Investment and productivity

Jonathan Haskel

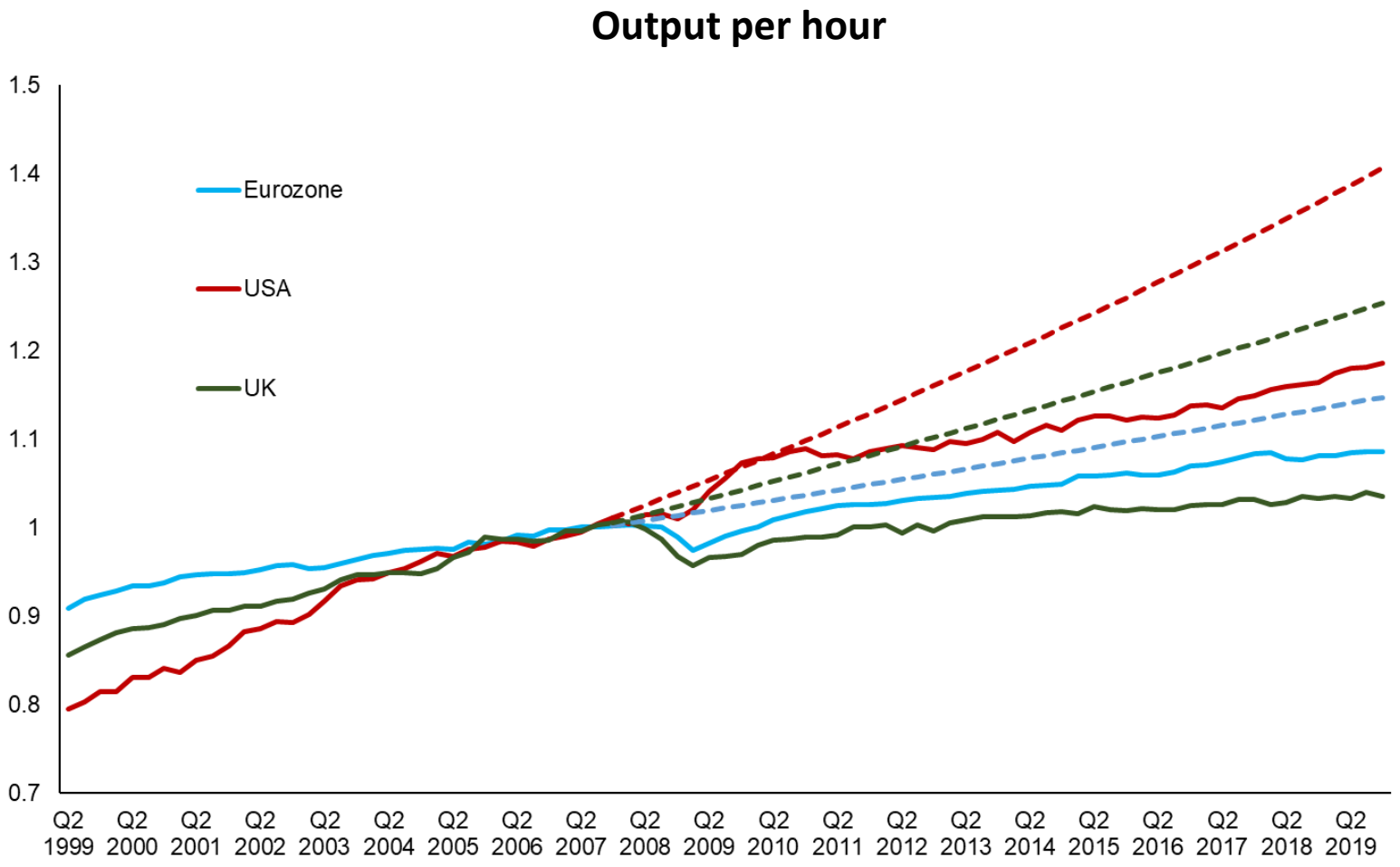
@haskelecon

Imperial College Business School and MPC, Bank of England

7th World KLEMS, Manchester, October 2022 .

Views are my own.

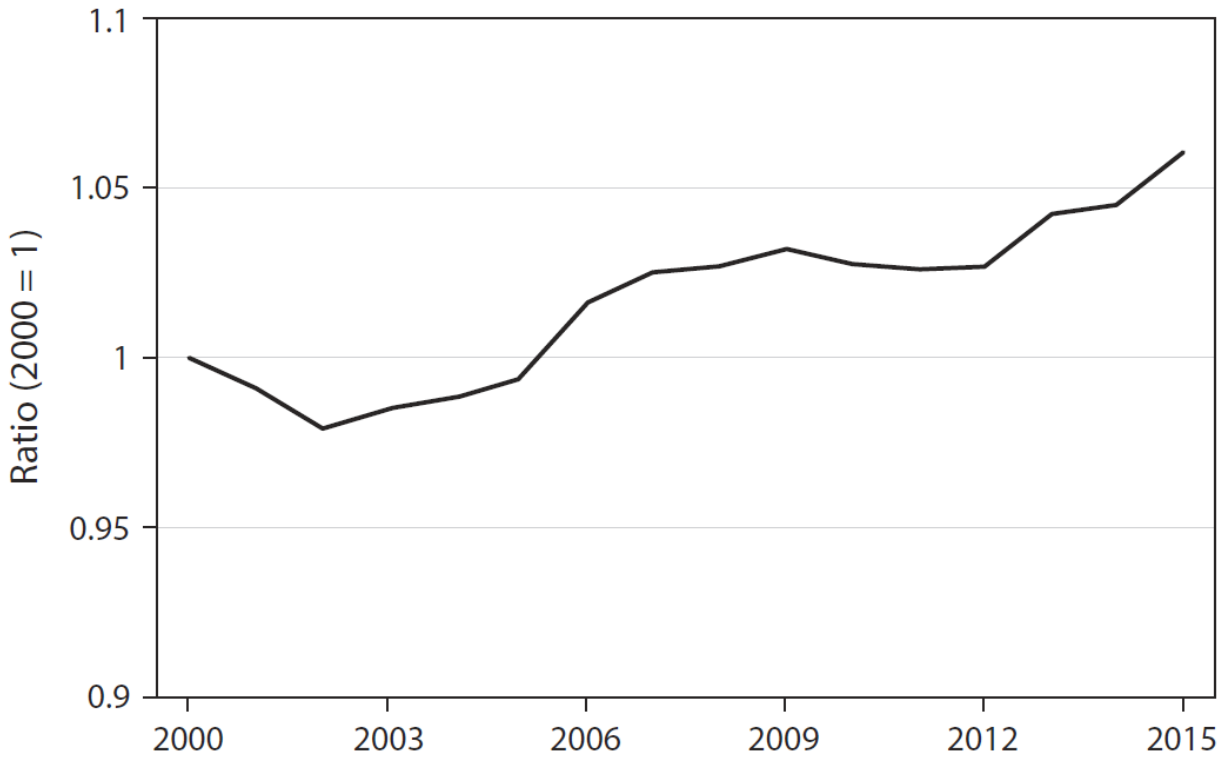
A productivity slowdown



Source: OECD
Note: Dashed lines is level of productivity consistent with pre financial crisis trend (1999-2007).

…rising estimated mark-ups…

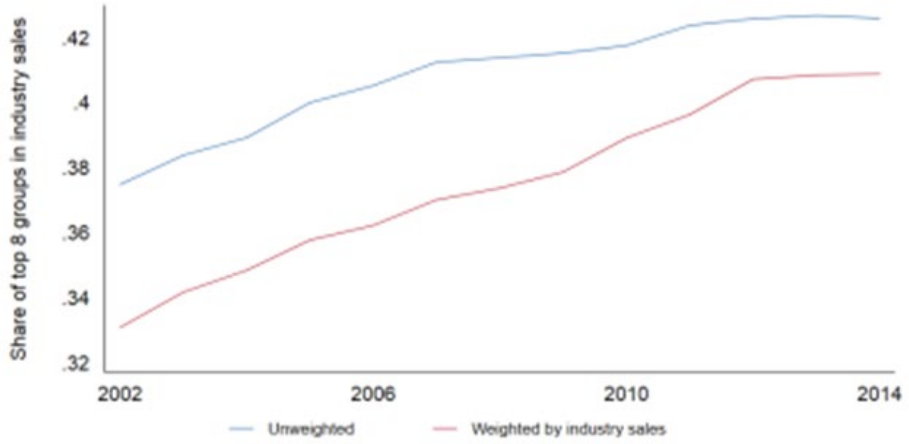
Average global mark-up (20 country average, company data)



Source: Diez, Fan, and Villegas-Sanchez, 2019.

…with more concentration and productivity leader/laggard gaps.

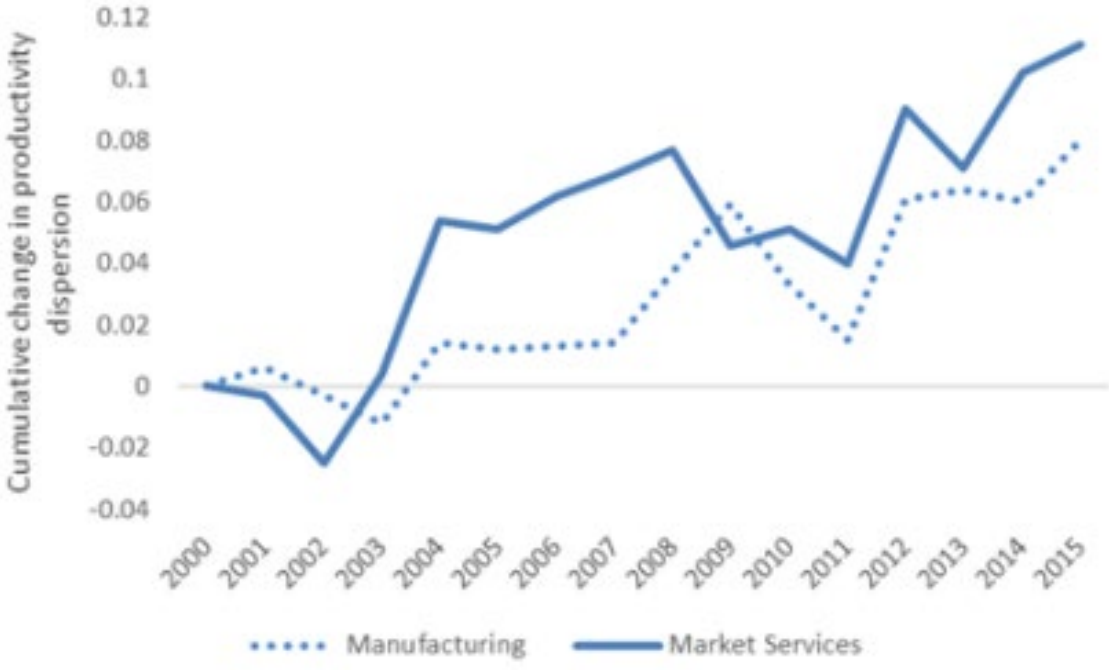
Country average 8-firm industry concentration, unweighted and sales-weighted



Note. The figure shows changes in the unweighted and weighted mean concentration across country-industry pairs. The weighted mean reweights concentration across industries within each country based on time-varying weights given by the share of each industry in the total country-level sales. Countries included are BEL, DEU, DNK, ESP, FIN, FRA, GBR, GRE, FRA, JPN, PRT, SWE and USA. Included 2-digit industries cover manufacturing, construction and non-financial market services.

