DATA APPENDIX

Cracking the Productivity Code: An International Comparison of UK Productivity

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A1.   Hours Worked in National Accounts

In general, there are four common sources used to construct labour input data in national accounts: the labour force survey (LFS), the population census (PC), business statistics (BS), and administrative data sources. And there are two main approaches for estimating the total actual hours worked in national accounts:

- Direct Method: the direct method (DM) annualizes the average actual hours worked per week from continuous surveys in all weeks of the calendar year. The LFS is often used as the single source for this method, and the self-reported data in the LFS is assumed to capture absences and extra hours worked. Since there is a natural tendency to exaggerate how hard one works, the direct method overstates hours (see Ward, Zinni and Marianna (2018)).

- Component Method: the component method (CM) starts with estimating the contractual, paid, or usual hours per week from establishment surveys and administrative sources. It then adjusts for absences and overtime using various datasources such as the LFS.

Table A1—: National accounts labour input data sources and methods

Country	Method		Main Data Source		Secondary Data Source	
	Employee	Self-employed	Employee	Self-employed	Employee	Self-employed
UK	DM	DM	LFS	LFS	-	-
US	Ratio of worked to paid hours	DM	BS	LFS	LFS	-
France	CM	CM	BS	AS	LFS/AS	LFS
Germany	CM	CM	AS	LFS	LFS/BS	AS

Sources: Table 3.6 and Table 3.7 in Ward, Zinni and Marianna (2018)

Notes: AS—Administrative data sources, LFS — The labour force survey, BS - Business statistics.

Table A1 summarises the data sources and methods used in the national accounts across countries. Among all four, the UK is the only country that adopts DM and solely relies on the LFS as its data source. As a result, the working hours in the UK national accounts are likely to be overstated. Since working hours in the EUKLEMS data are sourced from national accounts, the EUKLEMS working hours in the UK are consistently overstated compared to other countries by around 7% as shown in Figure B2.

A2. Hours Worked from OECD

The OECD publishes average hours worked per person employed using a harmonised data construction method (e.g. OECD (2014)). In cases where countries do not utilize the component method to construct hours data in their national accounts, the OECD substitutes the hours data in national accounts with estimates derived from a simplified component method. To construct a time series of the harmonised hours data, the OECD uses the 2016 level of hours constructed by the component method as a benchmarak, and extrapolates this level forwards and backwards using official hours series. As a result, the growth rates of hours worked remain largely unchanged when comparing hours data from the OECD and EUKLEMS.

The OECD hours data is only available for total economies. To obtain the hours data for market economies, we utilize the share of hours worked in the market economy relative to the total economy in EUKLEMS to project the OECD hours series for the market economy, as shown below:

$$(A1) \qquad H_{OECD,Mkt} = H_{OECD,Tot} \times \frac{H_{KLEMS,Mkt}}{H_{KLEMS,Tot}}$$

Where Tot and Mkt refer to the total economy and market economy respectively. The total annual hours worked are denoted by H.

Since labour service is the weighted sum of hours worked adjusting for labour quality, the choice of hours series also affects labour service calculation, and thus labour composition. In this report, we assume that using either the direct method or the component method biases the estimates of hours worked across different types of workers in a broadly consistent way. That is labour composition at the national level is not affected by the choice of hours series.

A3. EU KLEMS 2012 and 2023 Releases

To analyse the performance of the UK and its peers (the US, France, and Germany) over a longer period, we merge the EUKLEMS releases of 2012 and 2023 using the method proposed by Fernald and Inklaar (2022). Specifically, we use the values in the earliest year available in KLEMS 2023 and extrapolate them using the 2012 time series. The extrapolation follows the equation provided below:

$$(A2) \qquad \tilde{x}_{2023,t} = x_{2012,t} \times \frac{x_{2017,t}}{x_{2012,t}}$$

Where t represents the earliest year in which data are available in the 2023 EUKLEMS and x denotes the variable of interest. Equation A2 is generally used for extrapolation purposes, with a few exceptions in the German data. The labour

service and capital service volume indices in Germany are missing before 1991, and we rely on the growth rates of labour service and capital service in 2012 EUKLEMS for the extrapolation of the respective time series before 1991.

A4. Labour Composition

EUKLEMS 2023 estimates the share of hours worked and the share of labour compensation by worker type. In the labour accounts, the labour force is categorized along three dimensions—age, gender and educational attainment. For the UK, France and Germany, their labour force is divided into 18 types at the industry level, as illustrated in Table A2. However, for the US, labour types are classified differently based on Table A3. To ensure consistency with the labour accounts in the other three countries, we transform the US labour accounts data using Table A4. In situations where the age groups in the US labour accounts span across two standard age groups in Table A2, we assume a uniform distribution of the share of hours worked and labour compensation within each age group. Based on this assumption, the shares of hours worked and labour compensation of these US age groups can be split into sub-age groups for the transformation. Another caveat is that the US labour accounts data is available only for the total economy. Due to this data limitation, we assume that the labour composition is the same for both the market economy and the total economy in the US.

Labour service are defined as below:

$$(A3) \qquad \log LabService_{j,t} = \sum_{l} v_{l,j,t} \log H_{l,j,t}$$

where $v_{l,j,t}$ denotes the nominal cost share of labour type l in industry j and year t, and $H_{l,j,t}$ are total hours worked by labour type l in industry j and year t.

Labour composition is then specified as

$$
\begin{aligned}
\log LabComp_{j,t} &= \log LabService_{j,t} - \log H_{j,t} \\
&= \sum_{l} v_{l,j,t} \log H_{l,j,t} - \log H_{j,t}
\end{aligned}
$$

(A4)

where $H_{j,t}$ is the total hours worked by all types of labour in the industry j and year t.

Table A2—: Standard EUKLEMS & INTANProd database labour types

Worker types					
Gender	Gender code	Age group	Age code	Educational Attainment	Education Code
Male	G1	15-29	A1	highly skilled	E1
Female	G2	30-49	A2	medium skilled	E2
		50+	A3	low-skilled	E3

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Table A3—: EUKLEMS & INTANProd database labour types for the US

Worker types					
Gender	Gender code	Age group	Age code	Educational Attainment	Education Code
Male	G1	15 -18	A11	Less than a high school diploma education group	E11
Female	G2	19 - 24	A12	A high school diploma (or GED) education group	E12
		25 - 34	A13	Some college education group	E13
		35 - 44	A14	A college degree education group	E14
		45 - 54	A15	More than a college degree education group	E15
		55 - 64	A16		
		65 +	A17		

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Table A4—: Conversion of worker types in the US labour accounts

Standard age group	Standard age code	Corresponding US labour accounts age code
15-29	A1	$A_{11} + A_{12} + 0.5 \times A_{13}$
30-49	A2	$0.5 \times A_{13} + A_{14} + 0.5 \times A_{15}$
50+	A3	$0.5 \times A_{15} + A_{16} + A_{17}$

Standard educational attainment	Standard education code	Corresponding US labour accounts education code
highly skilled	E1	$E_{13} + E_{14} + E15$
medium skilled	E2	E_{12}
low-skilled	E3	E_{11}

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

A5. Alternative Labour Composition

Barro and Lee (2013) only provide the average years of schooling for the total population between 15-64 every five years. However, the average education attainment varies between the total population and the workers. To overcome this issue, we transform BL's average years of schooling as below:

- For high skilled labour ($year_h$): Years of schooling of highly skilled workers = Total years of primary education + Total years of secondary education + Average years of education in the tertiary education reported by Barro and Lee (2013)

- For medium skill ($year_m$): Years of schooling of medium-skilled workers = Total years of primary education + Average years of schooling for secondary school by Barro and Lee (2013)

- For low skilled ($year_l$): Years of schooling o flow skilled workers = Average years of schooling for primary education by Barro and Lee (2013)

And the average education years of all workers are calculated as below:

$$(A5) \qquad year_{worker} = year_h \times share_h + year_m \times share_m + year_l \times share_l$$

Where $year_i$ denotes the transformed average years of schooling of workers with skill level i, and $share_i$ refers to the share of hours worked by skill level i over all types of workers from the EUKLEMS data.

Since BL's data is only available every five years, we take the most recent data in 2015 and extrapolate up to the year 2019 using the average growth rate of years of education between 2015 and 2010 from Barro and Lee (2013) as below:

$$(A6) \qquad year_{2019} = year_{2015} * (1 + growth_{2010/2015} \times 4)$$

where $year_t$ is the average years of education in year t. $growth_{2010/2015}$ is the average growth rate of average years of eduction between 2010 and 2015 from Barro and Lee (2013) as below:

$$(A7) \qquad growth_{2010/2015} = (\frac{year_{2015} - year_{2010}}{year_{2010}} - 1)/5$$

A6.   Industrial Breakdown

In 2021, the ONS implemented double deflation in the calculation of GVA volume for the first time. Double deflation has a modest impact on aggregate GVA volume, but a much more significant impact at the sub-sector level. The output price deflator for telecommunications services, for instance, decreased substantially, which led to much higher productivity and output in the IC sector.

Table A5 compares the sector performance using EUKLEMS data (Panel A) and ONS data (Panel B). The ONS data shows the UK has a less significant decline (-0.9%) in the total economy than the EUKLEMS data (-1.44%). This is due to both slower productivity growth before the crisis and higher productivity growth after the crisis in the ONS data.

At the sector level, both panels (A and B) have the same top four contributors to the post-GFC productivity slowdown: manufacturing, information, finance, and professional services. Using either data source has a relatively small impact on the performance of the manufacturing, finance, and professional services sectors. However, the slowdown of the information sector in the ONS data (-3.1%) is about half of the slowdown in EUKLEMS data (-6.2%). This is mainly due to a much higher growth rate before 2007 in the ONS data (10.0%) than the EUKLEMS data (12.5%). This could be related to the introduction of a new price index for telecommunications by the ONS.

Table A5—: Breakdown of labour productivity growth by industry EUKLEMS vs. ONS data

