

# Do It Yourself Digital: The Production Boundary and the Productivity Puzzle

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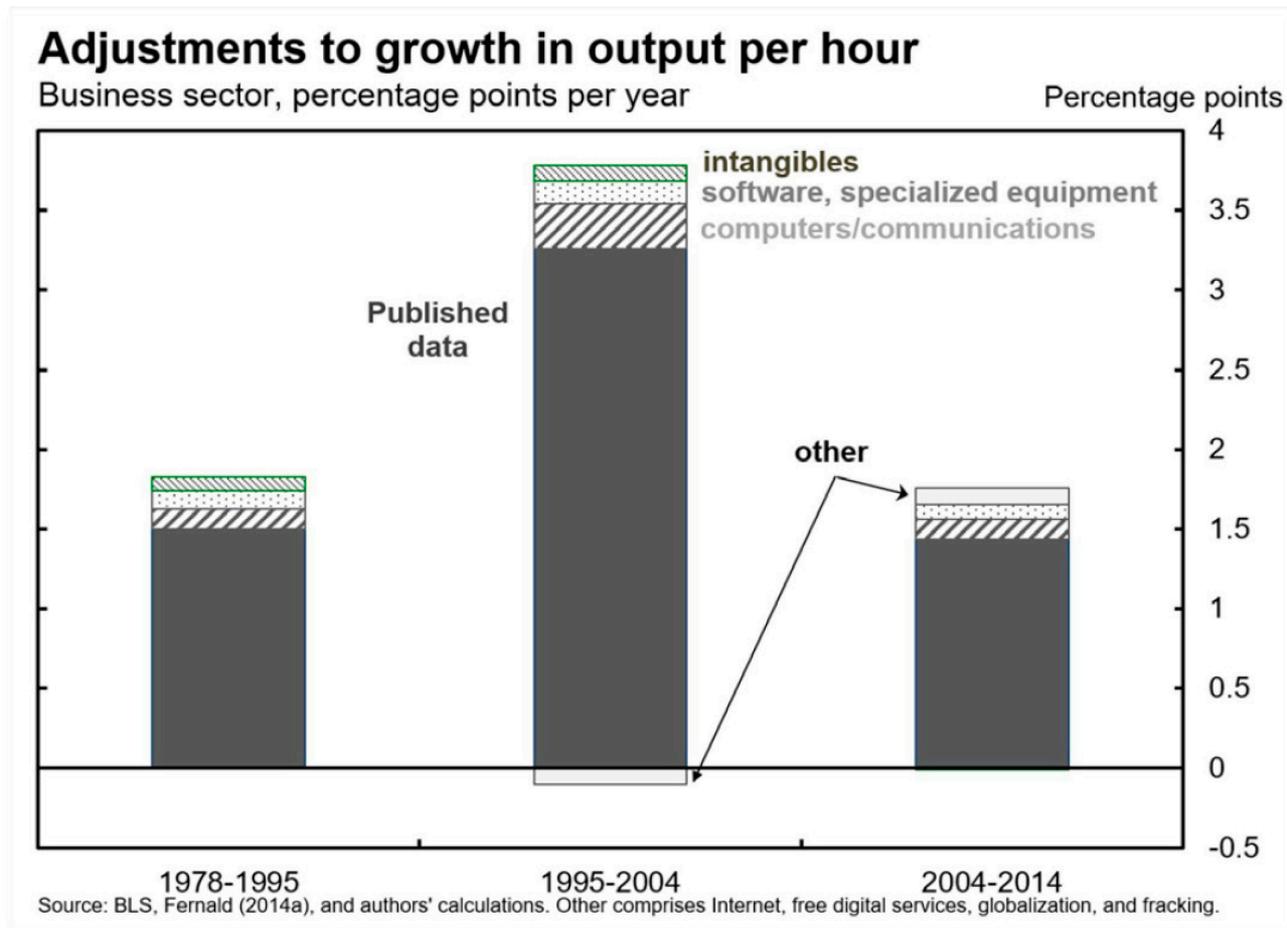
University of Manchester & ESCoE

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# Productivity puzzle: no measurement problems?

- “Certainly from a conceptual perspective GDP does not look to be deficient.” (Ahmad & Schreyer, OECD, 2016)
- Practical issues eg cross-border flows, intra-firm IP transfers
- GDP vs welfare: “[D]igitalization brings further into focus the fact that GDP is a measure of production and not a measure of welfare or consumer surplus.”