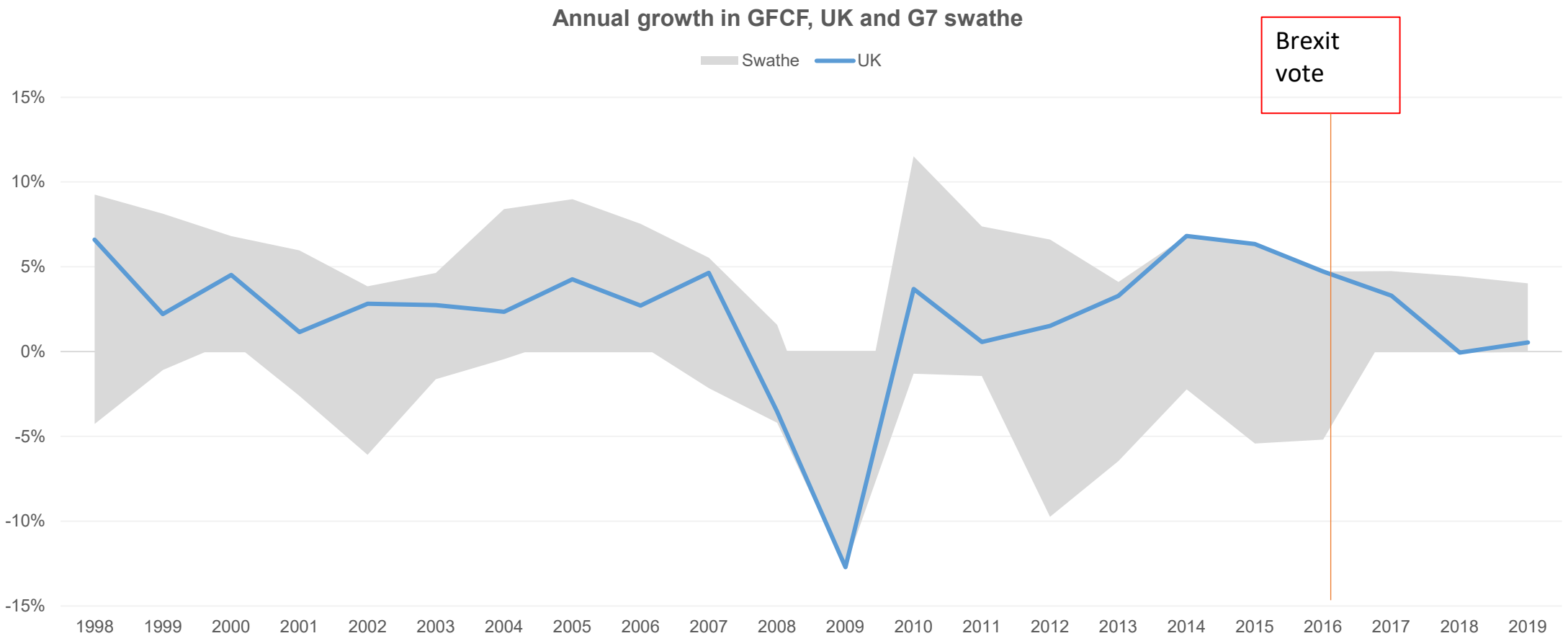
- Note: The figure shows changes in the unweighted and weighted mean concentration across country-industry pairs. The weighted mean reweights concentration across industries within each country based on time-varying weights given by the share of each industry in the total country-level sales. Countries included are BEL, DEU, DNK, ESP, FIN, FRA, GBR, GRE, FRA, JPN, PRT, SWE and USA. Included 2-digit industries cover manufacturing, construction and non-financial market services.
- Bajgar, M., C. Criscuolo and J. Timmis (2021), "Intangibles and industry concentration: Supersize me", OECD Science, Technology and Industry Working Papers, No. 2021/12, OECD Publishing, Paris, https://doi.org/10.1787/ce813aa5-en.

Labour productivity leader/laggard gaps



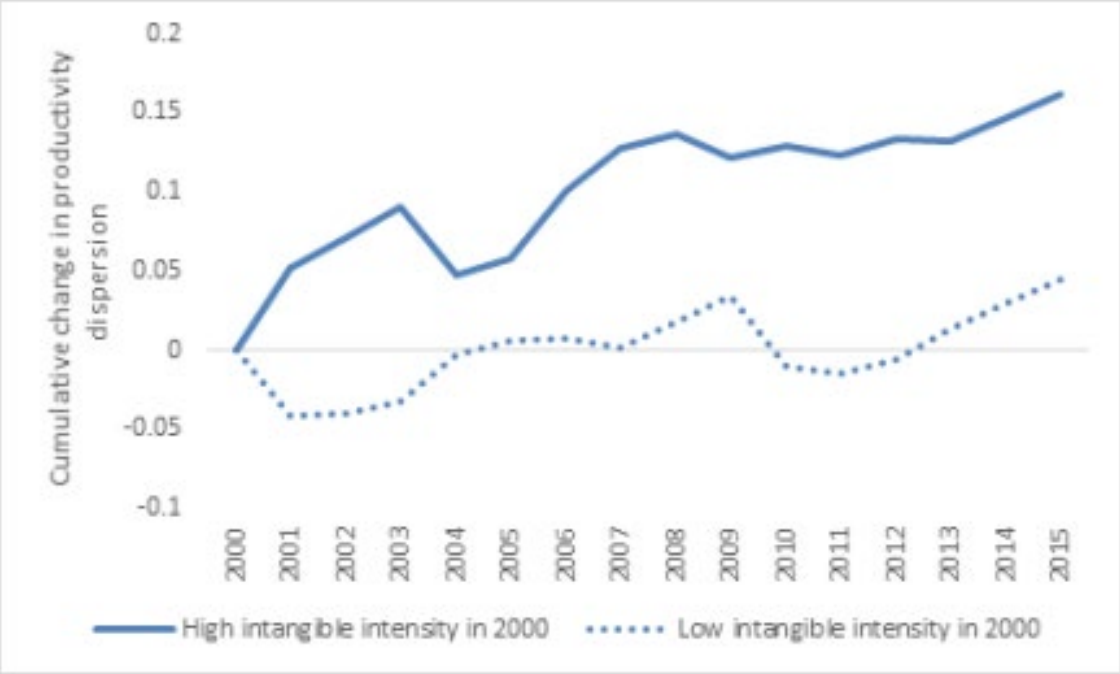
- Note: The graph plots the evolution of productivity dispersion over time within manufacturing and market services. Unweighted averages across two-digit industries are shown for both groups, normalized to 0 in the starting year. The time period is 2000-15. Productivity dispersion is measured as the 90-10 difference in multifactor productivity a la Woolridge, i.e. the difference in productivity between firms at the 90th percentile of the productivity distribution in a country-industry and firms at the 10th percentile. The vertical axes represent logpoint differences from the starting year: for instance, productivity dispersion in market services has increased by about 0.11 in the final year, which corresponds to approximately 11% higher productivity dispersion in 2015 compared to 2000. Countries included are AUT, BEL, DEU, DNK, FIN, FRA, IRL, ITA, NLD, PRT. Source: Authors' estimation based on MultiProd database (November 2020)
- Corrado, C., et al. (2021), "New evidence on intangibles, diffusion and productivity", OECD Science, Technology and Industry Working Papers, No. 2021/10, OECD Publishing, Paris, https://doi.org/10.1787/de0378f3-en.

…and some UK-specific issues…

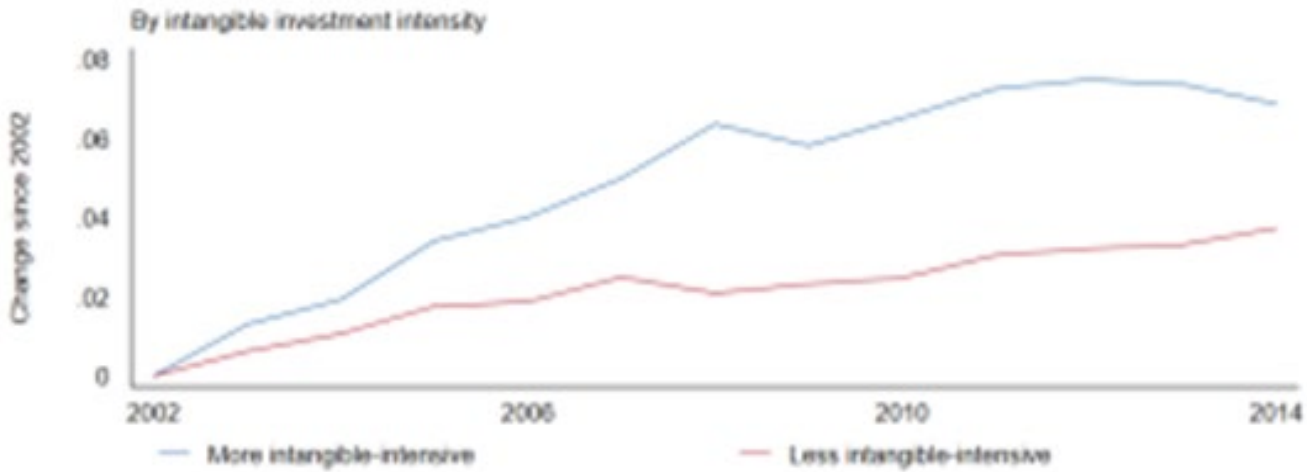


Growth in productivity gaps and concentration are in the intangible-intensive industries…

Country average productivity dispersion, by intangible-intensity



Country average 8-firm industry concentration, by intangible-intensity



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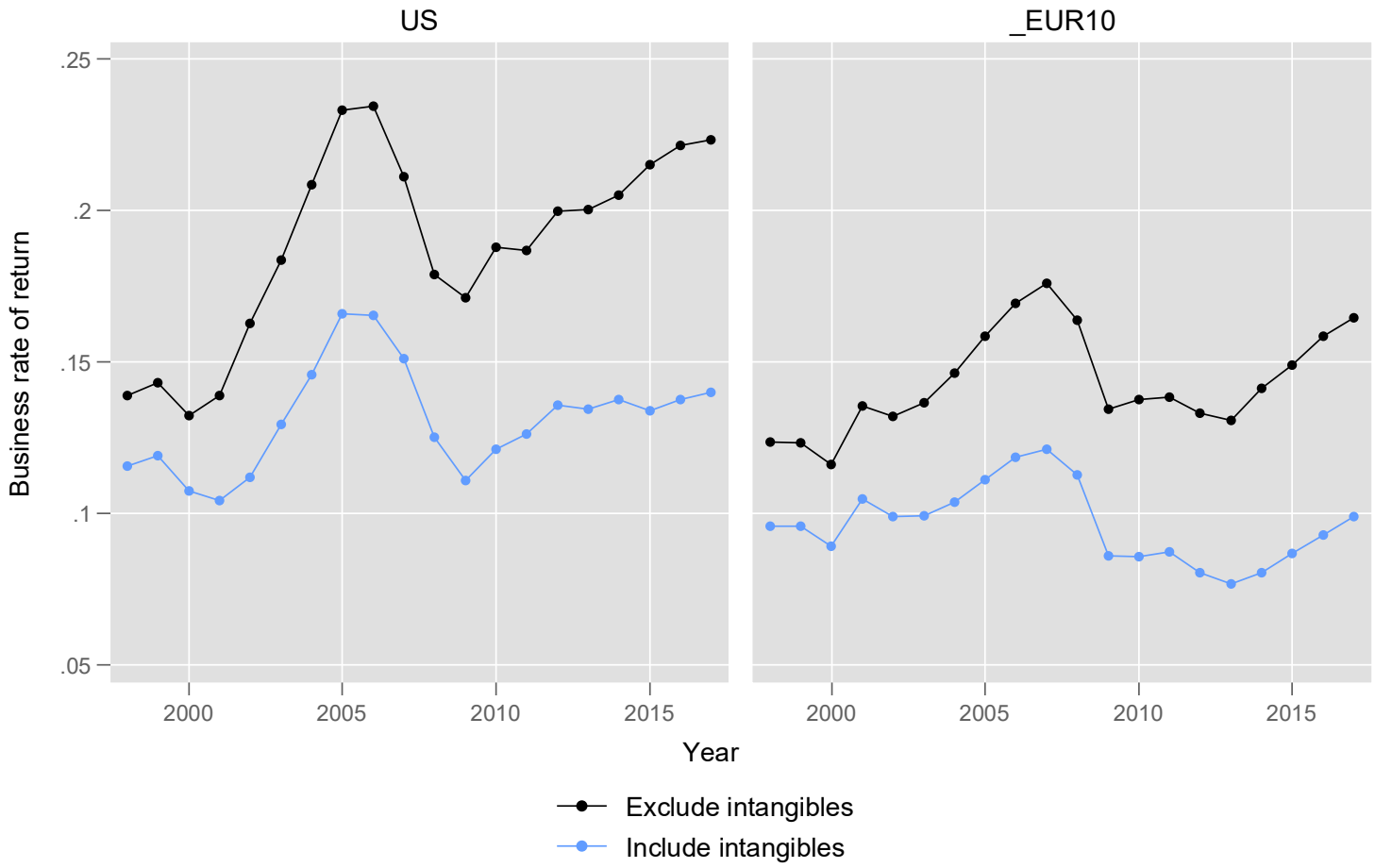
…rates of return are flat if you include intangibles



Source: author's calculations from www.euklems-intanprod-llee.luiss.it.

