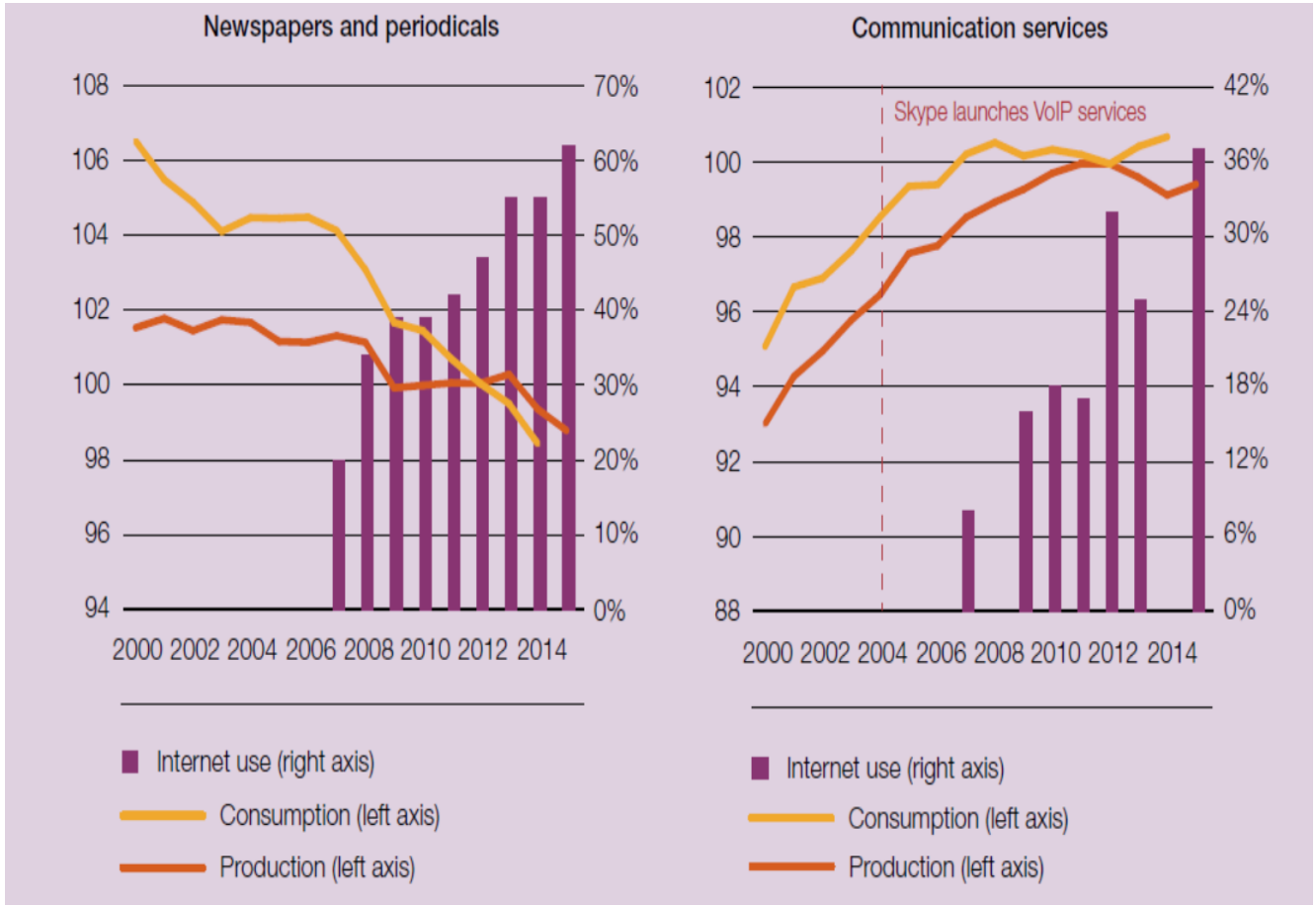


Source: Ofcom, (2015). 'Communications Market Report,' Ofcom, (2015). 'Adults' media use and attitudes,' Office for National Statistics, Review calculations.

The digital economy: New business models

- Digital products non-rival and supplied at zero marginal cost
- Products often provided free and financed in other ways (advertising, selling user info)
- Not reflected in output of affected industries
- Products paid for by advertising net out of GDP!