PANEL A: EUKLEMS LABOUR GROWTH BY SECTOR 1997-2019

Industry	Overall (1997-2019)				Pre-GFC (1997-2007)				Post-GFC (2007-2019)				Change		
	Within Growth	Weight	Weighted Growth	Share	Within Growth	Weight	Weighted Growth	Share	Within Growth	Weight	Weighted Growth	Share	Within Growth	Weight	Weighted Growth
Total economy	1.12%	100.00%	1.12%	100.00%	1.94%	100.00%	1.94%	100.00%	0.51%	100.0%	0.51%	100.00%	-1.44%	0.00%	-1.44%
Agriculture	3.53%	0.78%	0.04%	3.38%	7.16%	0.85%	0.06%	3.14%	-0.25%	0.70%	0.00%	-0.34%	-7.41%	-0.15%	-0.06%
Mining	-5.65%	1.55%	-0.12%	-10.92%	-5.50%	1.78%	-0.10%	-5.03%	-5.83%	1.37%	-0.08%	-15.77%	-0.34%	-0.41%	0.02%
Manufacturing	3.91%	11.80%	0.50%	44.52%	6.90%	13.47%	0.93%	47.81%	1.48%	10.30%	0.15%	29.99%	-5.42%	-3.17%	-0.78%
Energy supply	0.04%	1.44%	0.00%	-0.07%	1.86%	1.29%	0.02%	1.24%	-2.42%	1.57%	-0.04%	-7.48%	-4.29%	0.27%	-0.06%
Water supply and waste management	-2.34%	1.32%	-0.03%	-2.83%	-1.88%	1.31%	-0.02%	-1.27%	-2.87%	1.32%	-0.04%	-7.49%	-1.00%	0.01%	-0.01%
Construction	-0.37%	5.90%	-0.03%	-2.67%	-0.96%	5.92%	-0.06%	-2.91%	-0.28%	5.94%	-0.02%	-3.22%	0.68%	0.02%	0.04%
Wholesale & retail	0.54%	11.02%	0.06%	5.04%	0.93%	11.64%	0.11%	5.55%	0.16%	10.50%	0.02%	3.39%	-0.76%	-1.14%	-0.09%
Transport	0.06%	4.17%	0.00%	0.43%	1.53%	4.33%	0.07%	3.41%	-0.76%	4.02%	-0.03%	-6.01%	-2.29%	-0.31%	-0.10%
Food & accommodation	-0.43%	2.72%	-0.01%	-1.08%	-0.29%	2.67%	-0.01%	-0.40%	-0.81%	2.77%	-0.02%	-4.41%	-0.52%	0.09%	-0.01%
Information & communication	8.89%	6.13%	0.54%	48.59%	12.47%	5.99%	0.75%	38.44%	6.23%	6.25%	0.39%	76.72%	-6.25%	0.26%	-0.36%
Finance & insurance	1.53%	8.04%	0.12%	10.38%	4.23%	7.29%	0.31%	15.88%	0.68%	8.74%	0.06%	11.76%	-3.55%	1.45%	-0.25%
Real estate	-1.76%	13.28%	-0.24%	-21.31%	-4.44%	13.69%	-0.61%	-31.25%	-0.01%	12.90%	0.00%	-0.35%	4.42%	-0.79%	0.61%
Professional & scientific services	0.21%	6.63%	0.01%	0.93%	1.16%	6.08%	0.07%	3.61%	-0.66%	7.10%	-0.05%	-9.28%	-1.82%	1.03%	-0.12%
Administrative and support service	0.13%	4.27%	0.01%	0.93%	-1.23%	3.92%	-0.05%	-2.48%	1.22%	4.56%	0.06%	10.99%	2.45%	0.64%	0.10%
Public administration	1.60%	5.15%	0.08%	7.35%	0.57%	5.16%	0.03%	1.50%	2.29%	5.15%	0.12%	23.27%	1.73%	-0.01%	0.09%
Education	-1.47%	5.82%	-0.09%	-7.63%	-2.88%	5.45%	-0.16%	-8.08%	-0.32%	6.14%	-0.02%	-3.82%	2.57%	0.68%	0.14%
Health	-0.31%	6.86%	-0.03%	-2.47%	0.55%	6.21%	0.03%	1.75%	-0.90%	7.43%	-0.07%	-13.15%	-1.45%	1.21%	-0.10%
Art and entertainment	-0.33%	1.37%	0.00%	-0.34%	1.56%	1.29%	0.02%	1.03%	-2.08%	1.43%	-0.03%	-5.86%	-3.63%	0.14%	-0.05%
Other service	-1.02%	1.59%	-0.01%	-1.30%	-2.39%	1.49%	-0.04%	-1.84%	0.00%	1.67%	0.00%	-0.01%	2.39%	0.17%	0.04%
Household activities	2.11%	0.16%	0.01%	0.46%	-3.45%	0.16%	-0.01%	-0.28%	5.03%	0.15%	0.01%	1.52%	8.49%	0.00%	0.01%

PANEL B: ONS LABOUR GROWTH BY SECTOR 1997-2019

SIC07 code	Overall (1997-2019)				Pre-GFC (1997-2007)				Post-GFC (2007-2019)				Change		
	Within Growth	Weight	Weighted Growth	Share	Within Growth	Weight	Weighted Growth	Share	Within Growth	Weight	Weighted Growth	Share	Within Growth	Weight	Weighted Growth
Total Economy	0.9%	100.0%	0.9%	100.0%	1.5%	100.0%	1.5%	100.0%	0.6%	100.0%	0.6%	100.0%	-0.9%	0.0%	-0.9%
Agriculture	2.9%	0.8%	0.0%	3.4%	5.1%	0.8%	0.1%	3.6%	0.1%	0.7%	0.0%	1.2%	-5.0%	-0.1%	0.0%
Mining	-5.1%	1.5%	-0.1%	-12.4%	-6.2%	1.8%	-0.1%	-8.2%	-5.3%	1.4%	-0.1%	-22.3%	0.9%	-0.4%	0.0%
Manufacturing	4.0%	11.6%	0.5%	54.5%	7.1%	13.2%	0.9%	63.3%	1.6%	10.3%	0.2%	30.6%	-5.5%	-2.9%	-0.8%
Energy Supply	-0.7%	1.4%	0.0%	-2.0%	2.0%	1.3%	0.0%	1.6%	-3.3%	1.6%	-0.1%	-10.4%	-5.3%	0.3%	-0.1%
Water supply and waste management	-2.4%	1.3%	0.0%	-3.6%	-1.3%	1.3%	0.0%	-1.1%	-2.9%	1.3%	0.0%	-7.2%	-1.6%	0.0%	0.0%
Construction	-0.7%	6.0%	-0.1%	-5.7%	-2.0%	6.0%	-0.1%	-8.7%	0.0%	5.9%	0.0%	-1.3%	2.0%	-0.1%	0.1%
Wholesale and retail	0.8%	11.0%	0.1%	9.4%	1.2%	11.6%	0.1%	9.1%	0.4%	10.5%	0.0%	7.4%	-0.8%	-1.1%	-0.1%
Transport	-0.8%	4.2%	0.0%	-3.4%	-0.2%	4.3%	0.0%	-0.6%	-1.0%	4.0%	0.0%	-7.1%	-0.8%	-0.3%	0.0%
Accommodation	-0.4%	2.7%	0.0%	-1.1%	-0.3%	2.7%	0.0%	-0.5%	-0.4%	2.8%	0.0%	-1.8%	-0.1%	0.1%	0.0%
Information & communication	8.1%	6.2%	0.5%	55.2%	10.0%	6.1%	0.6%	41.8%	6.9%	6.3%	0.4%	78.3%	-3.1%	0.2%	-0.2%
Finance & insurance	1.3%	8.1%	0.1%	11.0%	4.2%	7.3%	0.3%	22.8%	0.1%	8.7%	0.0%	1.6%	-4.1%	1.4%	-0.3%
Real estate	-1.4%	13.2%	-0.2%	-21.0%	-3.5%	13.6%	-0.5%	-31.5%	-0.2%	12.9%	0.0%	-6.7%	3.2%	-0.7%	0.4%
Professional and scientific service	-0.7%	6.7%	0.0%	-5.4%	0.6%	6.2%	0.0%	2.6%	-1.6%	7.1%	-0.1%	-19.7%	-2.2%	0.9%	-0.1%
Administrative and support service	0.8%	4.3%	0.0%	4.3%	-0.4%	3.9%	0.0%	-1.0%	1.7%	4.6%	0.1%	13.8%	2.1%	0.6%	0.1%
Public administration	1.4%	5.2%	0.1%	8.4%	0.3%	5.2%	0.0%	1.3%	2.2%	5.2%	0.1%	20.3%	1.8%	0.0%	0.1%
Education	-1.5%	5.9%	-0.1%	-9.6%	-3.2%	5.5%	-0.2%	-12.1%	-0.3%	6.1%	0.0%	-4.2%	2.9%	0.6%	0.2%
Health	-0.3%	6.9%	0.0%	-2.2%	0.2%	6.3%	0.0%	1.0%	-0.6%	7.4%	0.0%	-7.2%	-0.8%	1.1%	-0.1%
Arts and entertainment	-0.1%	1.4%	0.0%	-0.1%	1.2%	1.3%	0.0%	1.1%	-1.2%	1.4%	0.0%	-3.1%	-2.4%	0.1%	0.0%
Other services	-0.8%	1.6%	0.0%	-1.2%	-2.5%	1.5%	0.0%	-2.4%	0.4%	1.7%	0.0%	1.4%	2.9%	0.2%	0.0%
Household activities	2.7%	0.2%	0.0%	0.5%	-10.1%	0.2%	0.0%	-0.9%	9.8%	0.2%	0.0%	2.6%	19.8%	0.0%	0.0%

B1.   Productivity Level Decomposition

In section IV, we decompose the productivity gap into weighted level differences in factor inputs and TFP. The share contributed by each factor input to the overall productivity gap is contingent upon both its cost share (weight) and its absolute level. In this section, we present the unweighted factor input level differences and conduct further decomposition of the capital intensity gap based on distinct capital asset classes. Figure B3 illustrates the unweighted relative levels of factor inputs. Notably, the UK's capital intensity gap is the largest when compared to Germany, while its skill gap is most pronounced when compared to the US. However, when we take into account broader intangibles in Figure B5, both the capital and labour composition gaps between the UK and the US stand out as the largest across all countries. This is mainly due to that the US is more intangible intensive than the EU countries. Figure B4 offers a detailed decomposition of the total capital intensity, distinguishing tangible from intangible capital. The UK marginally outperformed the US in terms of tangible capital intensity, yet significantly lagged behind the US in terms of intangible capital. Furthermore, the UK's performance in both tangible and intangible capital was worse than the other EU countries. Similar results are observed in Figure B6, which include broader intangibles.

Figure B1. : Labour productivity, 1995-2019, SNA market economy
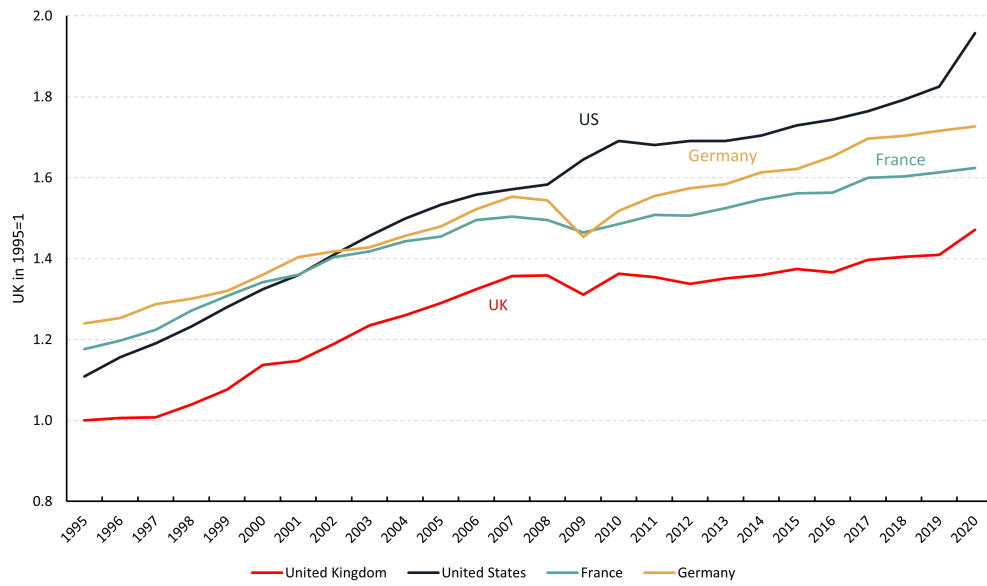
Note: Capital intensity and labour composition gaps are the absolute level differences. See Table C5 for level accounting results. Because of data availability in EUKLEMS, unweighted labour composition is assumed to be the same for market and non-market sectors in the US. See the data appendix for further details.