Some results for the UK

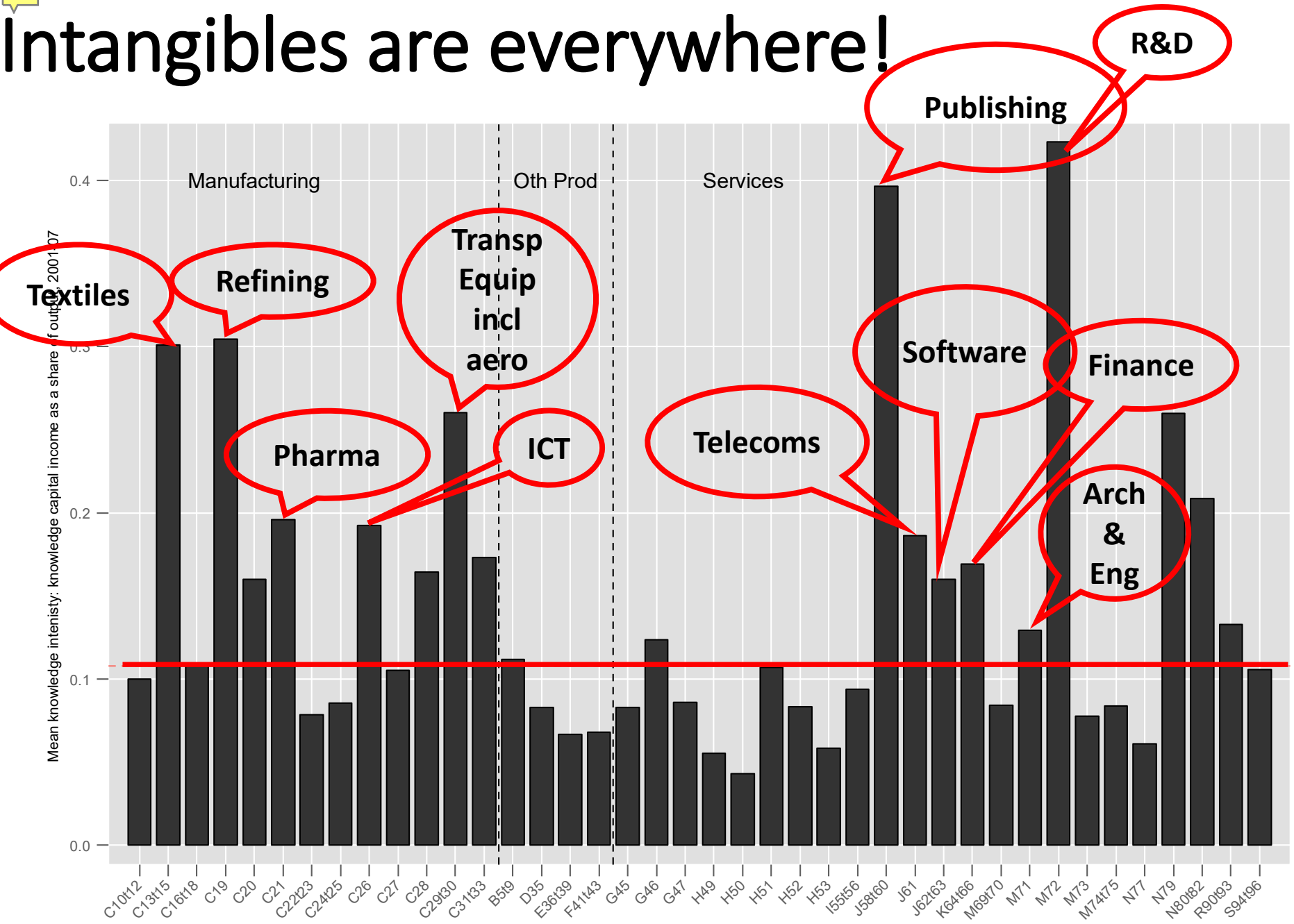
- **Accounting for the slowdown in UK innovation and productivity** with Peter Goodridge, TPI working paper and data set
- UK non-farm market sector industry-year data (1999-2020)
  - Based on ONS intangible investment and BB21 national accounts; double-deflated GVA & new price indices
  - 40 (non-farm) market sector industries
    - Excluding: Agriculture (A), Real Estate (L), Public Admin & Defence, Education, Health (O-Q) and Employment Agencies (N78)

- Growth-accounting with:
  - Intangible-adjusted value-added
  - Tangible capital
  - National accounts intangible capital
  - Additional CHS (Corrado, Hulten and Sichel, 2005) intangibles
  - Labour composition

Data: intangible investment (Corrado, Hulten & Sichel, 2005)

Category	Asset	Included in national accounts
Computerised information	Software and databases	✓
Innovative property	R&D (incl. non-scientific R&D)	✓
	Artistic originals	✓
	Mineral Exploration	✓
	Design	✗
	Financial product innovation	✗
Economic competencies	Firm-specific training	✗
	Branding (advertising and market research)	✗
	Organisational capital	✗

Intangibles are everywhere!



- Intangible-intensity = mean share of intangible capital income in industry output (red line = median)
- Compare with knowledge-intensive./digital

TFP is the major driver of the UK labour productivity slowdown, some capital shallowing

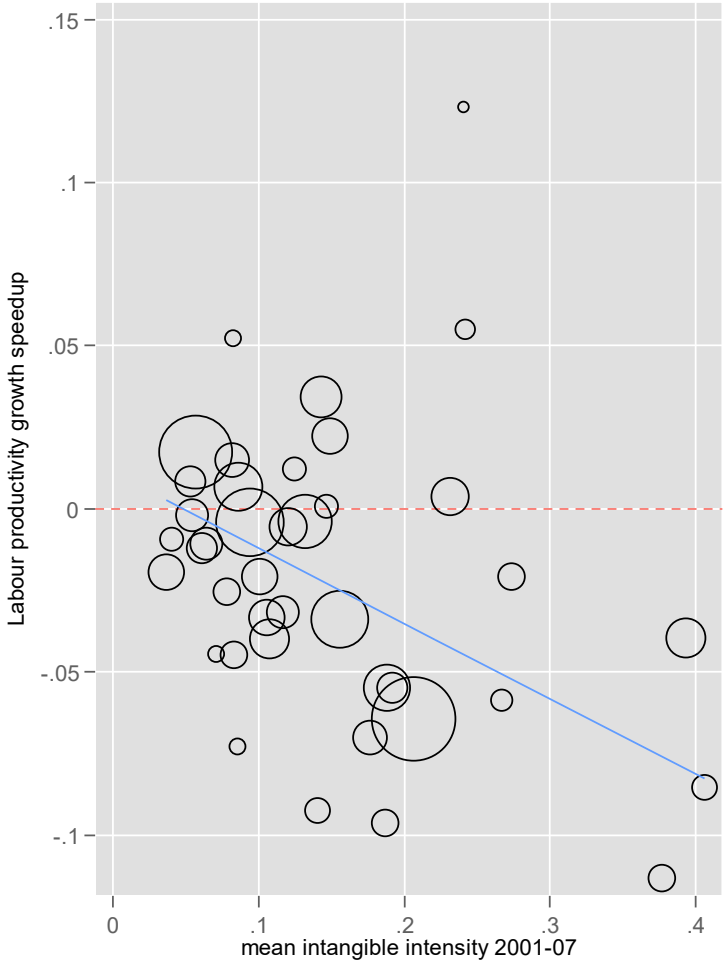
		1	2	3	4
		Before (00-07)	**After (07-19)**	**Implied gap (pp)**	***% of gap explained***
	Δln(Q/H)ii	2.32%	0.10%	26.59	100%
1	Labour reallocation	-0.24%	-0.04%	-2.41	-9%
2	Contribution: Labour Composition	0.17%	0.24%	-0.86	-3%
3	Contribution: Capital deepening	0.94%	0.17%	9.23	35%
	Tangibles	0.62%	0.07%	6.59	25%
	Intangibles	0.33%	0.11%	2.63	10%
4	TFP	1.44%	-0.28%	20.64	78%

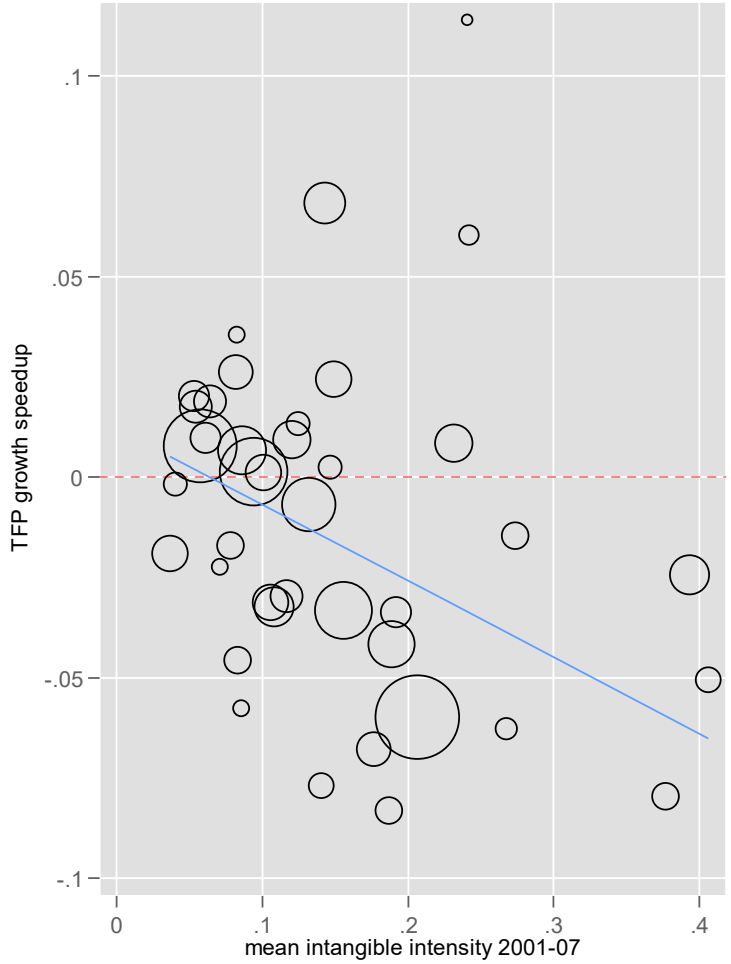
(9.23/26.59=) 35% due to slowdown in K deepening
(20.64/26.59=) 78% due to slowdown in TFP

TFP slowdown driven by intangible-intensive sectors

		1	2	3
	sector	**2000-07**	**2007-19**	**Implied gap**
1	Non-farm market sector (40 inds)	1.44%	-0.28%	20.64
2	Intangible-intensive (20 inds, above MS median)	1.83%	0.30%	18.37
3	Other (20 inds, below MS median)	-0.38%	-0.57%	2.27