The digital economy: Services disintermediation

- Internet has greatly reduced search and matching costs
- Led to disintermediation of services into home production (e.g. travel agents, estate agents, on-line banking)
- GDP can fall even though quantity and quality of services consumed rises

Examples of household disintermediation

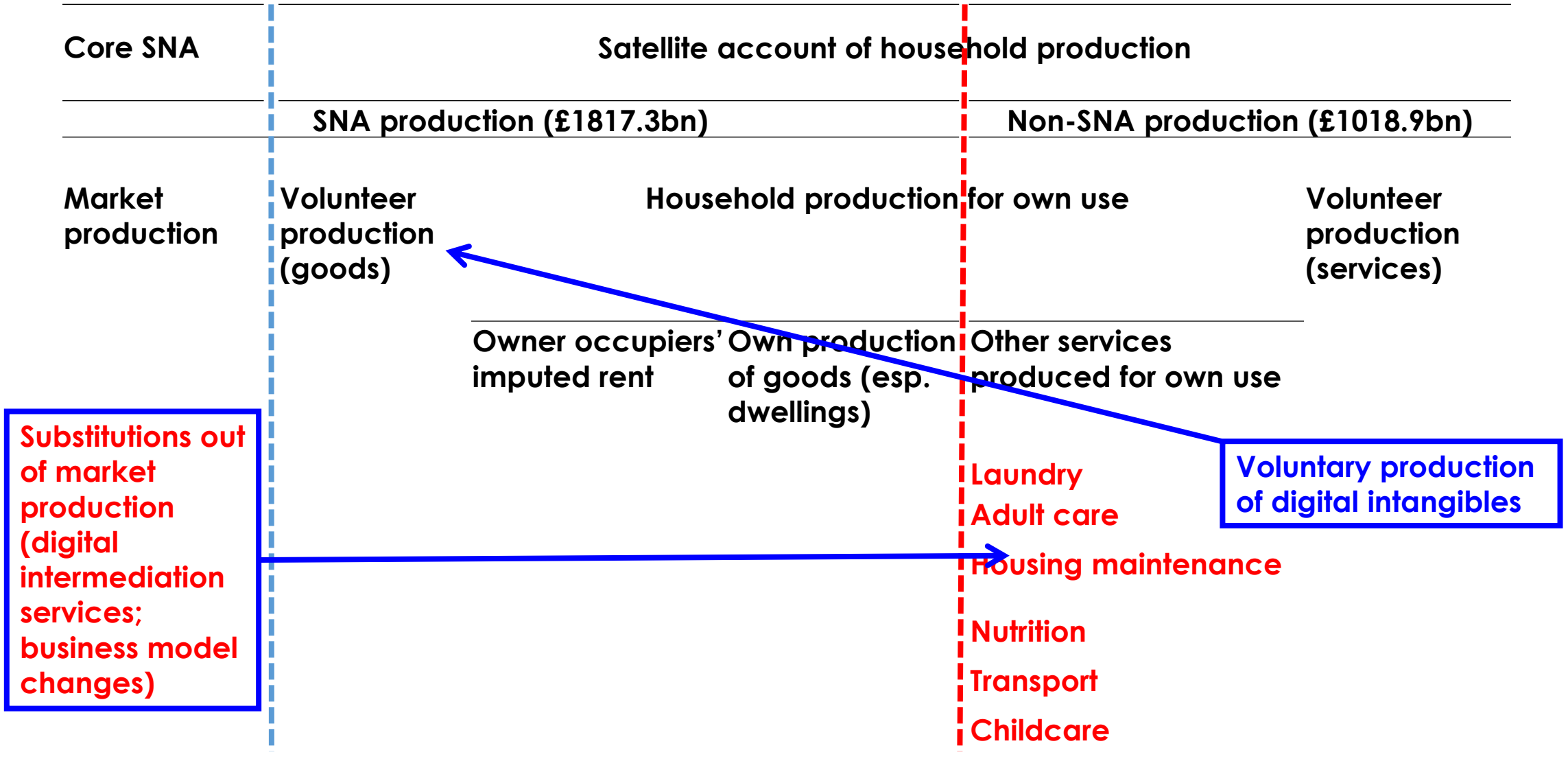
Banking	*56% of UK adults used internet banking in 2015*[28]
Financial trading	*No estimate of numbers for normal personal transactions eg via 'wrapper' platforms; many 'day trading' services advertised and careers advice available: https://www.reed.co.uk/career-advice/how-to-become-a-day-trader/*
Insurance broking	*Many households search online for insurance*
Mortgage broking	*Many households search online for mortgages*
Travel advice & reservations	*46% used the web to use travel or accommodation services*[29]
Estate agency	*Many households search online for properties; there are some online-only estate agencies*
Employment agency	*25% used the web to look for a job or send a job application*[30]
Online search	*Almost everyone who is online*