Figure B2. : Comparison of labour productivity constructed by different working hours data, SNA market economy
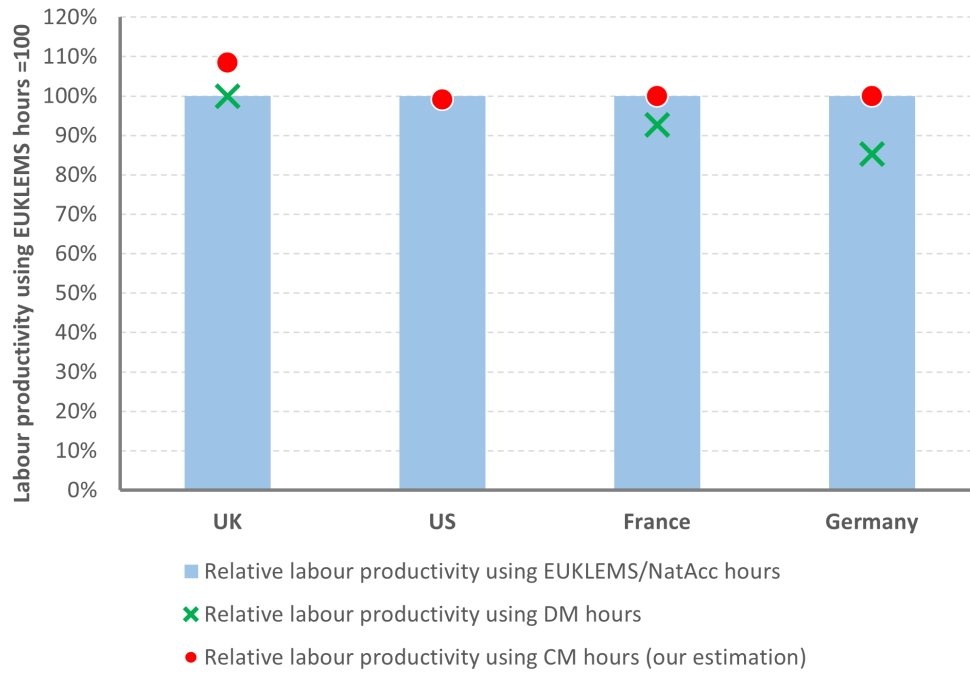
Notes: Relative labour productivity is averaged from 1997 to 2019. Working hours data in EUKLEMS are sourced from national accounts. DM working hours are missing in the US. CM hours data in the UK and US are estimated using the simplified component method by OECD, as they are not available through NSIs.
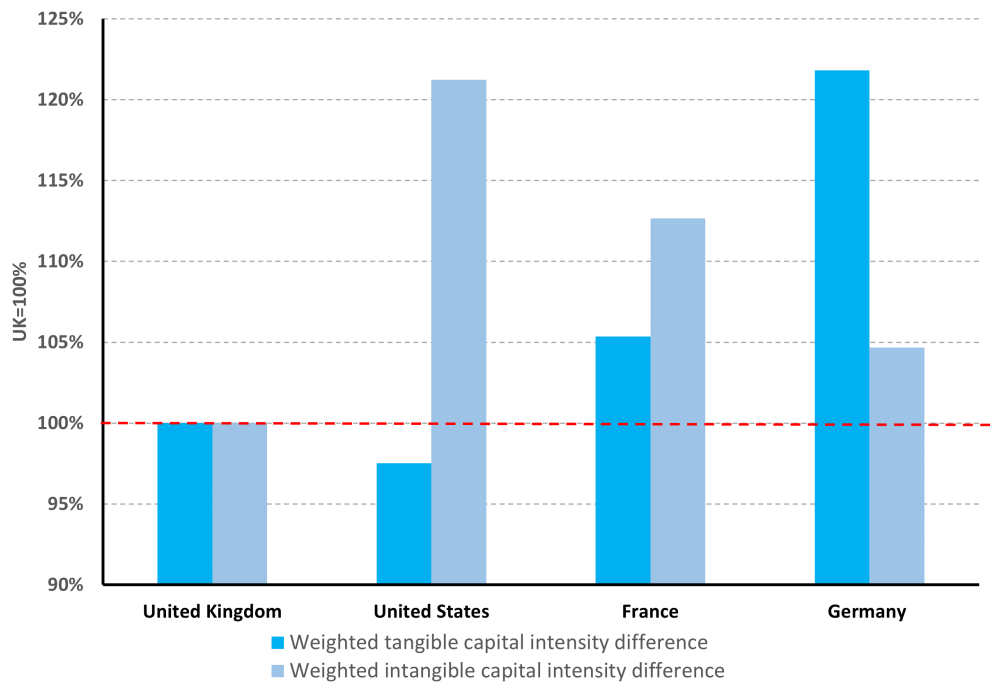
Figure B3. : Unweighted level of factor inputs relative to the UK, SNA market economy, 2019
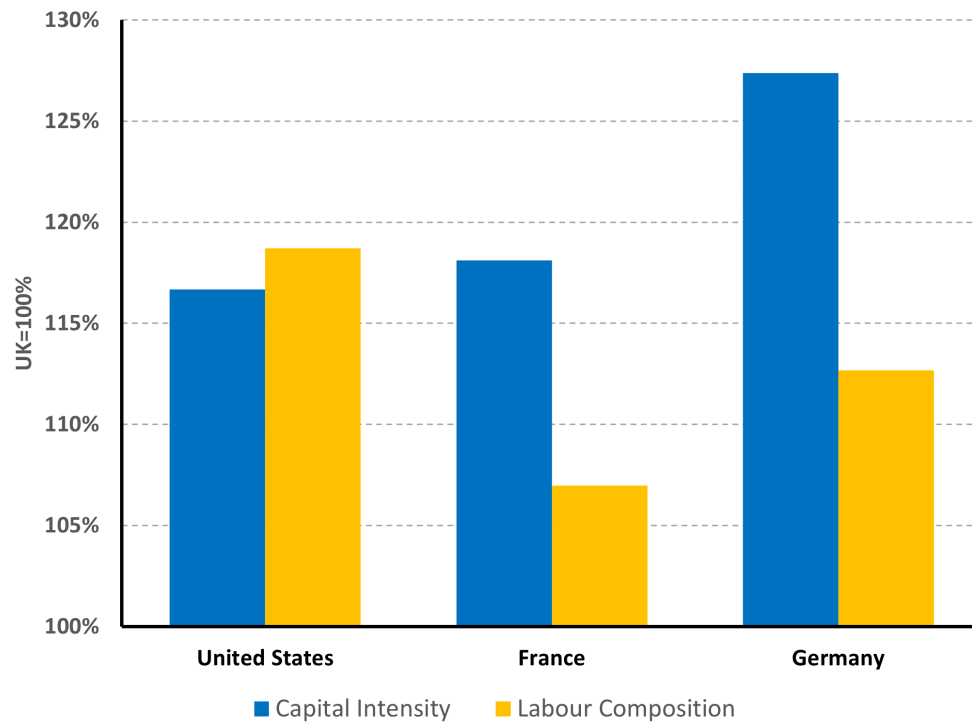
Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); OECD productivity statistics (OECD, 2014); PPP (OECD, 2023c).
Notes: Capital intensity and labour composition gaps are the absolute level differences. See Table C5 for level accounting results. Because of data availability in EUKLEMS, unweighted labour composition is assumed to be the same for market and non-market sectors in the US. See the data appendix for further details.
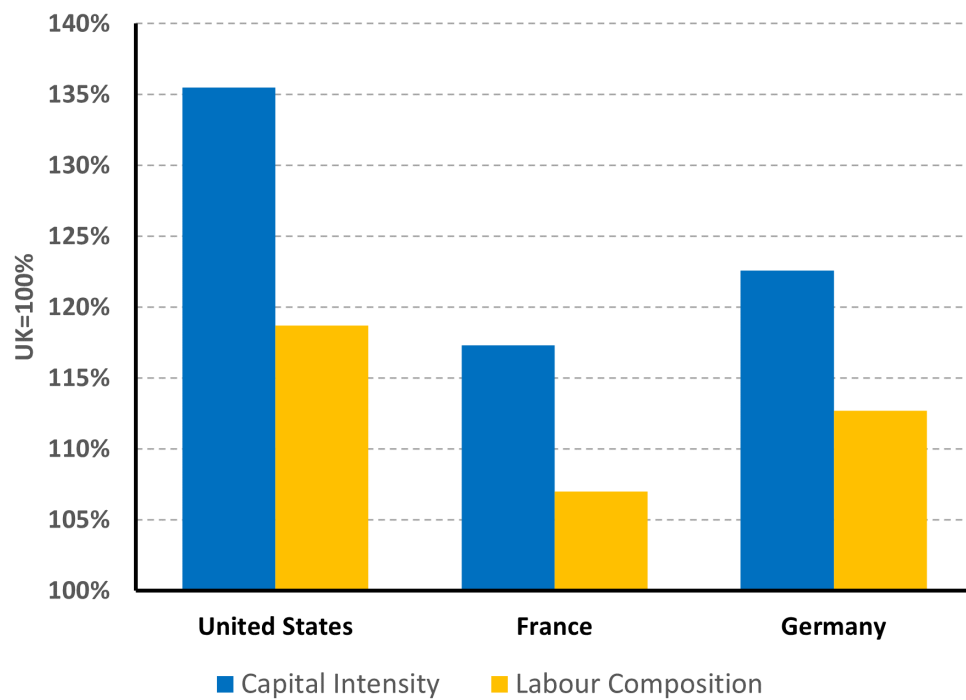
Figure B4. : Weighted breakdown of differences in capital intensity level, SNA market economy, 2019

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); OECD productivity statistics (OECD, 2014); PPP (OECD, 2023*c*)
Notes: Tangible and intangible capital intensities are weighted by their shares over total capital assets. The product of weighted tangible and intangible capital intensity differences is the total capital intensity difference in Figure B3.

Figure B5. : Unweighted level of factor inputs relative to the UK, CHS market economy, 2019

Sources & notes: See sources and notes in Figure B3. See Table C5 for decomposition estimates

Figure B6. : Weighted breakdown of differences in capital intensity level, CHS market economy, 2019

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); OECD productivity statistics (OECD, 2014); PPP (OECD, 2023c)
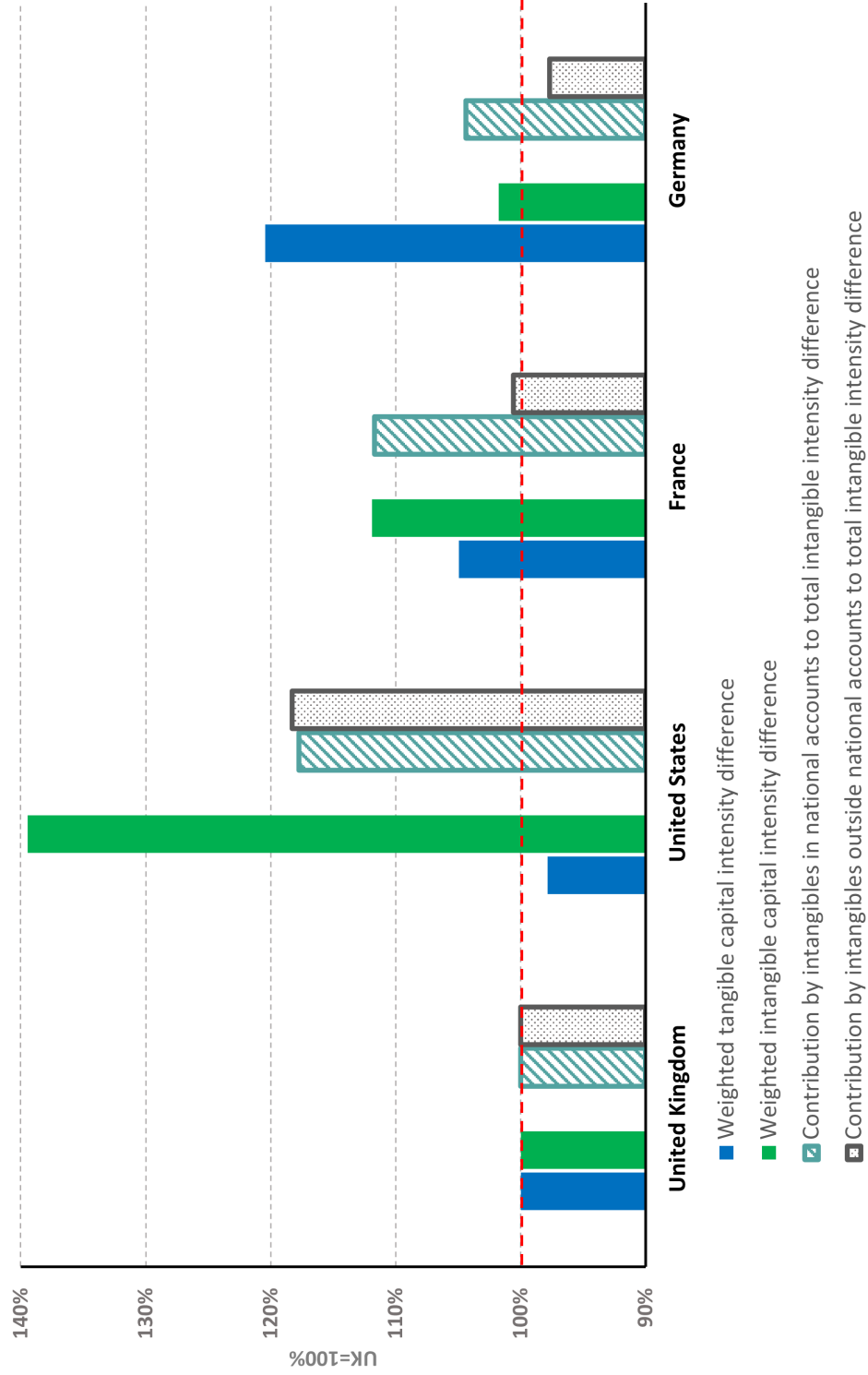
Notes: Tangible capital intensity and intangible capital intensity differences are weighted by their shares over total capital stock. The product of weighted tangible and intangible capital intensity differences is the total capital intensity difference in Figure B5. Contributions by intangibles in and outside national accounts are weighted by their shares over total intangible capital stock. The product of the contribution by intangibles in and outside national accounts is the weighted intangible capital differences.