# Small measurement problems?



Byrne, Fernald & Reinsdorf, Brookings, 2016

# Multiple digital measurement issues

- Substitution across the production boundary – market to household
- Activities in GDP – affected by digital business models
- Activities in GDP – quality changes and nominal/real split

# Production boundary issues

| Core SNA                   |                              | Satellite account of household production  |   |
|----------------------------|------------------------------|--|---|
| SNA production (£1817.3bn) |                              | Non-SNA production (£1018.9bn)   |   |
| Market production          | Volunteer production (goods) | Household production for own use   | Volunteer production (services) (£23.3bn)   |
|                            |                              | Housing services produced by owner occupiers (£178bn)                                | Other services produced for own use   |
|                            |                              | Own account production (goods), in particular, own-account construction of dwellings | Laundry £5.6bn<br>Adult care £56.9bn<br>Housing services £147.9bn<br>Nutrition £144.3bn<br>Transport £235.8bn<br>Childcare £320.6bn |

# Old questions revisited

- Studenski: “Home ownership was assumed [from 1944] to be a business, producing services that are sold to the home owner in his capacity as tenant.”
- Home production of goods – can be sold in market after production
- Home production of services – substitution by market services occurs (before production)
  - 40% of lone-parents of under fives work and 62% of couples with under fives are both employed
- Post-war productivity flattered by substitution from home to market production
- Accounting for other household capital assets?

# New digital production boundary questions

- Do-it-yourself digital intermediation
- Sharing economy
- Home digital production



Do-it-yourself digital: the production boundary  
and the productivity puzzle

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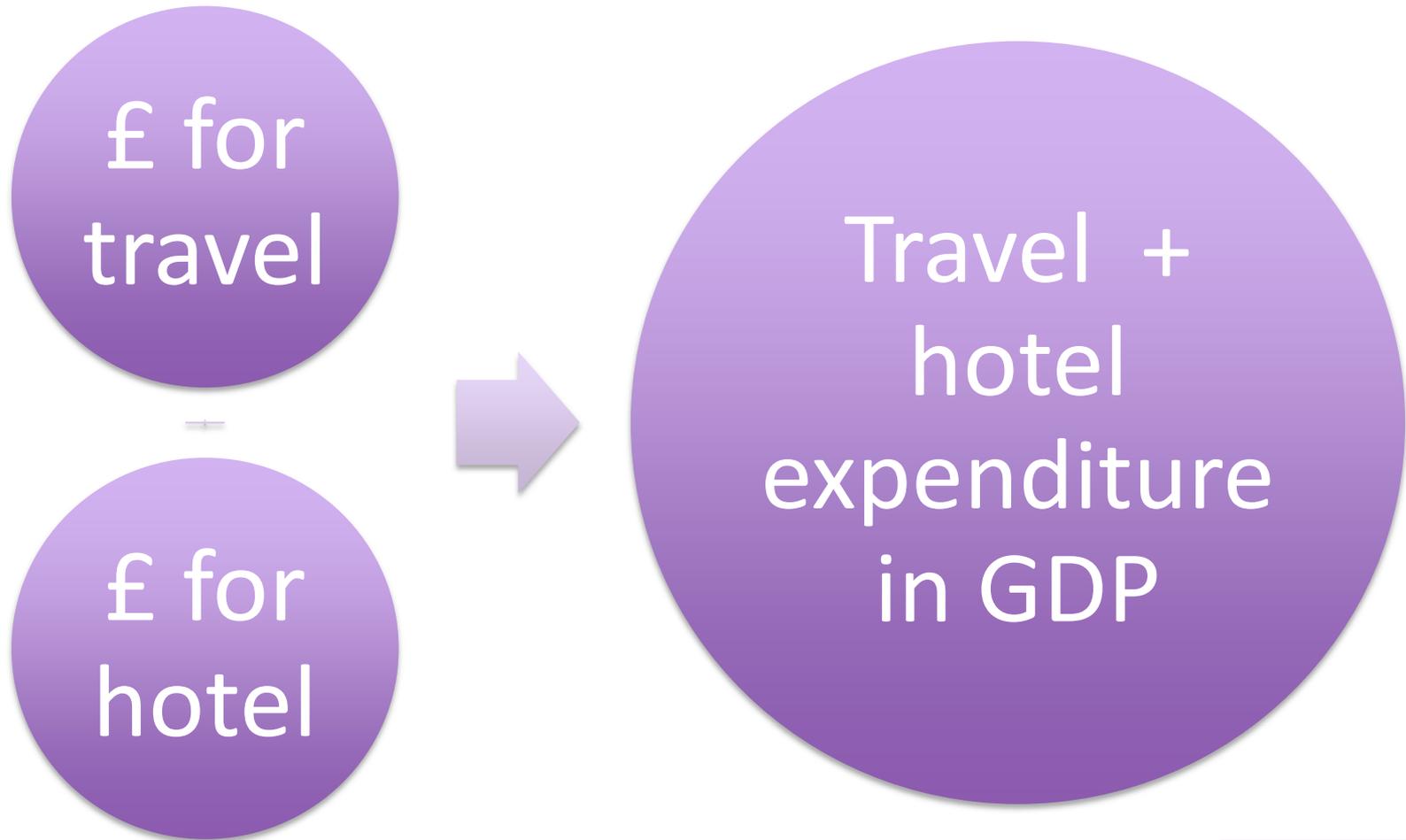