The digital economy: Voluntary digital production

- Internet has also led to an increase in material provided voluntarily at zero price (e.g. open-source software, Wikipedia, YouTube)
- In some cases this material is a substitute for marketed products
- GDP can again fall, even though quantity and quality of services rises

Type	Examples	Marketed substitute
Open source software	R, Python, Apache, Linux, Mozilla	Proprietary software
Online software/tech advice	Stack Overflow, GitHub etc	Consultancy, software services
Writing/editing online material	Wikipedia, blogs	Purchased reference works, magazines
Uploading videos, other entertainment	YouTube & more	Purchased entertainment
Other advice, discussion forums	MumsNet, health forums	Club subscriptions
Educational material	Khan Academy, CORE Economics, EdX	Textbooks, tutors, fees
Crowdsourced information, UGC	Waze	Local radio
Innovative product designs	Medical devices, household products	Various

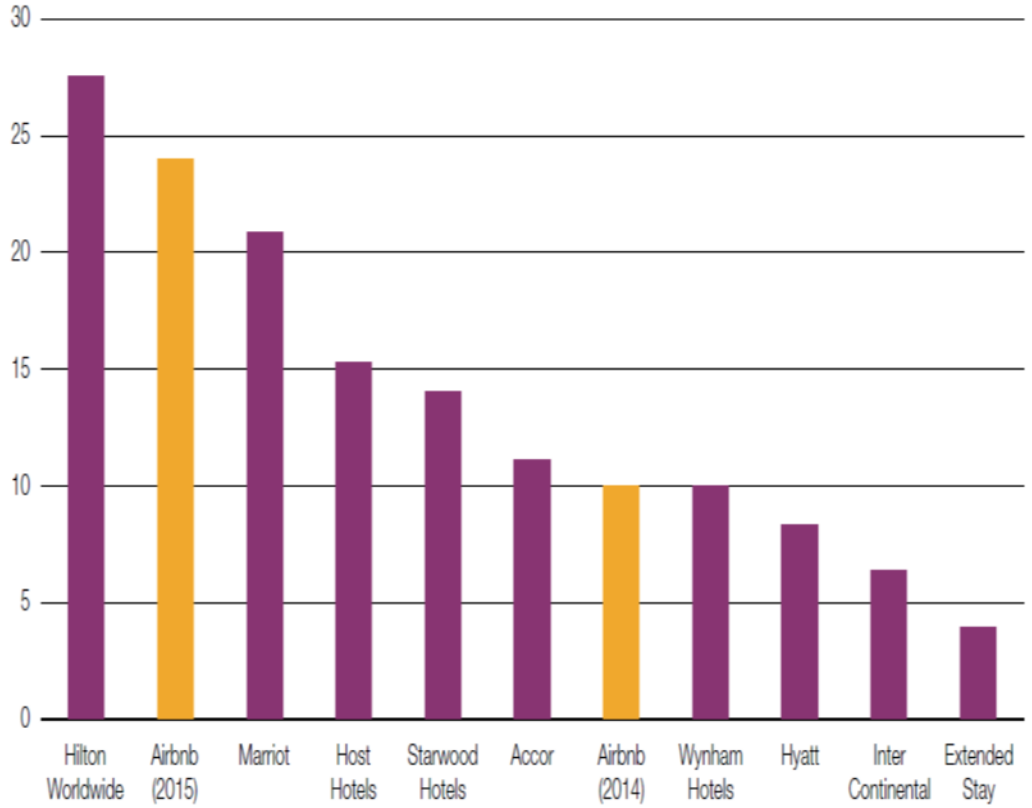
Production boundary issues redux



The digital economy: The 'sharing' and 'gig' economies

- Digital technology has facilitated hiring/sharing of assets (Uber, Airbnb) & skills (Fiverr, TaskRabbit)
- Shift towards *household* rather than the *firm* as a value creator
- Monetary transactions *should* be captured in SNA, but how much actually gets picked up in earnings surveys and tax returns?
- Might see as a growing wedge between GDP(I) and GDP(E)?