Figure B7. : Growth accounting before and after the GFC, CHS market economy
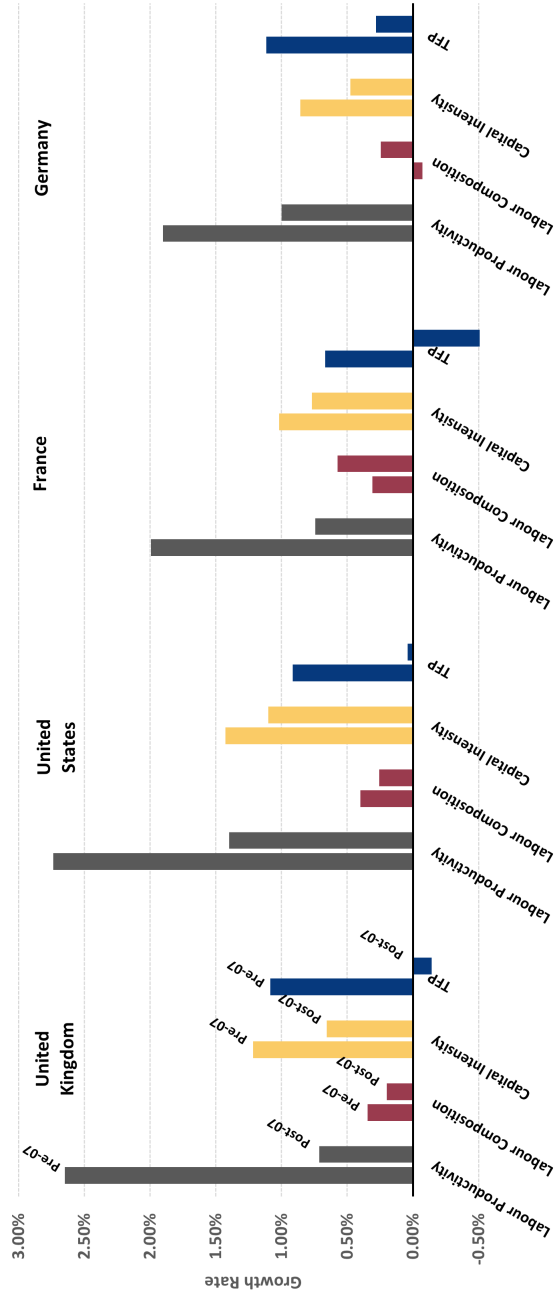
Sources & notes: See Figure 1 for data sources and table notes. See Table C12 for growth accounting results.

Figure B8. : Contribution of capital deepening to labour productivity growth before and after the GFC, CHS market economy
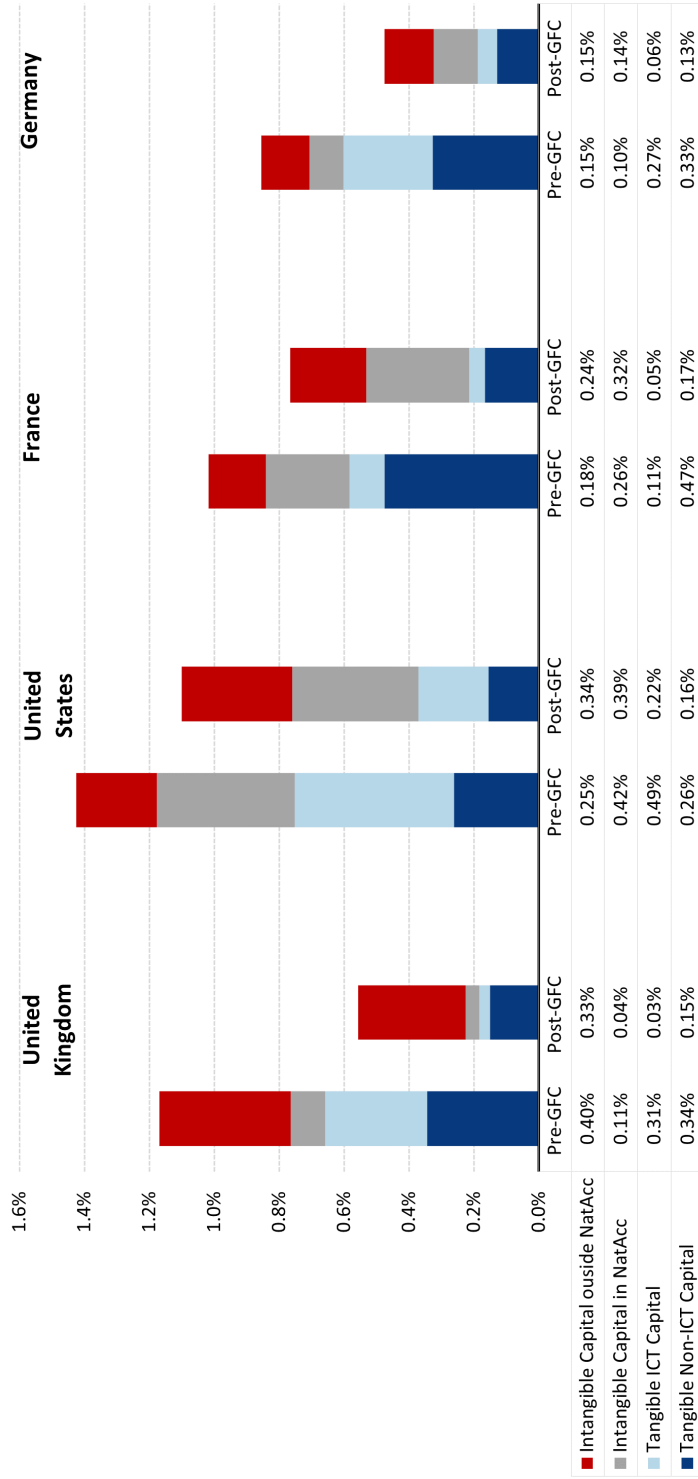
Source & note: See Figure 1 for data sources and table notes.

Figure B9. : Decomposition of the slowdown in labour productivity growth after the GFC, CHS market economy

	United Kingdom	United States	France	Germany
■ Total Capital (K)	-0.56%	-0.32%	-0.25%	-0.38%
■ TFP	-1.23%	-0.87%	-1.26%	-0.84%
■ Labour Composition (H)	-0.14%	-0.14%	0.26%	0.32%
✕ Labour Productivity	-1.94%	-1.34%	-1.25%	-0.90%
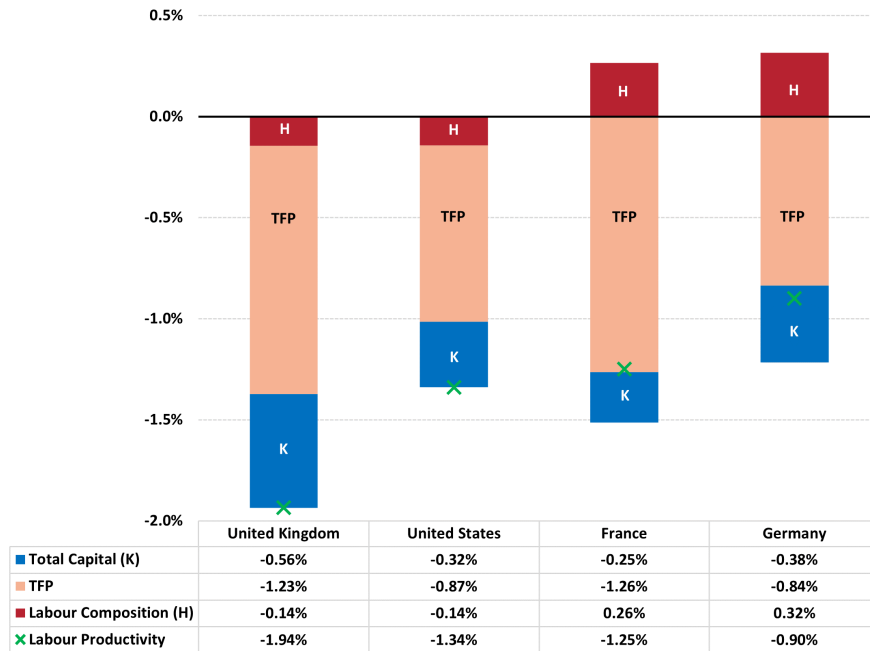
Sources & notes: See Figure 1 for data sources and table notes.

B2. Looking Back Further in Time

We have focused on productivity performance since the mid-1990s. Bergeaud et al. (2016) look at trends across our four countries since 1870 (see Figure B10). Germany and the US first overtook the UK before WW1, and by the mid-1970s a clear gap of around 20% emerged. However, in the decade leading up to the financial crisis, the UK was closing its gap with other European countries and keeping pace with the US.

As noted in the data section, we can splice earlier versions of EUKLEMS in order to obtain a consistent series since 1979 as in Fernald and Inklaar (2022).[13] Table B1 shows our growth accounting exercise from Equation 3 over the four decades between 1979 and 2019, dividing it into the Conservative years (1979-1997 under Prime Ministers Thatcher and Major) and (as before), pre-GFC years (1997-2007) and post-GFC years (2007-2019).

During the 1979-97 years, UK productivity growth outstripped that of the US and Germany, but was lower than France. The Anglo-Saxon countries both had the fastest rates of productivity growth in the 1997-2007 period, and this was an acceleration compared to 1979-1997.

Table B1—: Labour productivity growth accounting, 1979-2019

Market Economy Growth Rates	UK	US	France	Germany
2007-2019				
Labour Productivity	0.48%	1.21%	0.58%	0.92%
Labour Composition	0.23%	0.29%	0.65%	0.26%
Capital Intensity	0.20%	0.73%	0.27%	0.23%
TFP	0.06%	0.20%	-0.33%	0.43%
1997-2007				
Labour Productivity	2.72%	2.80%	2.07%	1.95%
Labour Composition	0.41%	0.44%	0.27%	-0.05%
Capital Intensity	0.87%	1.09%	0.42%	0.48%
TFP	1.43%	1.27%	1.38%	1.53%
1979-1997				
Labour Productivity	2.20%	1.67%	2.87%	1.69%
Labour Composition	0.18%	0.05%	0.75%	-0.09%
Capital Intensity	1.39%	1.04%	0.71%	1.26%
TFP	0.64%	0.58%	1.40%	0.52%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); EUKLEMS & INTANProd 2012 (O'Mahony and Timmer, 2009); OECD productivity statistics (OECD, 2014).
Notes: EUKLEMS& INTANProd 2023 is merged with EUKLEMS 2012. See Appendix A for further details. Growth accounting starts in 1991 for Germany and 1980 for France due to data availability issues.