Slowdown in TFPG and LPG *greater* for *more* intangible-intensive sectors



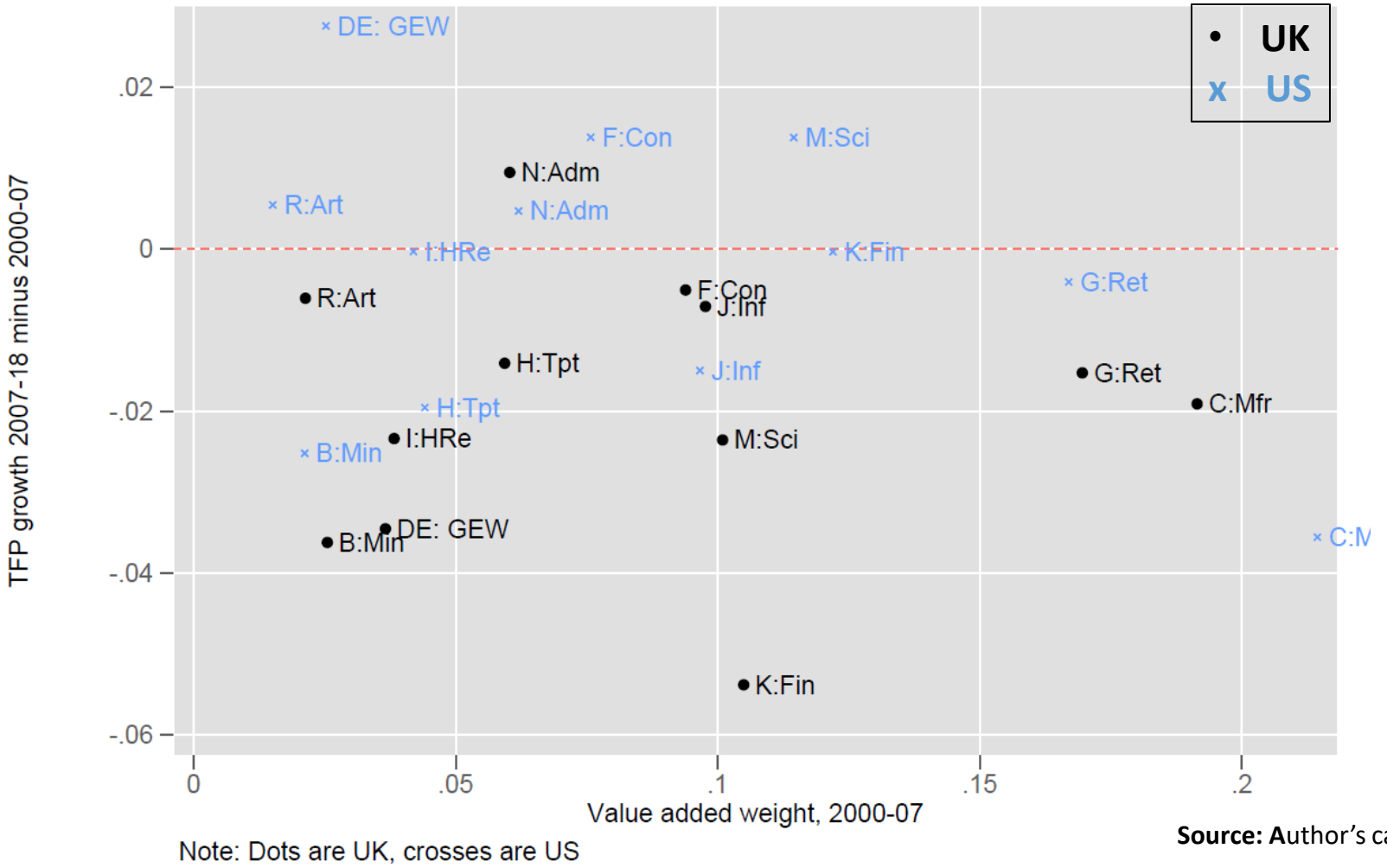


- Left: Δ(ΔLPG)
- Right: Δ(ΔlnTFP)

- Negative correlation for each
  → Slowdown greater in intangible-intensive inds

- Paper confirms with regressions and decompositions for numerous definitions of knowledge-intensity

Slowdown in TFP appears more broad-based and deeper in the UK than the US



Note: Dots are UK, crosses are US

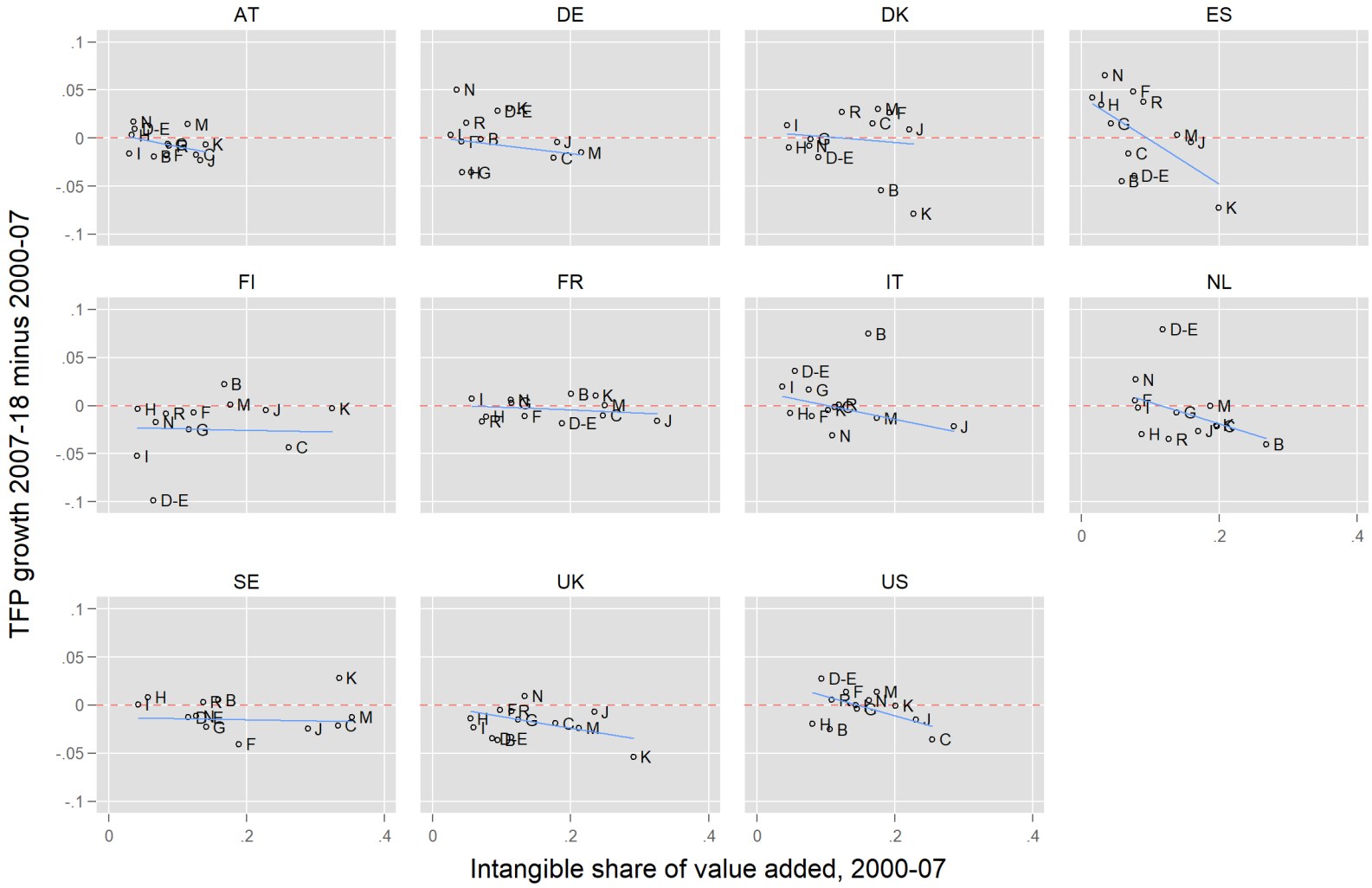
- Y-axis: Δ(ΔlnTFP) (post crisis – pre crisis)
- X-axis: ind share in value-added
- Below red line = slowdown

- 1) Ind structure similar

- 2) UK industry slowdowns deeper and more broad-based

Source: Author's calculations from www.euklems-intanprod-llee.luiss.it.

TFPG slowdown in intangible-intensive industries across countries



Source: Author's calculations from www.euklems-intanprod-llee.luiss.it.

R&D politically charged

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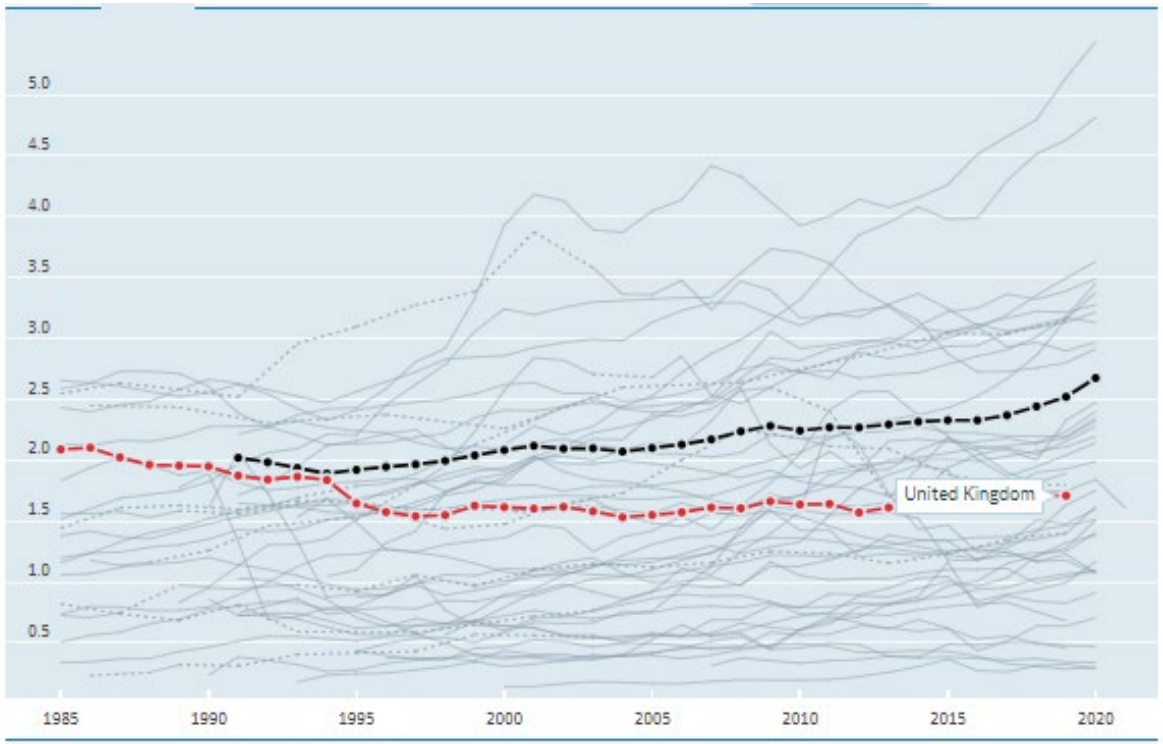
Press release

Government announces plans for largest ever R&D budget

The £39.8 billion R&D budget for 2022-2025 will help deliver the government's Innovation Strategy and drive forward ambitions as a science superpower.