Market cap of Airbnb & hotel chains (£bn)



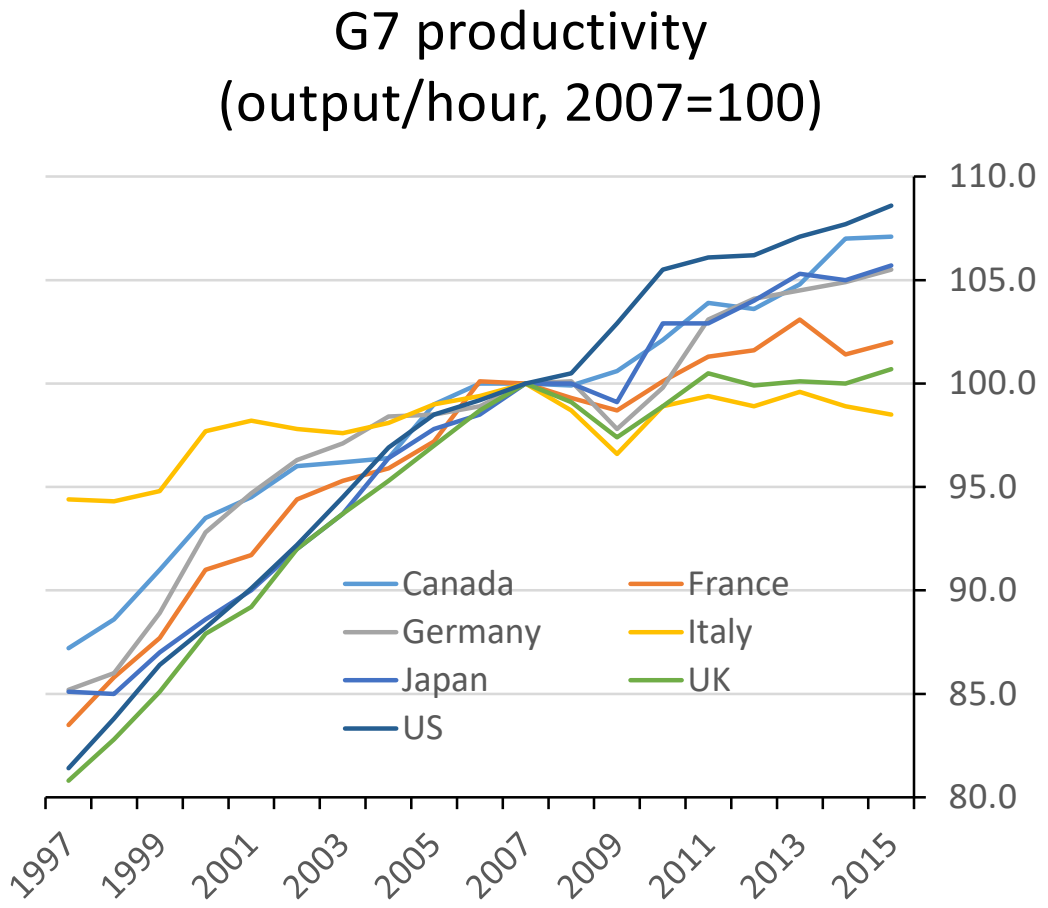
Source: Davidson, L., (2015). 'Airbnb boss calls the UK the "centre of the sharing economy",' *The Telegraph*.