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[13]Additional details regarding the data merging process are provided in Appendix A.

Figure B10. : Long-term labour productivity level relative to the UK, total economy, 1870-2018
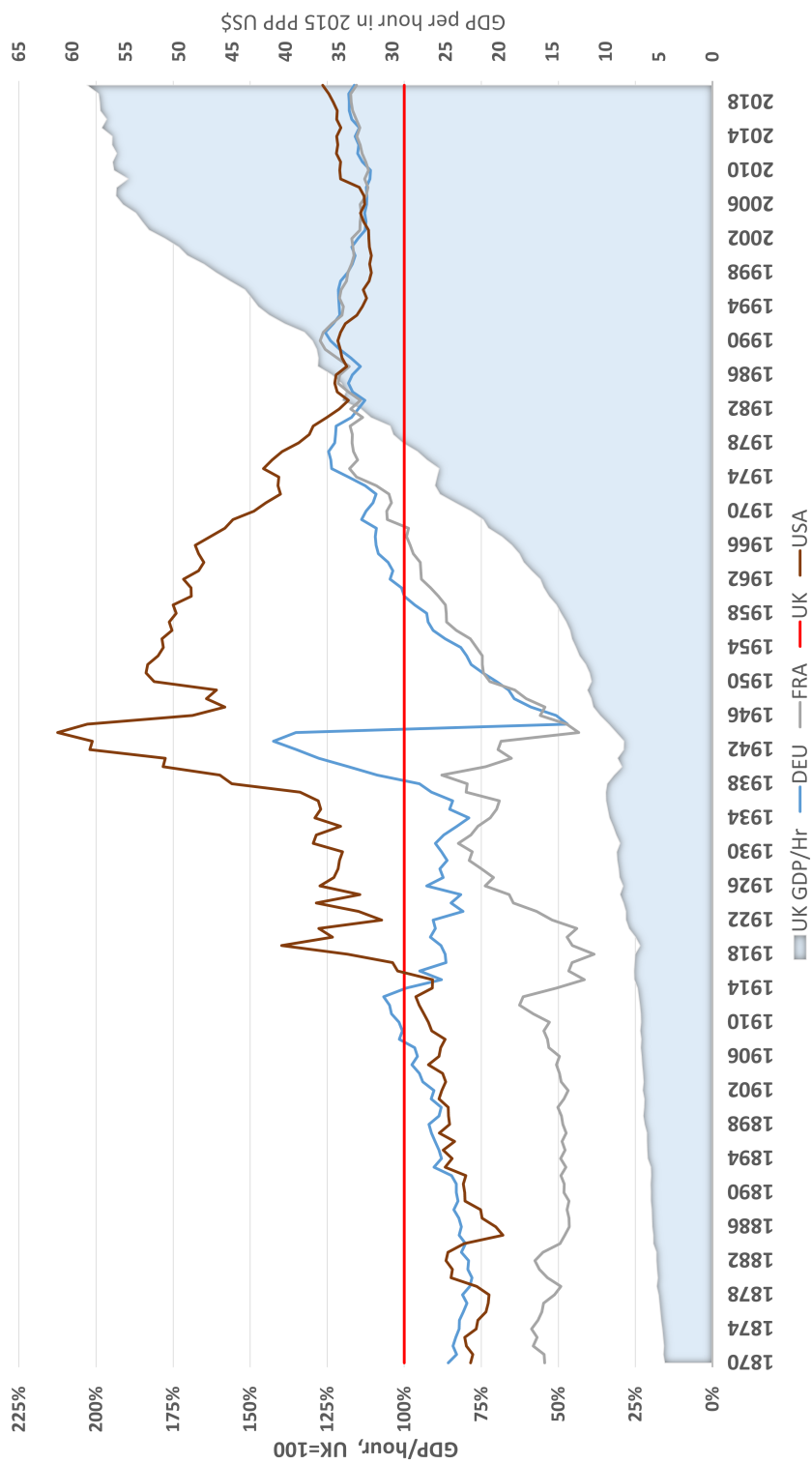
B3.   *Capital Intensity Growth in the UK*

As noted above, besides TFP, the slowdown in capital deepening is a key contributor to the UK's declining productivity growth after the GFC. In Figure B11, we observe that the tangible capital stock per hour was rising before 2007, and has become stagnant since then. Intangible capital stock per hour, however, has been rising steadily throughout both periods. This pattern of capital stock per hour worked aligns with the investment trend shown in Figure B13. Over time, the share of GVA invested in tangible capital has declined, but the share invested in intangibles has remained robust. An interesting feature of the graph is that the size of investment in intangibles outside national accounts is twice as large as the investment in intangibles reported in national accounts.

Figure B11. : UK's real capital intensity level, CHS market economy
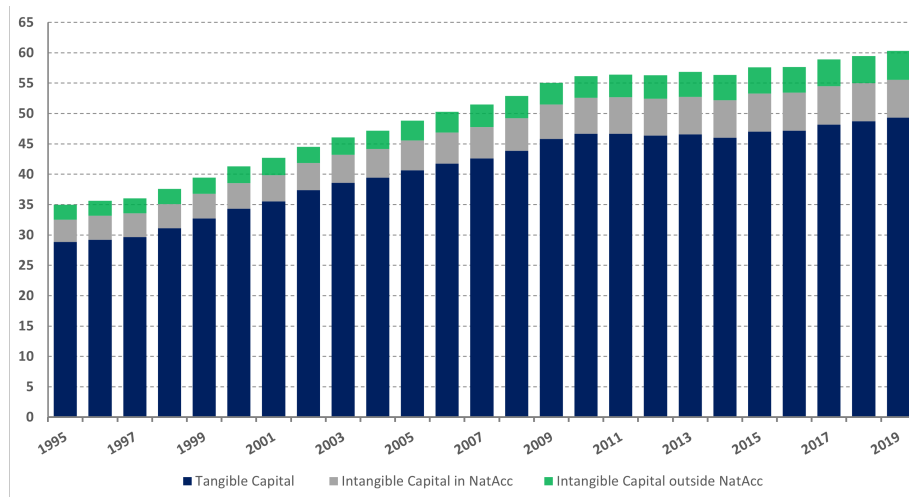
Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Figure B12. : Investment as a share of UK's GDP, SNA market economy
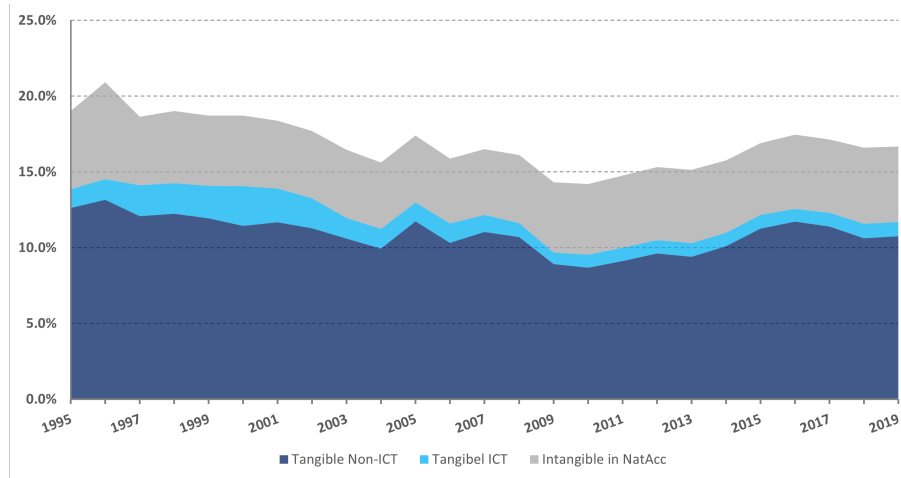
Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Figure B13. : Investment as a share of UK's GDP, CHS market economy
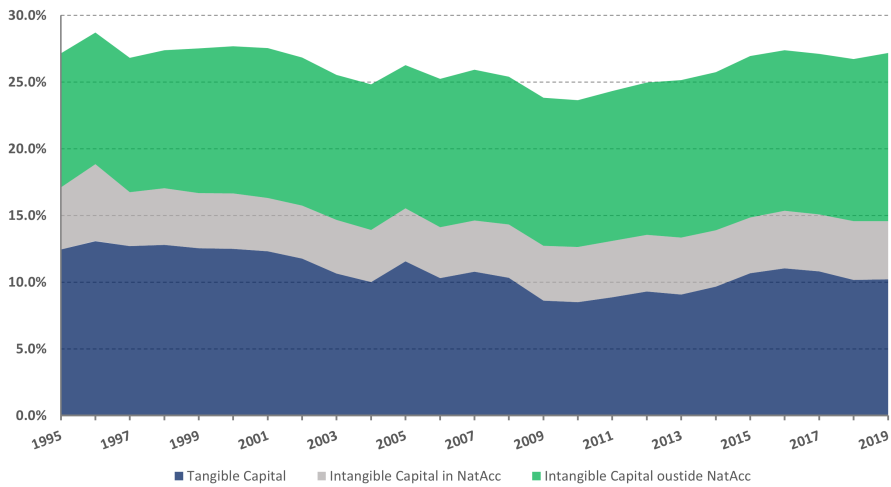
Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Figure B14. : Productivity slowdown after the GFC across sectors, SNA market economy
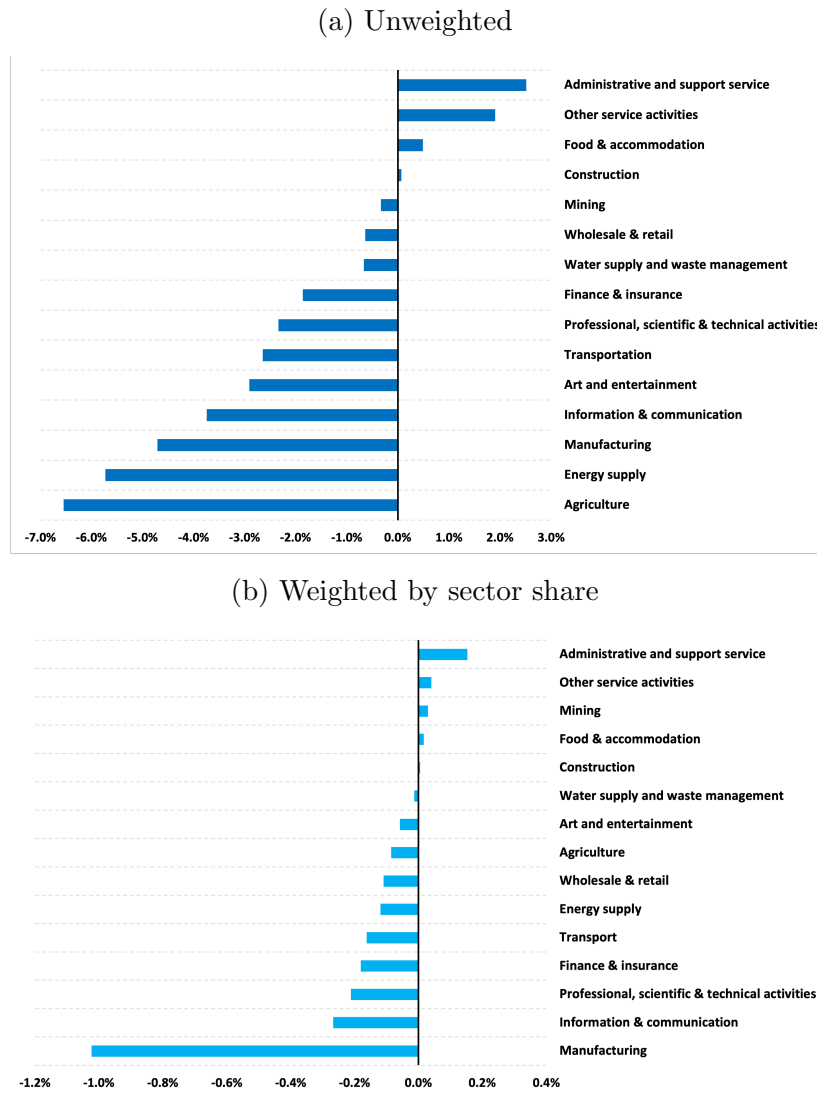
(a) Unweighted

(b) Weighted by sector share

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Notes: The productivity slowdown is the change in average labour productivity growth rates between 1995-2007 and 2007-2019. Panel (a) is the unweighted productivity slowdown by sector in the market economy. Panel (b) is the sectoral slowdown in productivity growth weighted by the output share of each sector.