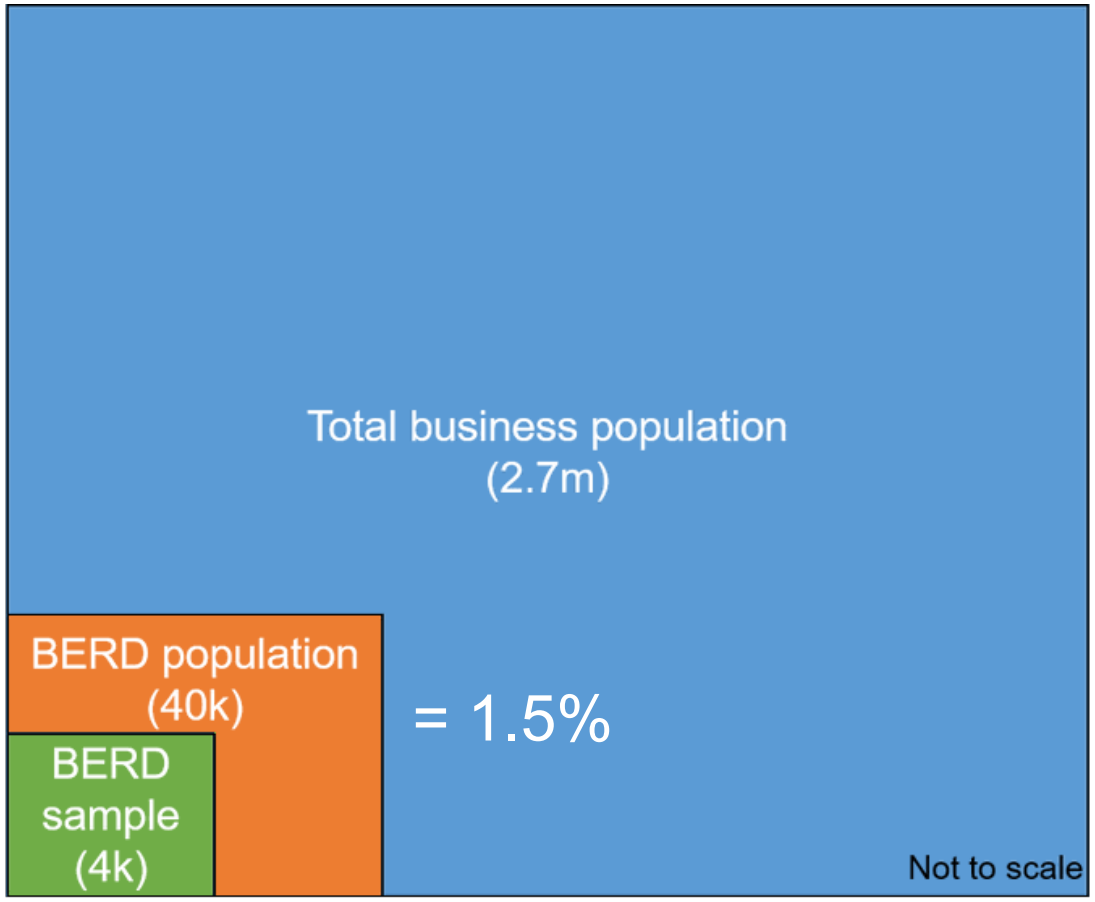
- allocations will deliver on the government's Innovation Strategy, including the ambition to increase total R&D investment to 2.4% of GDP by 2027

Gross domestic R&D spend/GDP



- Source: OECD 2022

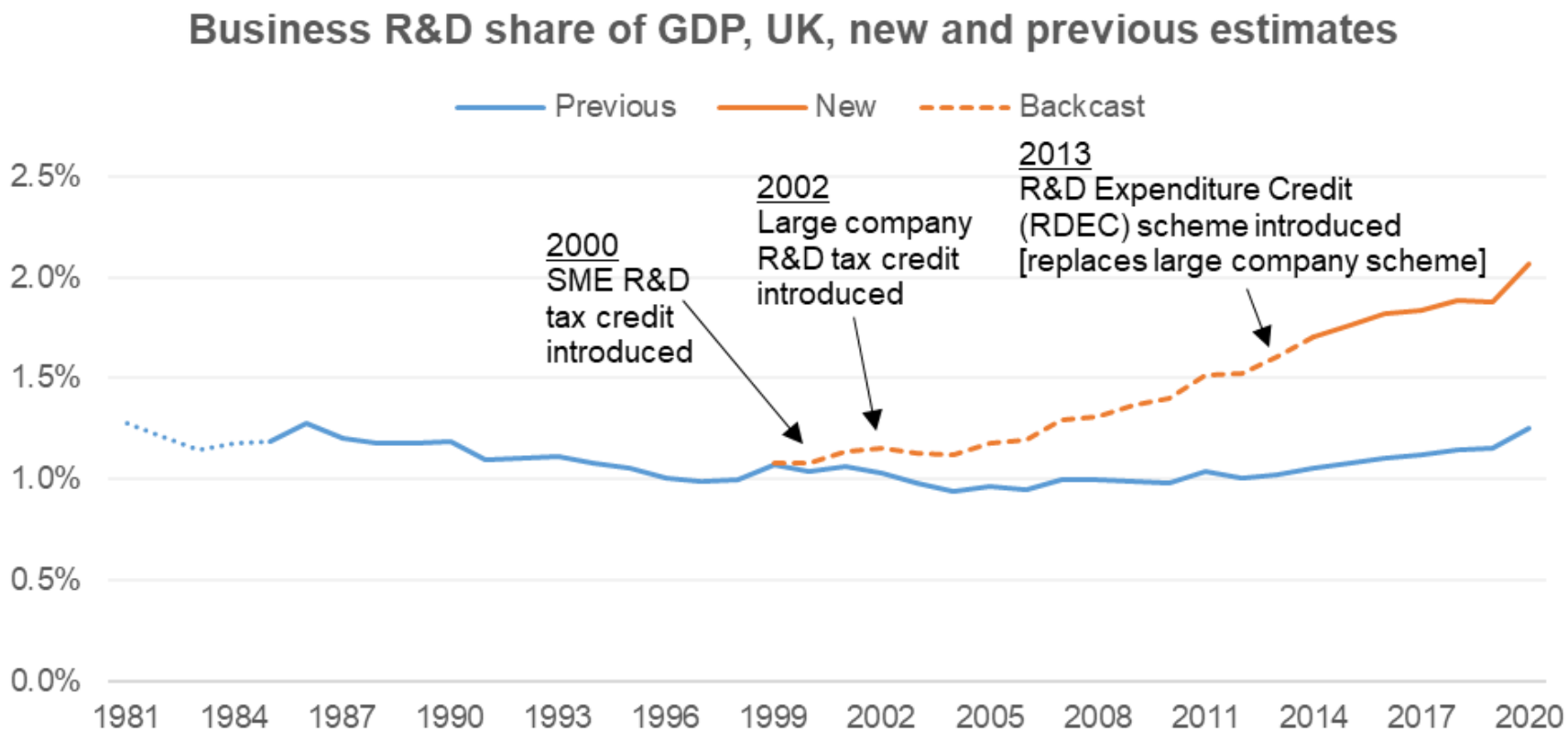
ONS have revised up business R&D estimates to correct for under-coverage of small firms



Survey	Reference year	Proportion of business conducting R&D
Investment in Intangible Assets survey	2008	8.0%
Investment in Intangible Assets survey (wave two)	2010	5.9%
UK Innovation Survey 2021	2018-2020	Internal R&D – 16.0% Acquisition of external R&D – 5.3%
UK Innovation Survey 2019	2016-2018	Internal R&D – 14.5% Acquisition of external R&D – 4.5%
UK Innovation Survey 2017	2014-2016	Internal R&D – 17.7% Acquisition of external R&D – 5.8%

Notes: All surveys listed cover only firms with 10 or more employees.

R&D tax credits feature of UK



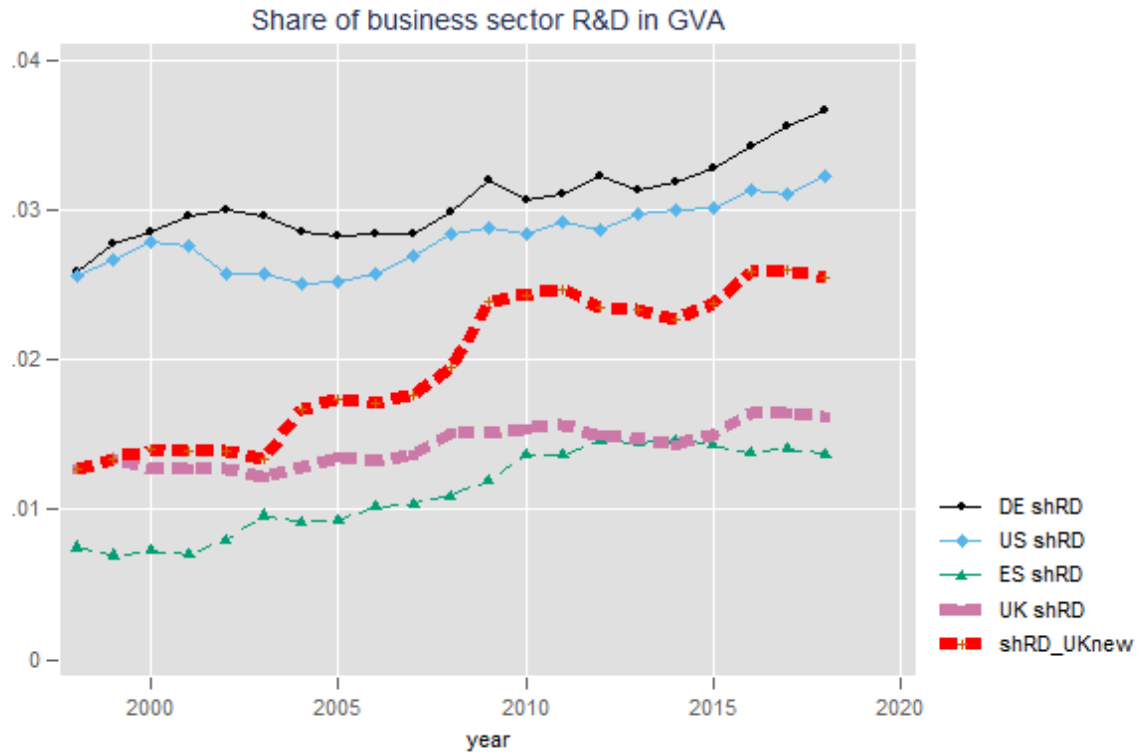
Source: ONS, author's calculations. Notes: "Previous" shows the share of BERD in GDP on a Blue Book 2021 basis (i.e. currently published). "New" are revised BERD estimates published by ONS on 29 Sept 2022, divided by GDP on BB22 basis, with adjustment to GDP for the higher level of R&D. "Backcast" assumes data up to 1999 are correct, and deviation starts in 2000 to coincide with introduction of SME R&D tax credits. Growth rates from the original series are preserved, but uplifted to hit new estimates in 2014.

Source: Josh Martin, (2022) Wonkhe blog: "We just met the government's R&D spending target… or did we?"

What are the effects on UK productivity growth?

- PIM => ΔK/K=(I/K)- δ
- So more I than we thought raises ΔK/K
- But: there might have been more K
- TFP
  - More I raises Y
  - More I changes rate of return, so might change contribution

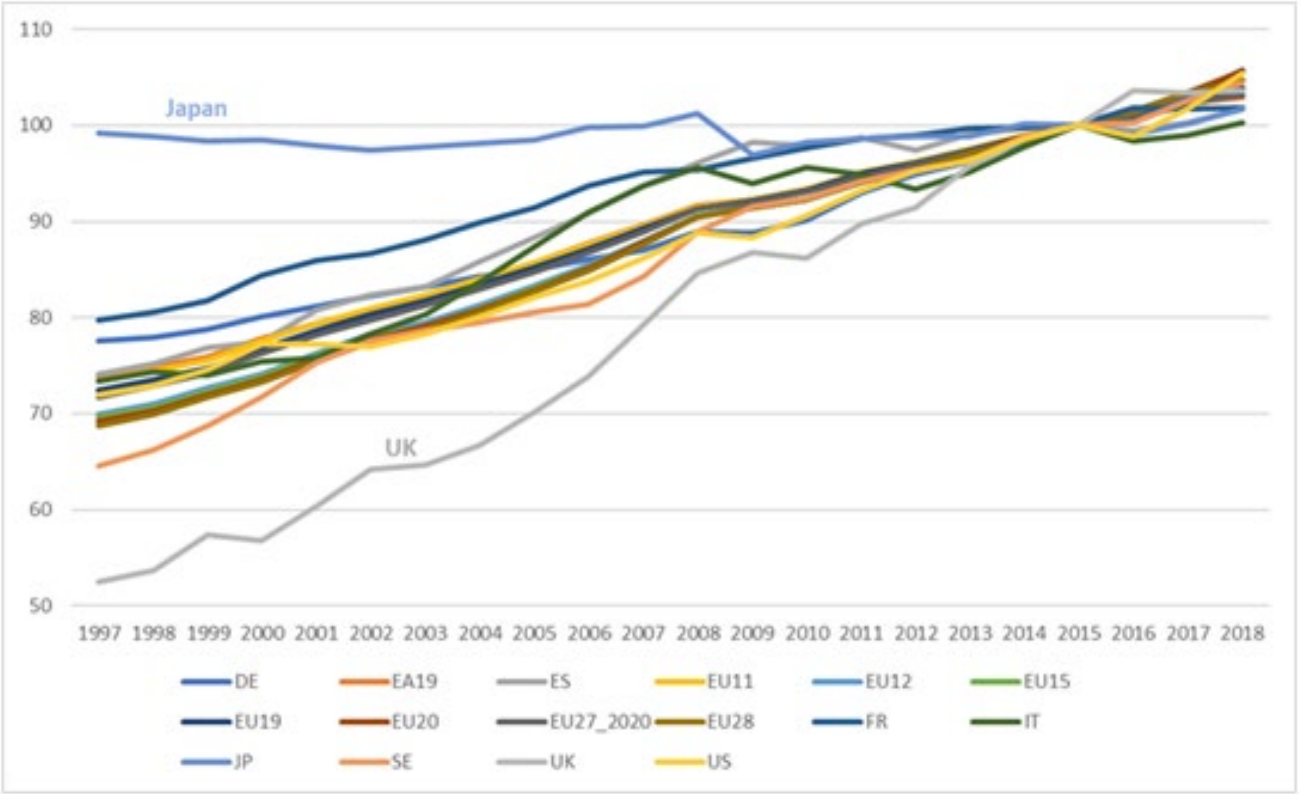
- Exercise: reprofile UK R&D and work through **EUKLEMS & INTANProd** database (https://euklems-intanprod-llee.luiss.it/)



Source: Author's calculations from www.euklems-intanprod-llee.luiss.it.