Measuring value added in the digital economy

- How much difference could these phenomena make?
- Some studies focus on advertising expenditures, but these miss a lot of the value created by the digital economy
- Two approaches to valuing consumption of digital products in IRES
  - Value time spent on line at average wage, allowing for some 'cannibalisation' of existing media
  - Adjust communications output in line with internet usage
- Both add ≈ ⅓-⅔ pp. to annual UK growth rate over past decade

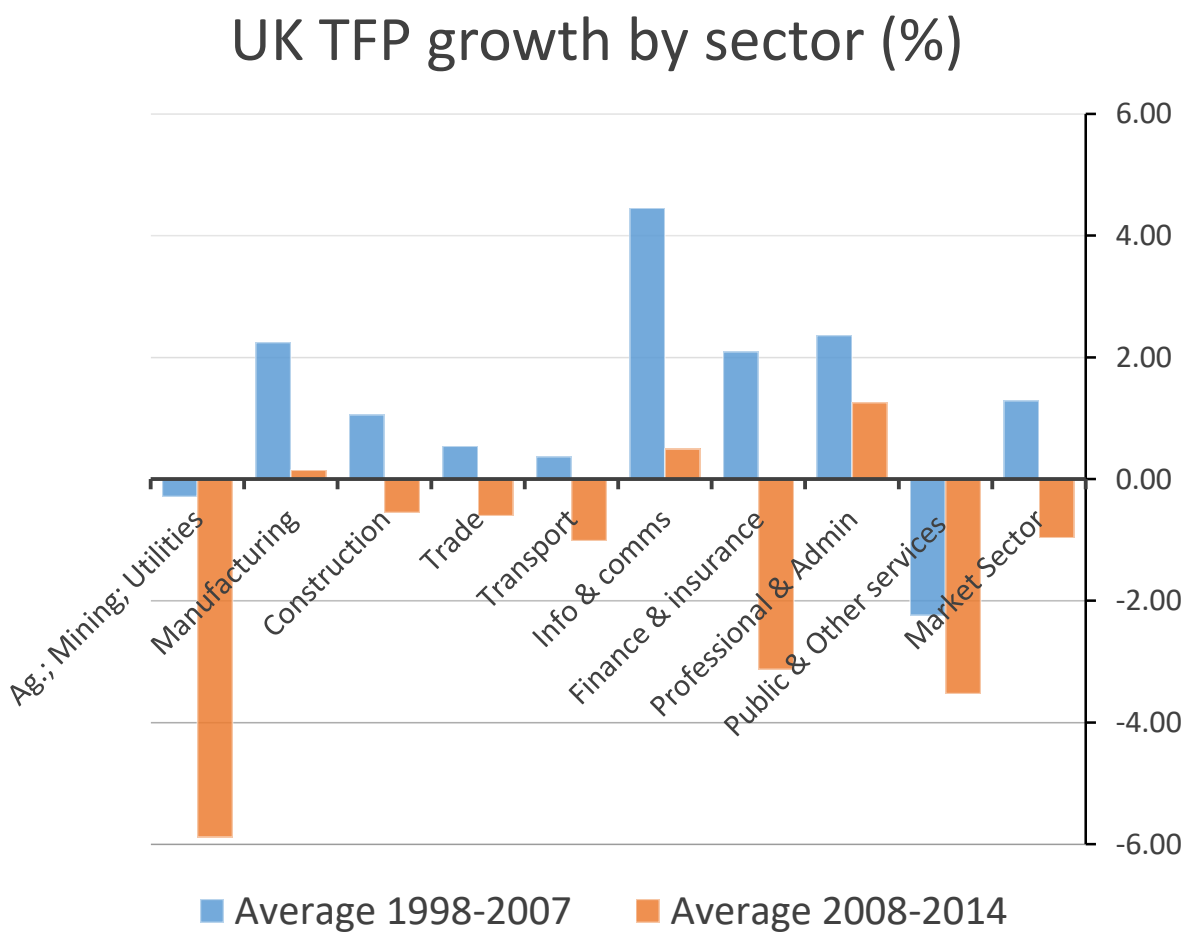
Aside: Can this explain the productivity 'puzzle'?

- Several explanations for the productivity slowdown, e.g.:
  - End of innovation (Gordon)
  - Drag from financial crisis, etc.
- Could measurement issues associated with digital economy, etc., be the explanation?
- Byrne, Fernald and Reinsdorf (2017) conclude not



Aside: Can this explain the productivity 'puzzle'?