Figure B15. : Productivity slowdown across sectors, 1997-2007 vs 2007-2019, SNA market economy
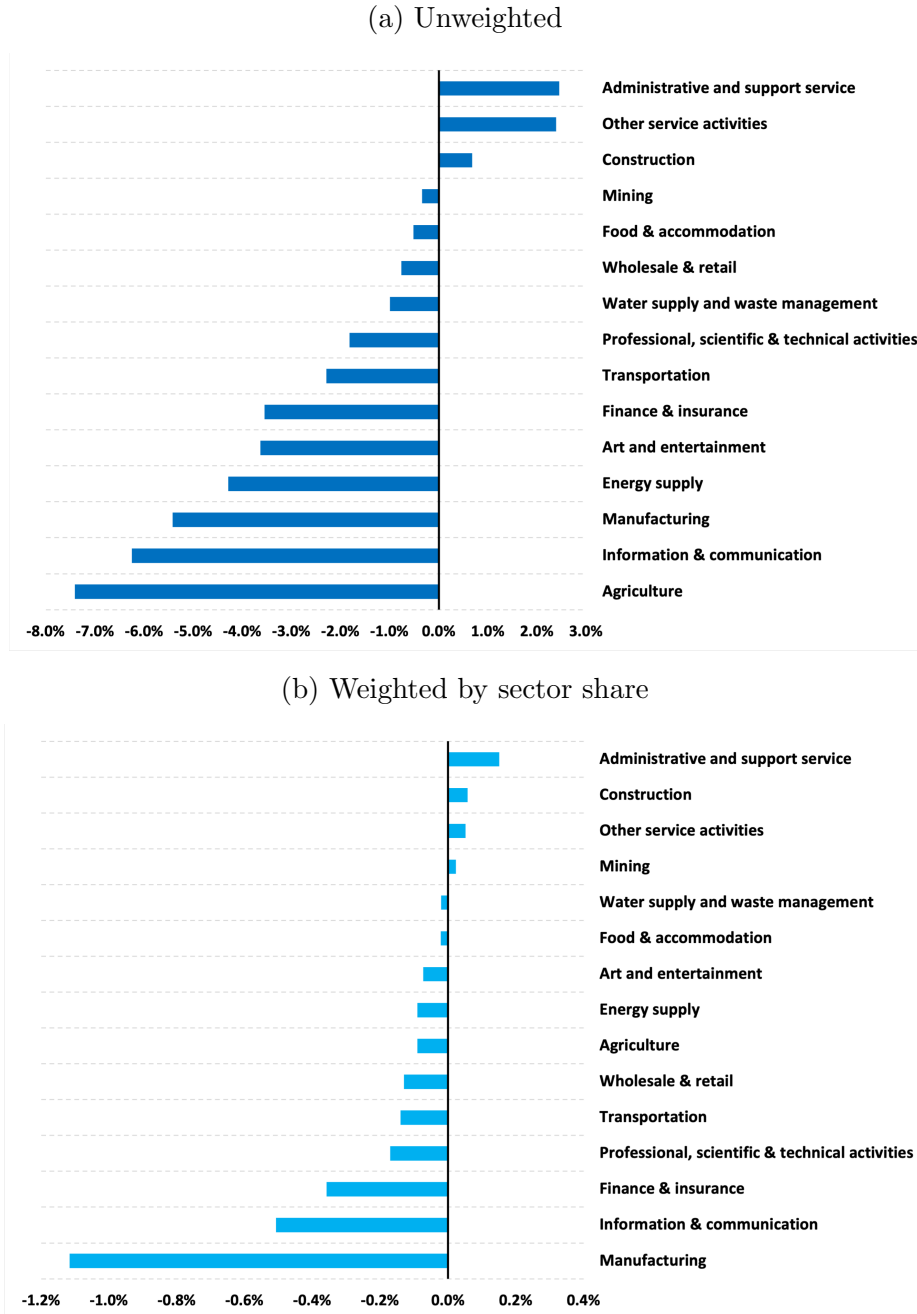
(a) Unweighted

(b) Weighted by sector share

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Notes: The productivity slowdown is the change in average labour productivity growth rates between 1997-2007 and 2007-2019. Panel (a) is the unweighted productivity slowdown by sector in the market economy. Panel (b) is the sectoral slowdown in productivity growth weighted by the output share of each sector.

Figure B16. : Decomposition of slowdown by sector after the GFC, SNA market economy

(a) Decomposition by factor inputs and TFP

	Manufacturing	Information & communication	Finance & insurance	Professional & scientific services
■ Capital intensity	-0.76%	-1.86%	-1.76%	-0.51%
■ TFP	-3.10%	-1.31%	0.09%	-1.39%
■ Labour composition	-0.84%	-0.57%	-0.19%	-0.45%
✕ Labour productivity	-4.71%	-3.74%	-1.86%	-2.34%
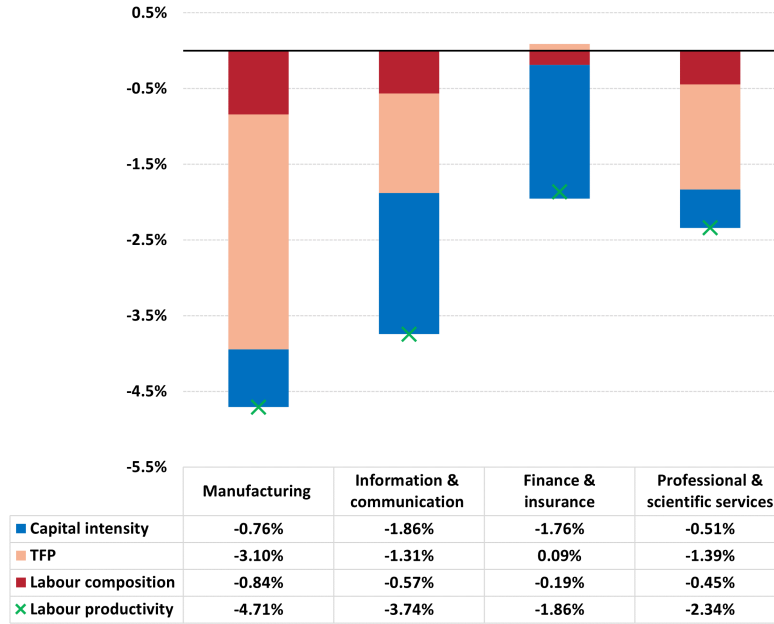
(b) Decomposition by different capital assets

	Manufacturing	Information & communication	Finance & insurance	Professional & scientific services
■ Intangible	-0.01%	-0.75%	-1.00%	-0.14%
■ Tangible ICT	-0.19%	-1.34%	-0.42%	-0.44%
■ Tangible NonICT	-0.56%	0.36%	-0.37%	0.11%
■ TFP	-3.10%	-1.31%	0.09%	-1.39%
■ Labour composition	-0.84%	-0.57%	-0.19%	-0.45%
✕ Labour productivity	-4.71%	-3.74%	-1.86%	-2.34%
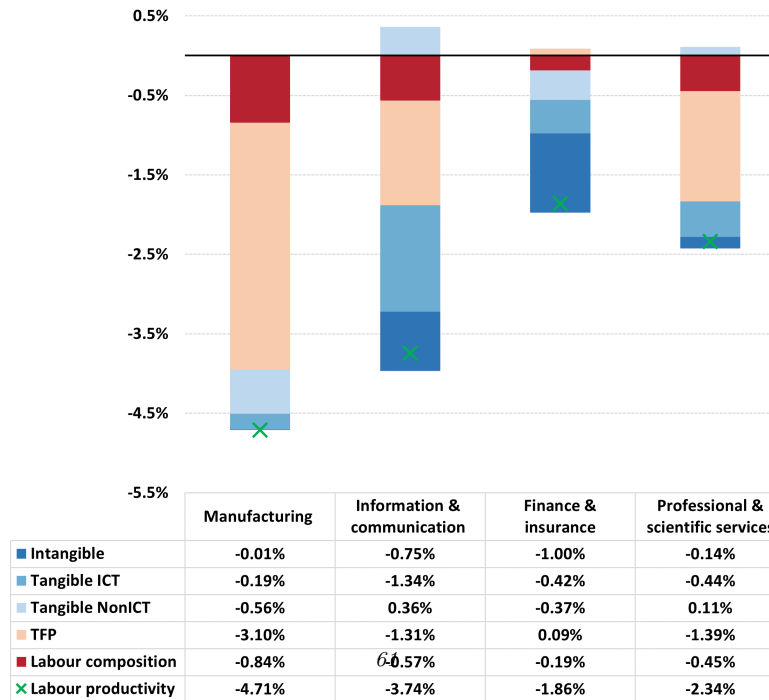
Sources & notes: See Figure 2 for data sources and figure notes.

Figure B17. : Labour productivity growth, SNA market economy vs. market economy excluding manufacturing

(a) Productivity growth pre-GFC vs post-GFC

(b) Productivity growth slowdown after the GFC
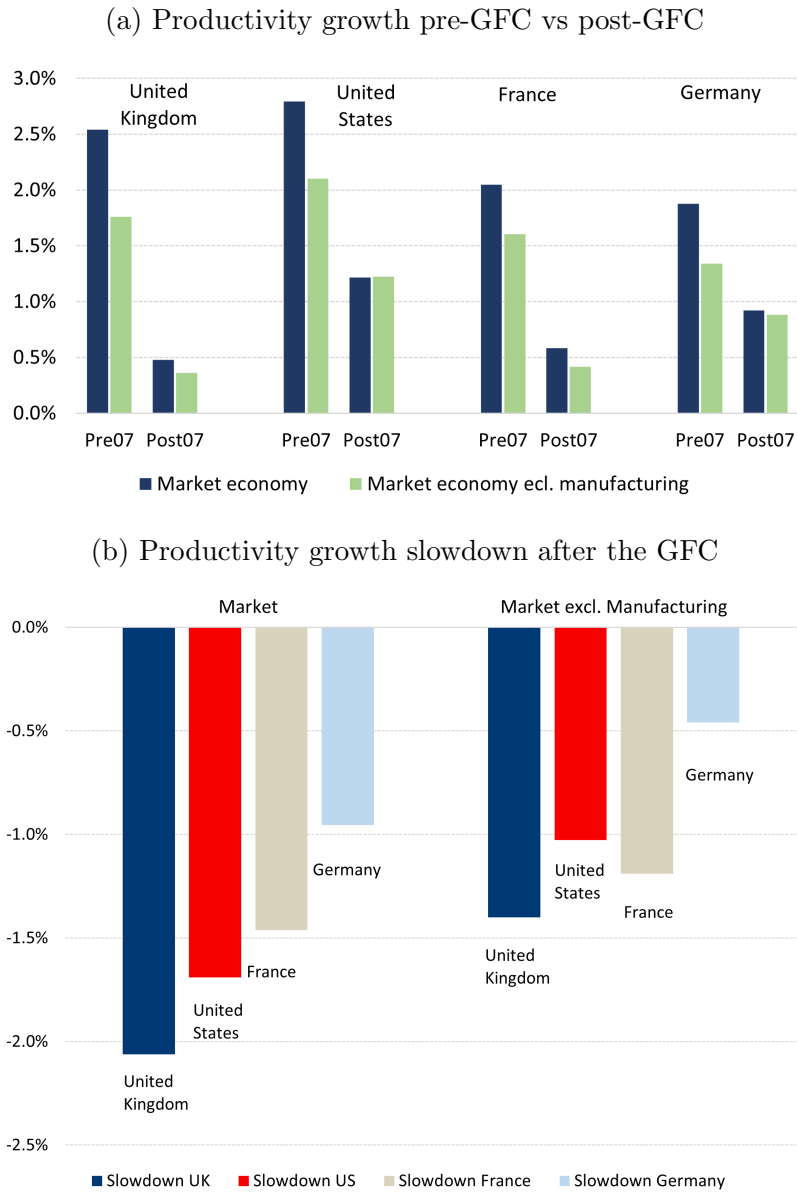
Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023).