But there is an additional complication…

- International R&D deflators



UK Rate of return rises slightly

Source: Author's calculations from www.euklems-intanprod-llee.luiss.it.

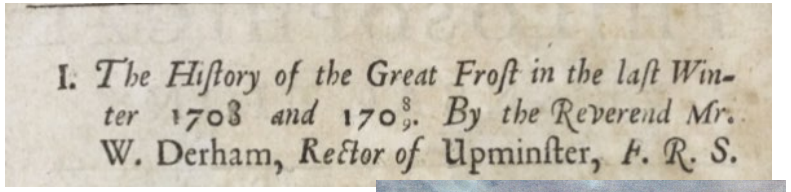
UK R&D capital growth, contribution, TFP

	Growth in K (R&D)	Contribution of gK(R&D)	TFP growth
EU9	2.52%	0.08%	0.26%
UK	0.47%	0.01%	0.76%
UK (revised invest)	0.52%	0.02%	0.77%
UK (revised invest, deflator)	4.35%	0.09%	0.62%

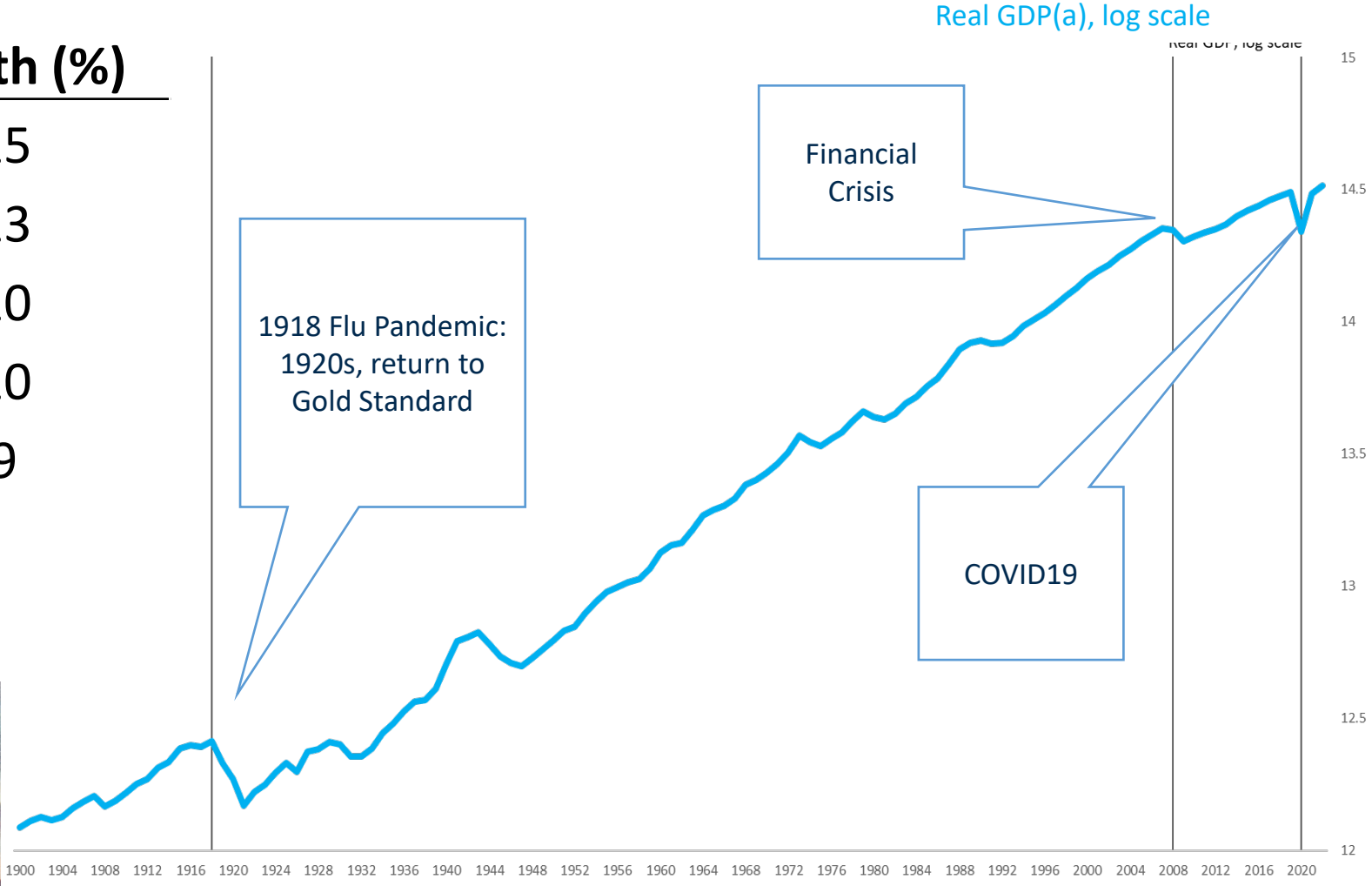
Source: Author's calculations from www.euklems-intanprod-llee.luiss.it.

The pandemic

Ranking	Year	Growth (%)
1st	1706	-15
2nd	1709	-13
3rd	1921	-10
4th	2020	-10
5th	1710	-9


I. The History of the Great Frost in the last Winter 1708 and 1709. By the Reverend Mr. W. Derham, Rector of Upminster, F. R. S.

Philosophical Transactions of the Royal Society, 1709



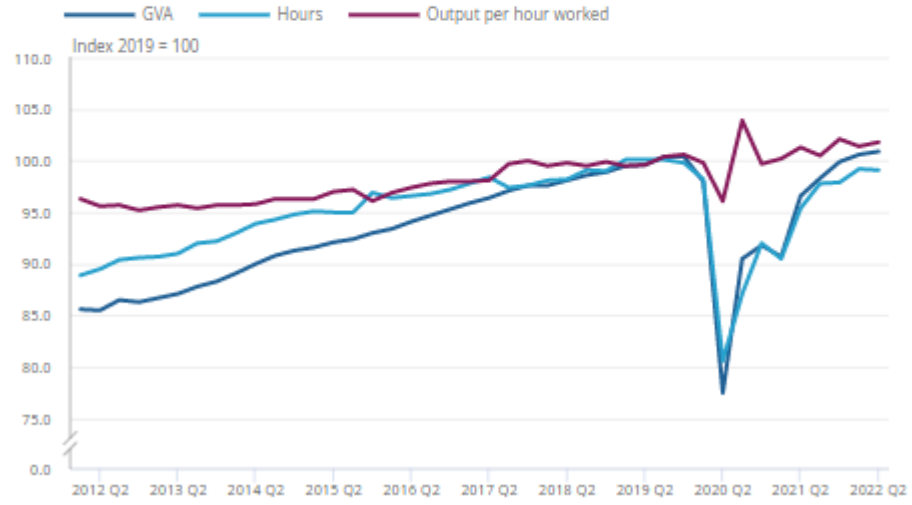
Sources: "A millennium of macroeconomic data for the UK", Bank of England and update. Author calculations.

Productivity growth rise and fall over pandemic was restructuring

- Lab prod back to pre-pandemic levels, GVA has recovered, hours are down: V/H, 2019=100, V/H, 2022Q2=101.8

Figure 2: Output per hour worked increased by 0.3% on the quarter, reflecting low gross value added (GVA) growth and a decrease in the number of hours worked

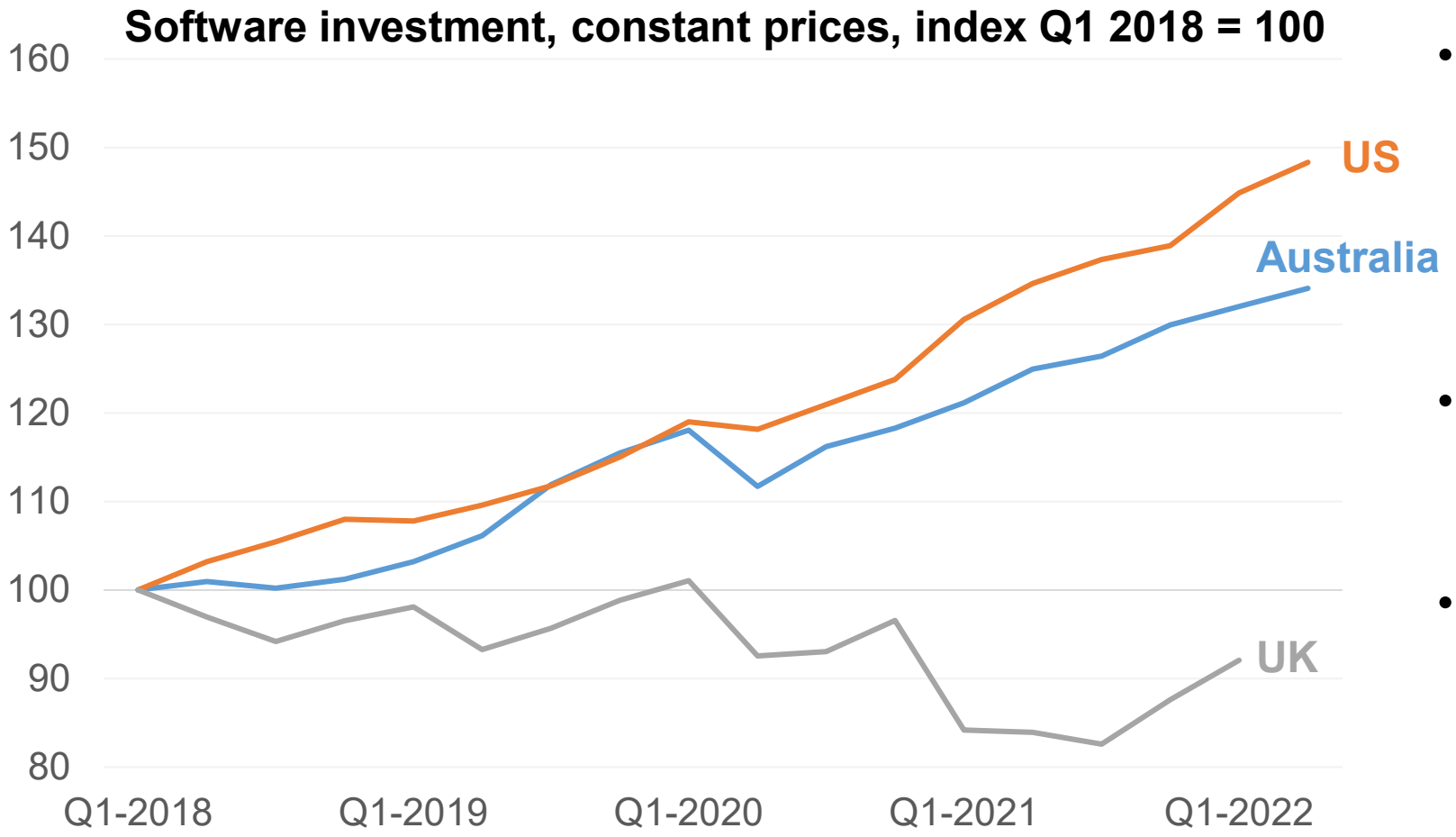
Gross value added, hours worked, output per hour worked, UK, index 2019 = 100, Quarter 1 (Jan to Mar) 2012 to Quarter 2 (Apr to Jun) 2022



Percentage change from the 2019 average, output per hour worked, between-industry reallocation, within-industry productivity growth, Quarter 1 (Jan to Mar) 2019 to Quarter 2 (Apr to Jun) 2022

Source: Office for National Statistics (ONS), released 7 October 2022, ONS website, statistical bulletin, Productivity overview, UK: April to June 2022

What is happening to software investment since the pandemic?