# Household digital intermediation services

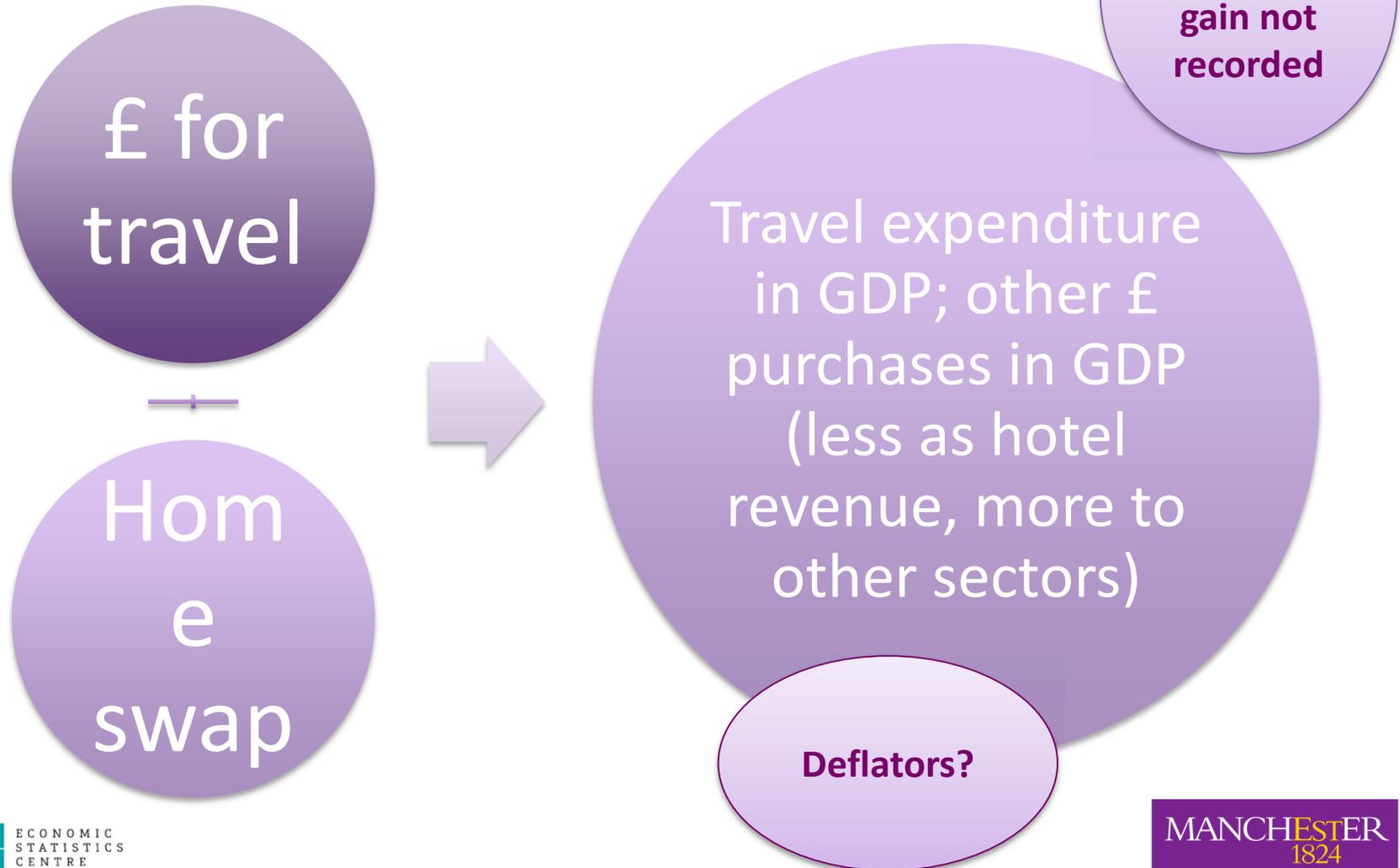
Table 3 Examples of household digital intermediation services