Notes: Pre-GFC period is from 1995 to 2007, and the post-GFC period is from 2007-2019. The productivity slowdown is the change in average labour productivity growth rates from the pre-GFC to the post-GFC period.

B5. Purchasing Power Parity Series

In section IV, our estimates of productivity gaps are based on input and output volume measures in 2015 price index and subsequently converted into international dollars using the 2015 PPP series. In essence, a single year, namely 2015 in our study, needs to be selected for the comparison of productivity levels. All subsequent productivity levels are derived by applying relative rates of productivity growth, consistent with those derived in national currencies. This method is commonly referred to as the 'constant purchasing power parities (PPPs)' approach. One key advantage of this approach is that it allows for both cross-country and over-time comparison. However, PPPs and price indexes may exhibit inconsistency over time due to changes in weighting and product sampling (Fernald, Inklaar and Ruzic, 2023). Moreover, estimations derived through this approach are contingent upon the relative productivity levels in the base year. An alternative method uses the current PPPs, i.e. a new set of PPPs for each period, which allows for variation in prices and price structure across time periods. While cross-country comparison in a given year is straightforward, the current PPPs approach presents more challenges when interpreting changes over time (OECD, 2019).

To illustrate the implications of these two approaches on our levels analysis, we conduct productivity level decomposition in section IV, employing both the current PPPs approach and the constant PPPs approach, as outlined in Table B2. For productivity and TFP levels, the use of the current PPPs approach results in a 5pp larger gap for France and Germany, but has a negligible impact on the gap for the US. For relative capital intensity levels, both approaches lead to very similar estimates across all three countries. In general, our main conclusions remain robust to both approaches.

Figure B18. : Labour productivity gap UK=100%, constant PPP vs. current-year PPP, SNA market economy

(a) Constant PPP (2015 PPP)
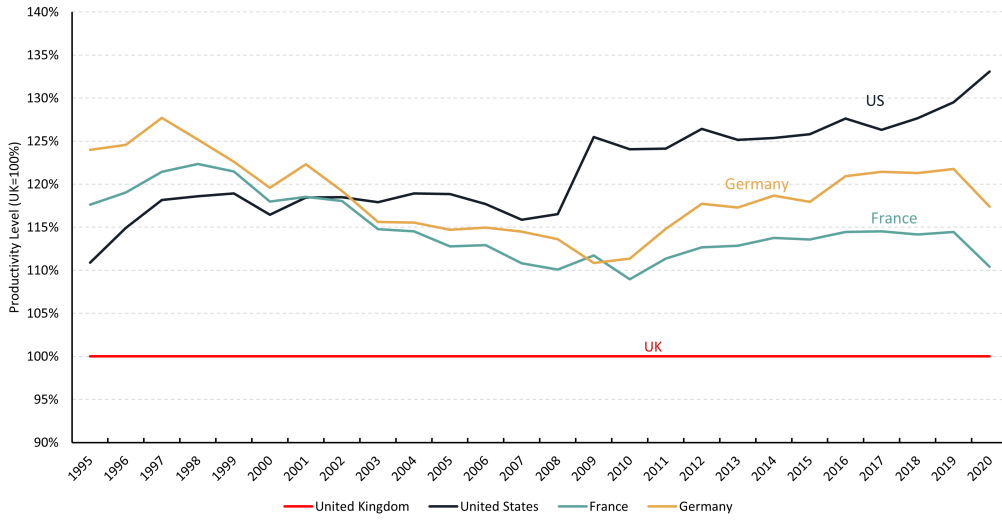
(b) Current-year PPP

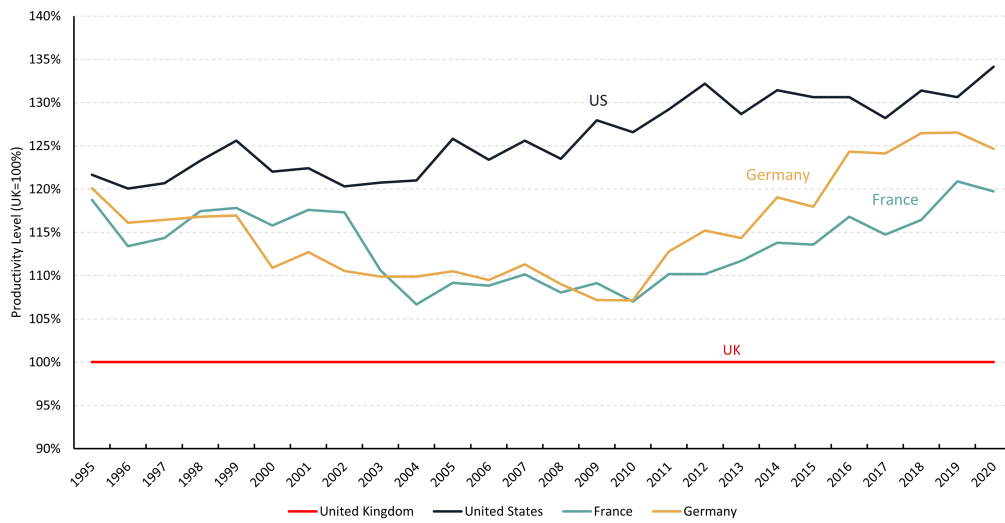*Sources:* EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023c).

Table B2—: Productivity level decomposition by constant PPPs approach vs. current PPPs approach, SNA market economy, 2019

(a) 2015 constant PPPs and prices

2015 cosntant PPPs and prices	United Kingdom	United States	France	Germany
Productivity	100.00%	129.52%	114.46%	121.77%
Labour composition	100.00%	112.23%	105.03%	108.88%
Capital intensity	100.00%	105.18%	104.66%	107.21%
TFP	100.00%	109.72%	104.13%	104.31%

(b) Current PPPs and prices

Current PPPs and prices	United Kingdom	United States	France	Germany
Productivity	100.00%	130.63%	120.90%	126.54%
Labour composition	100.00%	112.23%	105.03%	108.88%
Capital intensity	100.00%	103.49%	105.18%	107.86%
TFP	100.00%	112.47%	109.44%	107.75%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); EUKLEMS & INTANProd 2012 (O'Mahony and Timmer, 2009); OECD productivity statistics (OECD, 2014).
Notes: Levels in (a) are in 2015 constant prices and converted to international dollars using 2015 PPP series, which is identical to results in Table C4. Levels in (b) are in current prices and converted to international dollars using the current PPP series (i.e. 2019 PPP series).

B6. Comparison with Other Productivity Estimates

The Groningen Growth and Development Centre (GGDC) Productivity Level database (Inklaar and Timmer, 2008) offers estimates of comparative labour productivity, factor inputs and TFP levels across countries. We compare our level decomposition results in Table B3 with Inklaar and Timmer (2008)'s decomposition results in Table B4. Both sets of estimates show similar productivity and TFP gaps between the UK and France. However, the UK's labour productivity gaps with the US and Germany (120.6% and 116.5%) are significantly lower compared to the GGDC productivity estimates (147.4% and 132.3%). Similarly, the UK's TFP gaps with the US and Germany are almost 20pp and 30pp lower in our estimates. The divergence between our estimates and GGDC estimates stems from five differences in data sources and methodologies.

To understand the impact of each source on the estimate of productivity gaps, we systematically adjust for the differences in data and methodology one by one in Table B5. First, our analysis employs harmonised working hours data from the OECD to ensure consistency in measurement across countries, while Inklaar and Timmer (2008) relied on the working hours in national accounts for their estimates. Therefore, we start the adjustment by replacing the OECD hours data in our analysis with hours data in national accounts in Table B5 (a). The use of national accounts hours increases UK's productivity gaps by around 10pp and TFP gaps by around 5pp with all countries.

Second, Inklaar and Timmer (2008) constructed their own PPP series for the year 1997, whereas we reply on the PPP series by OECD (2023*b*). In panel (b), we

adjust our analysis from (a) by using the same PPP series as the GGDC database. Inklaar and Timmer (2008)'s PPP series leads to a 7pp larger productivity gap with the US. However, the UK's gap with EU countries decreases by about 7pp.

Third, national accounts data and methodology undergo revisions over time. Since Inklaar and Timmer published the GGDC estimates 15 years ago, the raw data in national accounts have undergone significant changes. To account for this difference, we use the raw levels of GVA and working hours in the GGDC database in panel (c). The change in raw data accounts for about 10pp of the differences in productivity gap compared to panel (b).

Fourth, Inklaar and Timmer (2008) and our study independently construct labour composition measures. To address discrepancies in the measurement of labour composition, we replace our measures with those provided by Inklaar and Timmer (2008) in panel (d). This substitution results in marginally larger productivity gaps between the UK and the US and France. Notably, the skills gap with Germany undergoes a substantial reduction of 13pp, consequently contributing to a proportional increase in the TFP gap.

Lastly, the capital intensity measures in the GGDC database encompass only tangible capital, whereas our original analysis incorporates both tangible and intangible capital as outlined in national accounts. In Panel (e), we only include tangible capital to align with the definition of capital in the GGDC database. The exclusion of intangible capital slightly increases the UK's TFP gap with its peers. Following the adjustments for these methodological and data source disparities, our analysis ultimately produces a TFP gap similar to the estimates presented by Inklaar and Timmer (2008).

In conclusion, among all sources of divergence, three stand out—incorporation of harmonised working hours data, revision of national accounts data, and inclusion of intangible— as clear improvements in data measurement, highlighting the robustness of our analysis. Yet, it remains challenging to determine which of the PPP series and labour composition measures are better choices. The findings in Table B5 affirm the overall consistency of our approach with Inklaar and Timmer (2008)'s estimates, and underscore the sensitivity of productivity gaps to data choices.

Table B3—: 1997 Relative labour productivity level by our analysis

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	120.7%	114.4%	116.4%
Labour composition	100.0%	107.5%	102.2%	116.3%
Capital intensity	100.0%	108.2%	102.0%	115.9%
TFP	100.0%	103.8%	109.7%	86.4%

Soures: EUKLEMS & INTANProd (Bontadini et al., 2023); PPP (OECD, 2023*b*).
Notes: Results in this table are based on our analysis using Equation 2. Labour productivity is measured at the SNA market economy level, with values in each cell benchmarked against the UK's level. GVA and factor input levels in each cell are in current prices (i.e. 1997 prices) and then converted to international dollars using the current PPP series (i.e. 1997 OECD PPP series).