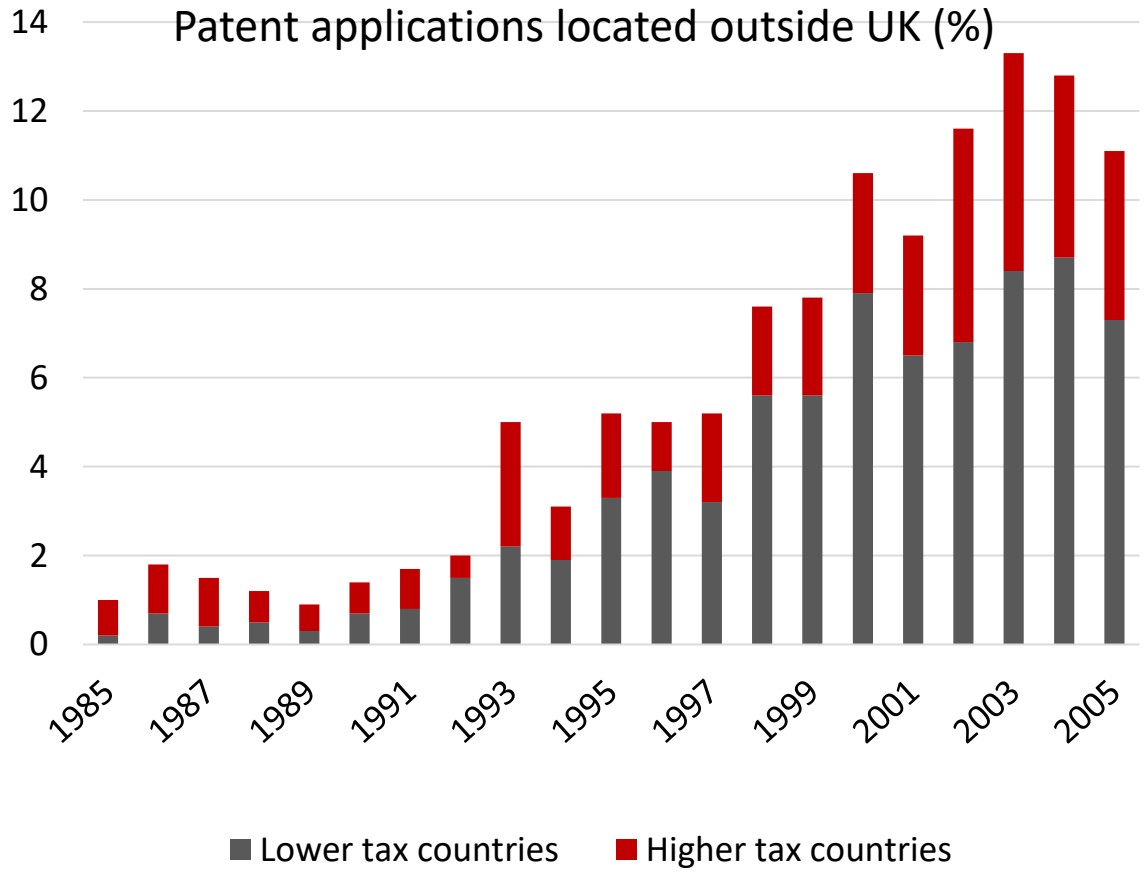
- In UK, slowing esp. large in:
  - Ag., mining & utilities (Oil)
  - Info & communication
  - Finance & insurance
- Measurement issues relevant in last two, but slowdown also apparent in other industries
- So probably only part of the story, but merits further investigation



Source: Office for National Statistics

Cross-border effects

- Geographical location of digital activity can be arbitrary and easily re-domiciled to low tax jurisdictions
- Transfer pricing and intangibles also make it easy for multinationals to shift nominal location of value added (e.g. Starbucks, Amazon)



Source: Griffith, R., Miller, H., O'Connell, M., (2014). 'Ownership of intellectual property and corporate taxation'.

The way forward

- Lots of challenges – but also lots of ne opportunities!
- SNA sometimes acts as a straitjacket; NSIs need to be pro-active, not reactive, in responding to changes in the economy
  - Begin with one-off studies of quantitative importance
  - Be opportunistic in exploiting new sources of information (e.g. web-scraping; Google searches; smartphone data)
  - More use of time-use surveys, satellite accounts, etc
- Stronger engagement needed between statisticians, academics and users in statistics development (e.g. UK ESCoE)
  - Need academic economists to be more interested in measurement issues!