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

# Sharing economy I



# Sharing economy II

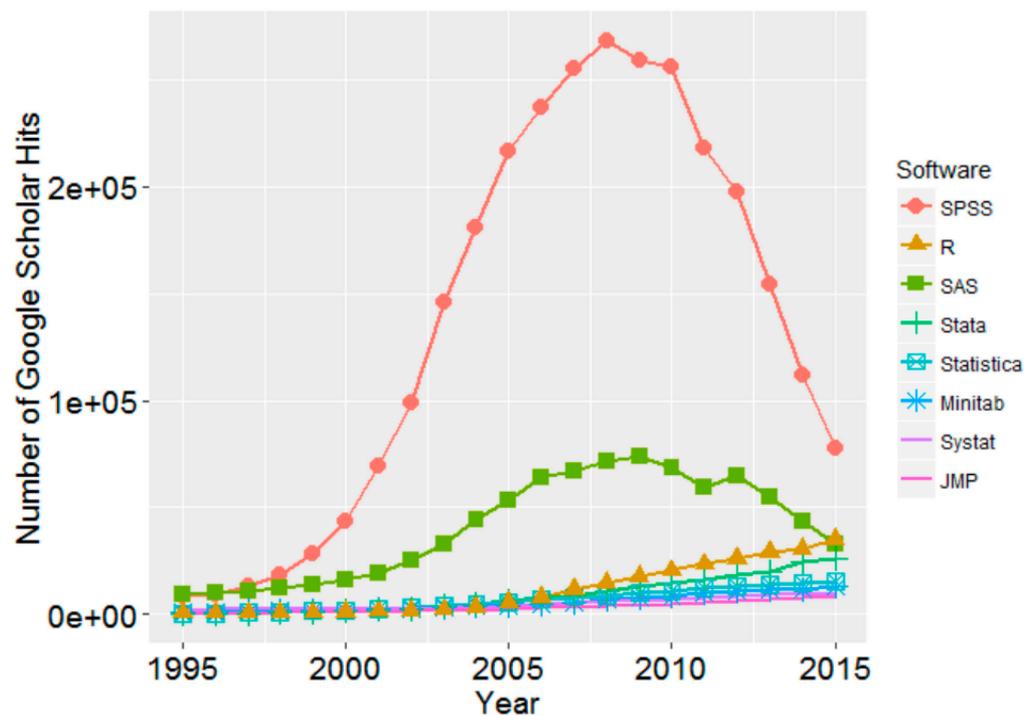


# Voluntary digital production

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

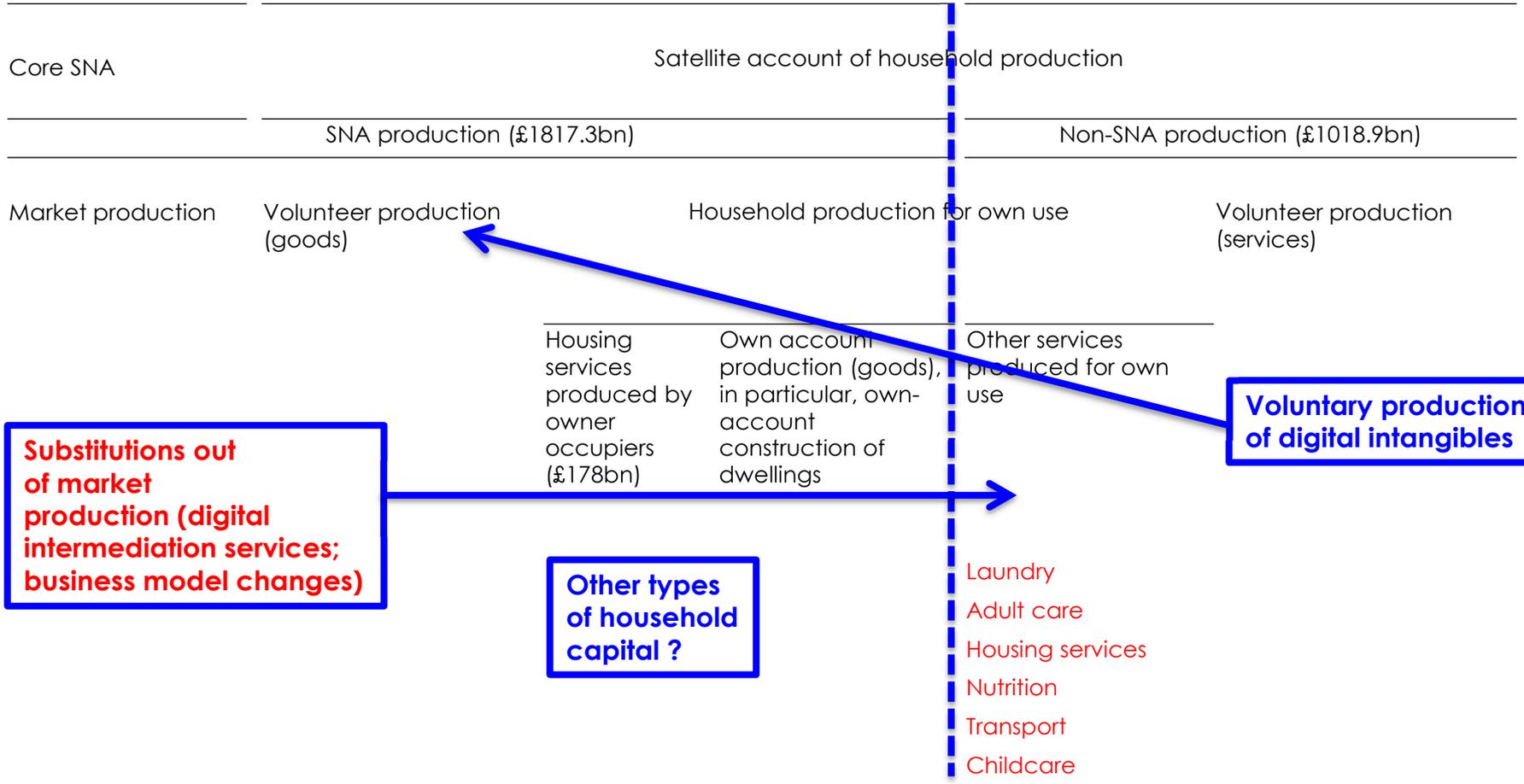
# Is open source substituting for proprietary software?