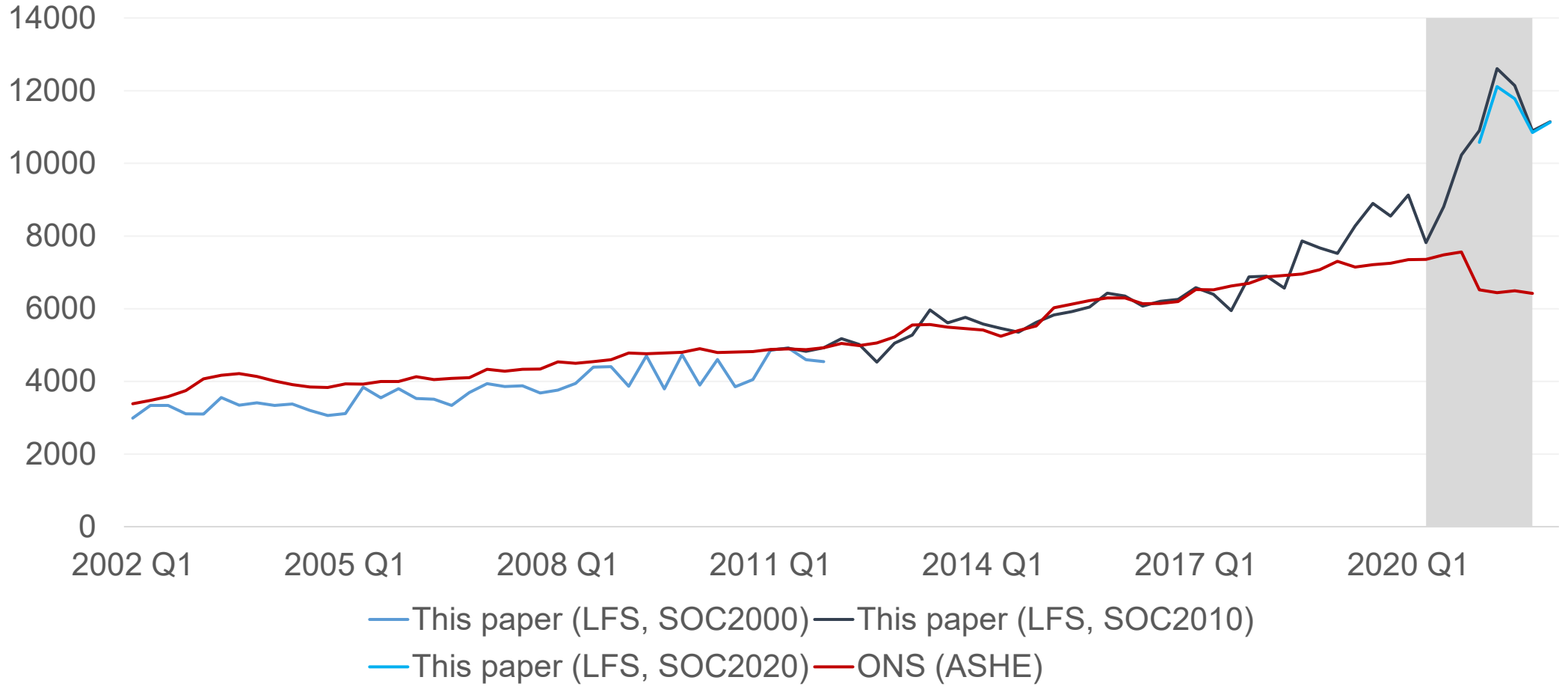


- Pandemic led to large changes in business practices
  - ➢ Likely spurred investment in software
- US shows acceleration in software investment, but UK shows stagnation
- UK estimates use an annual data source, updated with a lag
  - ➢ Miss rapid growth?

Source: OECD, Martin (forthcoming).
Notes: Australia and the US are the only countries that report quarterly software investment on OECD website.

New quarterly estimates of own-account software investment suggest more rapid growth during pandemic

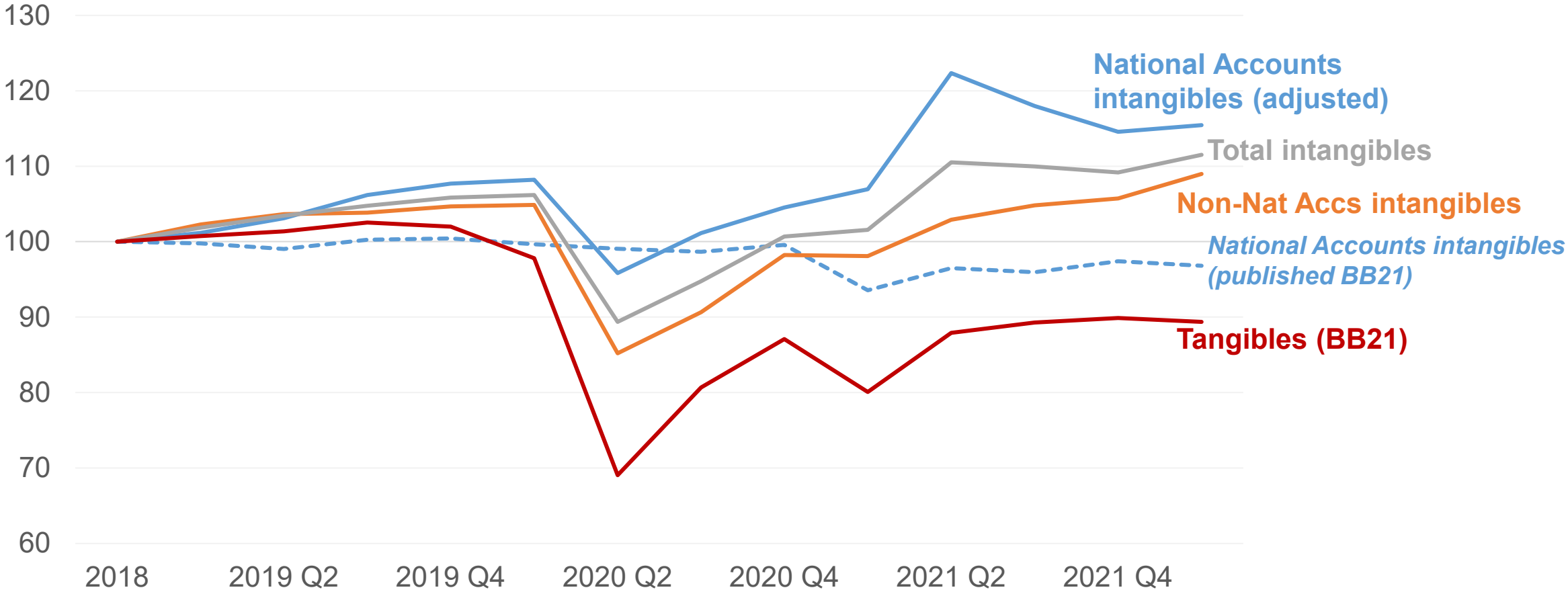
Own-account software investment, current prices, £ million, quarterly, not seasonally adjusted, ONS official estimates [ASHE-based] and Martin (forthcoming) [LFS-based]



Source: Martin (forthcoming).

Intangibles recovered, but tangible investment still low…

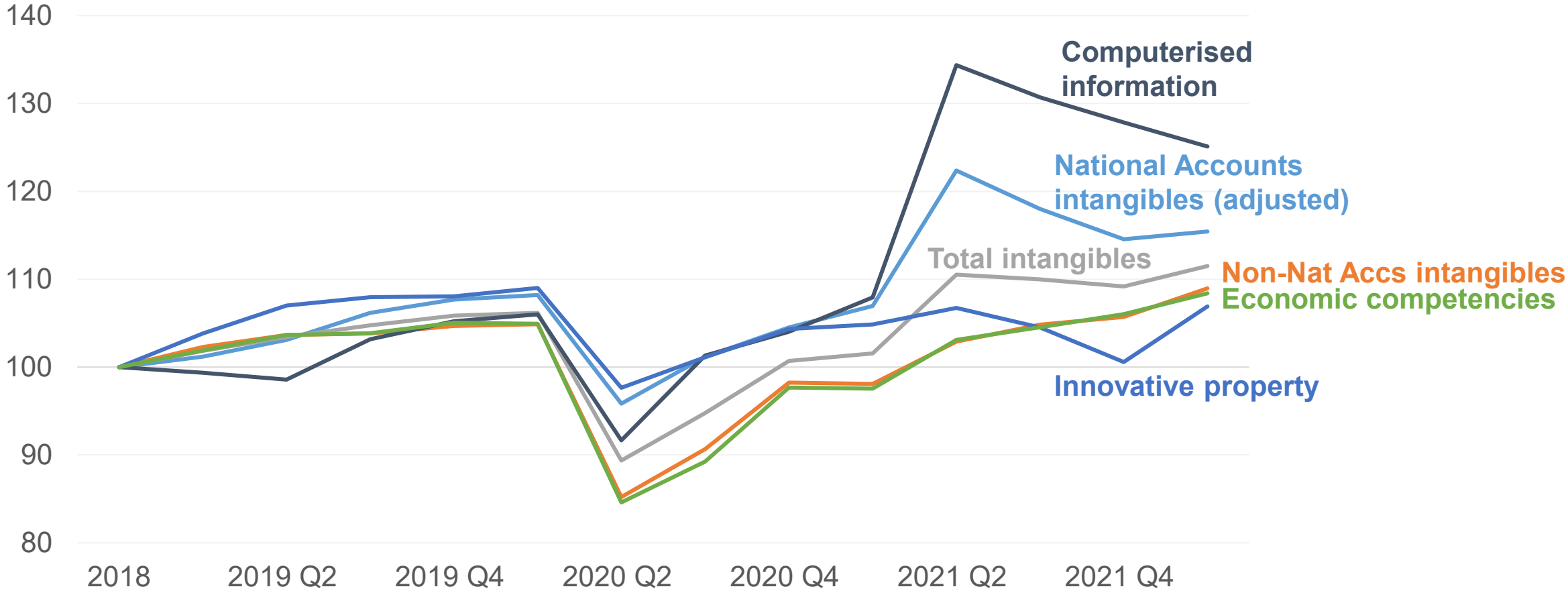
Market sector investment, intangibles and tangibles, constant prices, index 2018 = 100



Source: Martin (forthcoming) – ONS estimates for 2018 extended using quarterly indicators, by industry, aggregated.
Notes: “National accounts intangibles” adjust own-account software and R&D. All estimates for the “market sector”.