Figure 2: Top six software packages on Google Scholar



Source: Muenchen (2017)

# Production boundary issues



# Other research

- Open source software:
  - Greenstein, Shane and Frank Nagle, ‘Digital dark matter and the economic contribution of Apache’, *Research Policy*, 43, pp623-631 (2014).
  - Lerner, Josh and Jean Tirole, ‘The Economics of Technology Sharing: Open Source and Beyond’, *Journal of Economic Perspectives*, Volume 19, Number 2, Pages 99-120, 2005.
- User innovation: Gambardella, Alfonso, Christina Raasch and Eric von Hippel, ‘The User Innovation Paradigm: impacts on markets and welfare’, *Management Science*, 2016.
- Consumer WTA for loss of access to free digital goods: Brynjolfsson et al 2017
- Sharing economy – ONS programme

# Inside the production boundary: digital business models

- Intangibles, including data, algorithms
- Reduced fixed investment in commercial property (higher sales/bricks ratio, greater productivity of brick services)
- Ad-funded free goods
  - Same in principle as commercial TV, bigger in scale
  - Deduct an imputation for cost of watching ads?
  - Substitution between ad-funded vs subscription vs purchase to own consumption
- Cross-border effects
  - Substitution between different national GDP totals as consumers switch to overseas intermediaries;
  - Multinational operating services and intangible activities across borders
  - Attribution of value added in digital value chains; value is emailed overseas, products shipped back
- Factory-less manufacturing
- Software as a service, cloud services

# Inside the production boundary: deflators

- Sampling: prices of digital equivalent goods
- Digitisation: often substitution to zero price goods
- Sharing economy: substitution to zero or low price alternatives
- Second hand goods: increased sales enabled by digital platforms
  - Nets out of HHFCE but may be substituting for some new purchases

# Is it all about deflators?

- If inflation is ‘really’ much lower than conventionally measured, ‘real’ GDP/productivity growth is higher
- Thomas Schelling 1958: “[W]hat we call “real” magnitudes are not completely real; only the money magnitudes are real. The “real” ones are hypothetical.”
- Consumer surplus vs real (constant exchange value) growth – boundary with quality change is not clear (Griliches 1963)
- Real GDP is an implicit welfare measure as deflators are (meant to be) constant utility constructs

# What is a good?



Market/government

Household

Routine

Telecoms  
(SMS to WhatsApp)

Medicine

Retail

Consultancy, accountancy, law

Laundry  
(washing machine)

Retail

Cleaning,  
Driving

Domestic robots  
Self-driving cars

Less  
time

Non-  
routine

Consultancy, accountancy, law

Car repair,  
Plumbing

Home cooking, gardening,  
care

More  
time/bett  
er quality

Medicine

Childcare (TV)

Travel agency

Travel agency