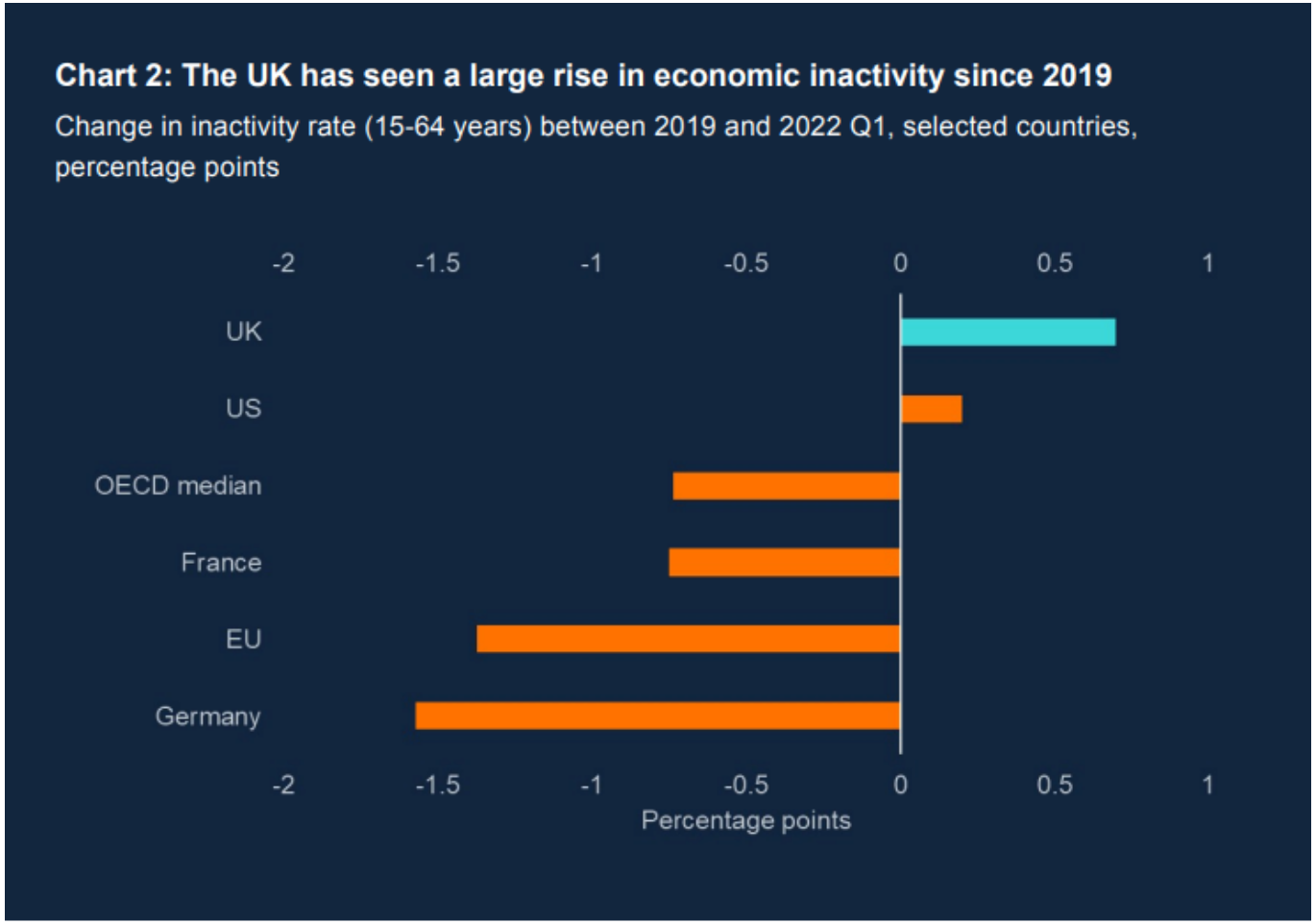
New quarterly estimates of intangible investment for the UK

Market sector intangible investment, constant prices, index 2018 = 100



Source: Martin (forthcoming) – ONS estimates for 2018 extended using quarterly indicators, by industry, aggregated.
Notes: “National accounts intangibles” adjust own-account software and R&D. All estimates for the “market sector”.

The next challenge… inactivity

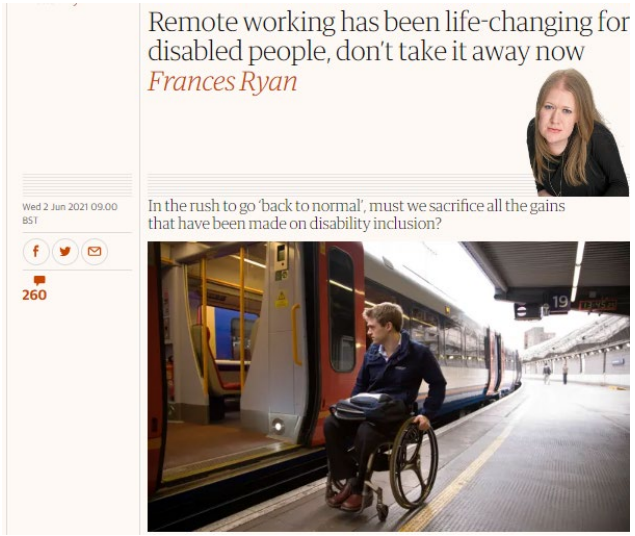


Source: OECD, author's calculations

Notes: UK inactivity rates published by ONS typically use the age band 16-64, but 15-64 are used here for international consistency. "OECD median" is the median change in inactivity across 38 OECD countries.

This raises a puzzle…

- Why hasn't working from home enabled more activity?


Remote working has been life-changing for disabled people, don't take it away now

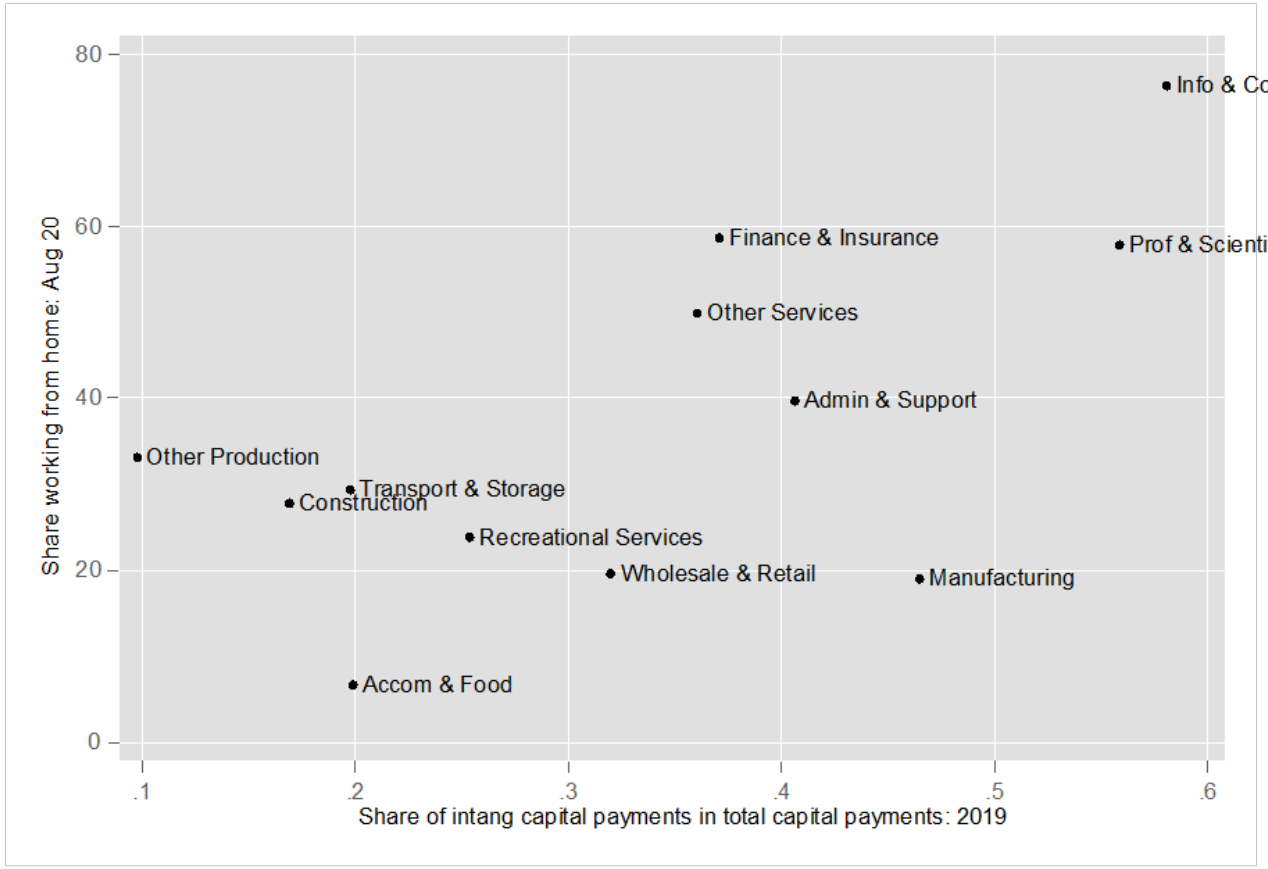
Frances Ryan

Wed 2 Jun 2021 09.00 BST

260

In the rush to go 'back to normal', must we sacrifice all the gains that have been made on disability inclusion?

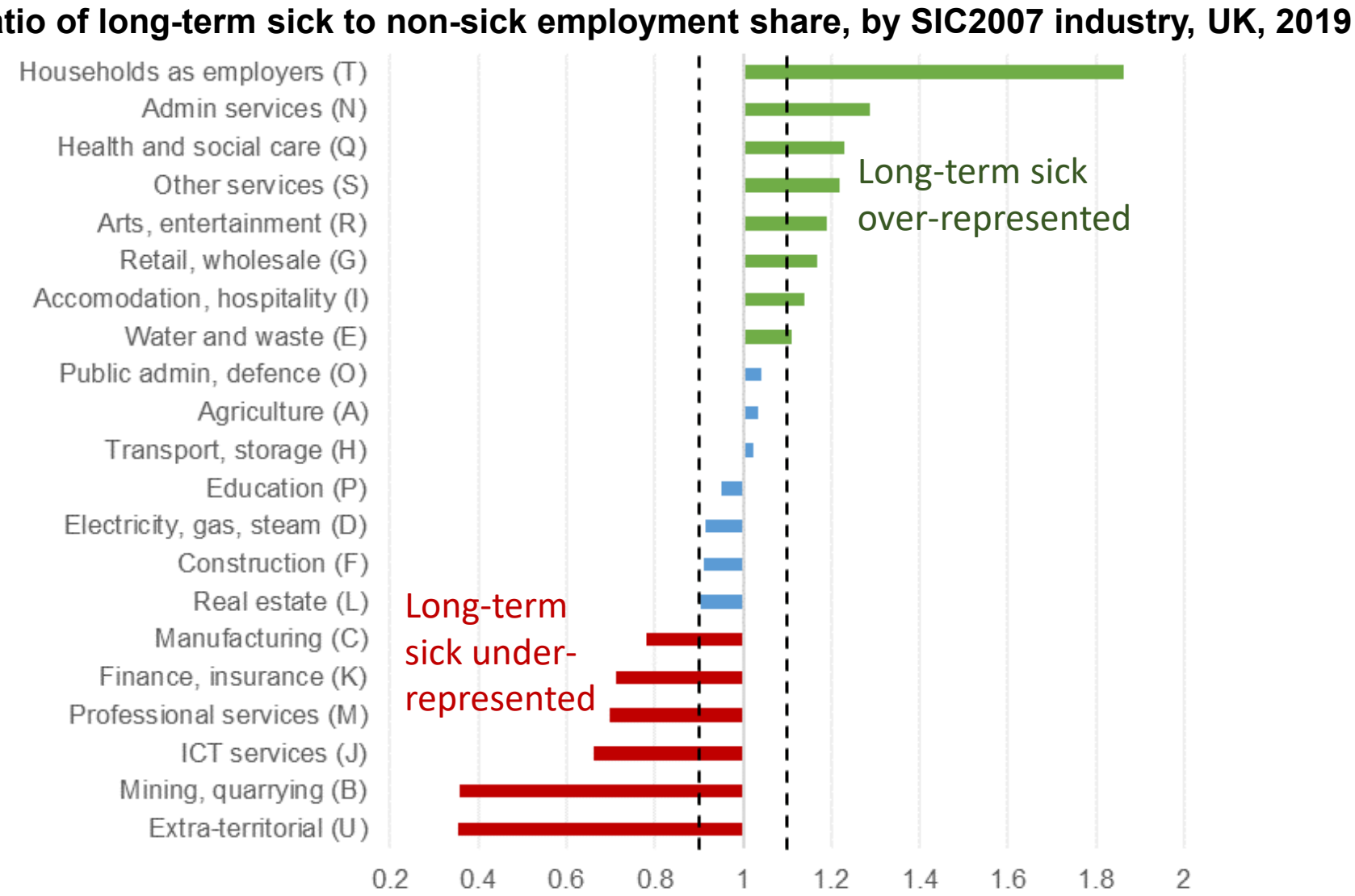
More intangible-intensive sectors in the UK work more from home…



Source: update of [Eberly, Haskel, Mizen](#) (2021)

…but these are not the sectors that the long-term sick work in

The long-term sick are over-represented in low-paying industries and occupations, which typically don't allow for working from home



Source: Haskel and Martin (forthcoming)

Summary

- UK ongoing poor productivity record
- Investment fell after Brexit
- TFPG falls highest in
  - intangible-intensive industries and
  - manufacturing
- Ongoing measurement issues around software and R&D
- Inactivity: change to working from home mostly in the intangible-intensive industries