Table B4—: 1997 Relative labour productivity level by Inklaar and Timmer (2008)

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	147.4%	115.8%	132.3%
Labour composition	100.0%	113.5%	108.4%	105.5%
Capital intensity	100.0%	133.6%	120.7%	141.1%
TFP	100.0%	123.2%	103.1%	114.4%

Sources & notes: : Results in this table are recalculations based on the appendix tables by Inklaar and Timmer (2008). Labour productivity is measured at the SNA market economy level, with values in each cell benchmarked against the UK's level. Labour productivity is defined as the double-deflated gross value added per hour worked (LP_VADD as per Inklaar and Timmer (2008)'s appendix tables), labour composition represents labour input per hour worked (LAB_QPH), capital intensity represents capital input per hour worked (CAP_QPH), and TFP represents double-deflated multifactor productivity (MFP_VADD).

Table B5—: Analysis on the differences in data sources

(a) Adjusting for the difference in working hours data

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	129.6%	122.9%	125.2%
Labour composition	100.0%	107.5%	102.2%	116.3%
Capital intensity	100.0%	110.8%	104.3%	118.5%
TFP	100.0%	108.8%	115.3%	90.8%

(b) Adjusting for the difference in PPP series

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	136.7%	106.6%	118.6%
Labour composition	100.0%	107.5%	102.2%	116.3%
Capital intensity	100.0%	116.1%	99.3%	117.0%
TFP	100.0%	109.6%	105.0%	87.2%

(c) Adjusting for changes in national accounts data

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	147.4%	115.8%	132.3%
Labour composition	100.0%	107.9%	102.3%	117.5%
Capital intensity	100.0%	115.6%	99.7%	119.7%
TFP	100.0%	118.2%	113.5%	94.1%

(d) Adjusting for difference in labour composition measures

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	147.4%	115.8%	132.3%
Labour composition	100.0%	109.3%	106.2%	104.1%
Capital intensity	100.0%	115.6%	99.7%	119.7%
TFP	100.0%	116.6%	109.4%	106.2%

(e) Adjusting for difference in capital definition

	United Kingdom	United States	France	Germany
Labour productivity	100.0%	147.4%	115.8%	132.3%
Labour composition	100.0%	109.3%	106.2%	104.1%
Capital intensity	100.0%	111.5%	97.9%	118.6%
TFP	100.0%	120.9%	111.3%	107.2%

Sources: EUKLEMS & INTANProd,(Bontadini et al., 2023); The appendix tables by Inklaar and Timmer (2008)
Notes: Results in this table are based on our analysis using Equation 2. Labour productivity is measured at the SNA market economy level, with values in each cell benchmarked against the UK's level.

Table C1—: Relative labour productivity level after adjusting for factor inputs, SNA market economy

	United Kingdom	United States	France	Germany
1997 level				
Productivity	100.0%	118.2%	121.4%	127.7%
Productivity after adjusting for capital	100.0%	112.0%	118.7%	111.4%
Productivity after adjusting for capital and skills (TFP)	100.0%	109.6%	122.1%	106.3%
2007 level				
Productivity	100.0%	115.9%	110.8%	114.5%
Productivity after adjusting for capital	100.0%	111.9%	108.9%	104.2%
Productivity after adjusting for capital and skills (TFP)	100.0%	108.4%	112.7%	103.5%
2017 level				
Productivity	100.0%	126.3%	114.5%	121.4%
Productivity after adjusting for capital	100.0%	120.4%	109.6%	113.2%
Productivity after adjusting for capital and skills (TFP)	100.0%	117.2%	109.6%	112.5%
2018 level				
Productivity	100.0%	127.6%	114.2%	121.3%
Productivity after adjusting for capital	100.0%	121.6%	109.3%	113.3%
Productivity after adjusting for capital and skills (TFP)	100.0%	118.5%	108.6%	112.9%
2019 level				
Productivity	100.0%	129.5%	114.5%	121.8%
Productivity after adjusting for capital	100.0%	123.1%	109.3%	113.5%
Productivity after adjusting for capital and skills (TFP)	100.0%	120.5%	108.6%	113.8%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023*c*).
Notes: Levels in each cell are relative to the UK's level. Productivity level is measured in 2015 constant prices and converted to international dollars using the constant 2015 PPP series. The adjusted productivity in the second and third rows of each panel accounts for the relative level differences in factor inputs. "Capital" refers to capital intensity (i.e. capital stock per hour). Capital intensity and labour composition levels are estimated by level accounting based on Equation 2. See Table C3 for level accounting results.

Table C2—: Labour productivity level decomposition, CHS market economy

	United Kingdom	United States	France	Germany
1997 level				
Productivity	100.0%	119.1%	122.6%	123.1%
Productivity after adjusting for capital in NatAcc	100.0%	111.3%	122.0%	123.1%
Productivity after adjusting for capital in NatAcc and broader intangibles	100.0%	105.1%	118.6%	105.8%
Productivity after adjusting for skills and capital	100.0%	103.1%	121.6%	101.3%
2007 level				
Productivity	100.0%	114.5%	109.9%	109.1%
Productivity after adjusting for capital in NatAcc	100.0%	108.5%	110.2%	109.8%
Productivity after adjusting for capital in NatAcc and broader intangibles	100.0%	103.9%	107.6%	99.0%
Productivity after adjusting for skills and capital	100.0%	101.0%	110.9%	98.4%
2017 level				
Productivity	100.0%	125.0%	114.4%	115.1%
Productivity after adjusting for capital in NatAcc	100.0%	118.3%	114.6%	115.9%
Productivity after adjusting for capital in NatAcc and broader intangibles	100.0%	111.3%	108.1%	107.0%
Productivity after adjusting for skills and capital	100.0%	108.7%	108.1%	106.4%
2018 level				
Productivity	100.0%	126.3%	114.0%	114.7%
Productivity after adjusting for capital in NatAcc	100.0%	119.3%	114.2%	115.6%
Productivity after adjusting for capital in NatAcc and broader intangibles	100.0%	112.2%	107.7%	106.8%
Productivity after adjusting for skills and capital	100.0%	109.7%	107.1%	106.6%
2019 level				
Productivity	100.0%	127.6%	113.3%	114.5%
Productivity after adjusting for capital in NatAcc	100.0%	120.5%	113.7%	115.5%
Productivity after adjusting for capital in NatAcc and broader intangibles	100.0%	113.0%	107.0%	106.5%
Productivity after adjusting for skills and capital	100.0%	110.9%	106.3%	106.8%

Sources & notes: "Capital in NatAcc" refers to the tangible and intangible capital within the SNA boundary. "Broader intangibles" refer to intangible capital not included in national accounts but included in the CHS assets boundary. See **??** for data sources and additional notes. See Table C4 for level accounting results using CHS framework.

Table C3—: Labour productivity level decomposition, SNA market economy

	United Kingdom	United States	France	Germany
1997 level				
Productivity	100.0%	118.2%	121.4%	127.7%
Labour composition	100.0%	102.1%	97.3%	104.9%
TFP	100.0%	109.6%	122.1%	106.3%
Capital intensity	100.0%	105.5%	102.3%	114.6%
Tangible capital intensity	100.0%	102.5%	100.9%	113.4%
Intangible capital intensity	100.0%	103.1%	101.5%	101.0%
2007 level				
Productivity	100.0%	115.9%	110.8%	114.5%
Labour composition	100.0%	103.2%	96.7%	100.7%
TFP	100.0%	108.4%	112.7%	103.5%
Capital intensity	100.0%	103.5%	101.7%	109.9%
Tangible capital intensity	100.0%	99.3%	99.9%	108.7%
Intangible capital intensity	100.0%	105.0%	102.1%	101.0%
2017 level				
Productivity	100.0%	126.3%	114.5%	121.4%
Labour composition	100.0%	102.8%	100.0%	100.7%
TFP	100.0%	117.2%	109.6%	112.5%
Capital intensity	100.0%	104.9%	104.4%	107.3%
Tangible capital intensity	100.0%	99.4%	101.6%	106.0%
Intangible capital intensity	100.0%	106.7%	103.2%	101.2%
2018 level				
Productivity	100.0%	127.6%	114.2%	121.3%
Labour composition	100.0%	102.6%	100.7%	100.3%
TFP	100.0%	118.5%	108.6%	112.9%
Capital intensity	100.0%	105.0%	104.4%	107.1%
Tangible capital intensity	100.0%	99.2%	101.4%	105.7%
Intangible capital intensity	100.0%	107.1%	103.5%	101.4%
2019 level				
Productivity	100.0%	129.5%	114.5%	121.8%
Labour composition	100.0%	102.2%	100.7%	99.7%
TFP	100.0%	120.5%	108.6%	113.8%
Capital intensity	100.0%	105.2%	104.7%	107.2%
Tangible capital intensity	100.0%	99.2%	101.4%	105.7%
Intangible capital intensity	100.0%	107.5%	103.9%	101.6%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023c).
Notes: Decomposition follows Equation 2, and the relative levels of labour and capital inputs are weighted by their respective cost shares.

Table C4—: Labour productivity level decomposition, CHS market economy

	United Kingdom	United States	France	Germany
1997 level				
Productivity	100.0%	119.1%	122.6%	123.1%
Labour composition	100.0%	101.9%	97.5%	104.5%
TFP	100.0%	103.1%	121.6%	101.3%
Capital intensity	100.0%	113.3%	103.4%	116.3%
Tangible capital intensity	100.0%	102.6%	101.0%	115.0%
Intangible capital intensity	100.0%	111.2%	102.8%	100.8%
Intangible capital intensity in national accounts	100.0%	103.2%	101.9%	101.2%
Intangible capital intensity outside national accounts	100.0%	108.0%	100.9%	99.5%
2007 level				
Productivity	100.0%	114.5%	109.9%	109.1%
Labour composition	100.0%	102.9%	97.0%	100.7%
TFP	100.0%	101.0%	110.9%	98.4%
Capital intensity	100.0%	110.2%	102.2%	110.2%
Tangible capital intensity	100.0%	99.3%	99.9%	109.6%
Intangible capital intensity	100.0%	112.8%	102.7%	100.2%
Intangible capital intensity in national accounts	100.0%	105.1%	102.5%	101.1%
Intangible capital intensity outside national accounts	100.0%	107.3%	100.2%	99.0%
2017 level				
Productivity	100.0%	125.0%	114.4%	115.1%
Labour composition	100.0%	102.5%	100.0%	100.6%
TFP	100.0%	108.7%	108.1%	106.4%
Capital intensity	100.0%	112.3%	105.8%	107.5%
Tangible capital intensity	100.0%	99.4%	102.0%	106.8%
Intangible capital intensity	100.0%	115.0%	104.3%	100.5%
Intangible capital intensity in national accounts	100.0%	106.9%	103.9%	101.4%
Intangible capital intensity outside national accounts	100.0%	107.5%	100.4%	99.1%
2018 level				
Productivity	100.0%	126.3%	114.0%	114.7%
Labour composition	100.0%	102.3%	100.6%	100.3%
TFP	100.0%	109.7%	107.1%	106.6%
Capital intensity	100.0%	112.6%	105.8%	107.4%
Tangible capital intensity	100.0%	99.2%	101.8%	106.5%
Intangible capital intensity	100.0%	115.4%	104.5%	100.6%
Intangible capital intensity in national accounts	100.0%	107.2%	104.2%	101.5%
Intangible capital intensity outside national accounts	100.0%	107.7%	100.4%	99.1%
2019 level				
Productivity	100.0%	127.6%	113.3%	114.5%
Labour composition	100.0%	101.9%	100.6%	99.8%
TFP	100.0%	110.9%	106.3%	106.8%
Capital intensity	100.0%	113.0%	105.9%	107.5%
Tangible capital intensity	100.0%	99.2%	101.7%	106.6%
Intangible capital intensity	100.0%	115.7%	104.6%	100.7%
Intangible capital intensity in national accounts	100.0%	107.5%	104.5%	101.8%
Intangible capital intensity outside national accounts	100.0%	107.5%	100.2%	99.0%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023*c*).
Notes: Intangible capital in national accounts refers to intangible assets within the SNA boundary. Intangible capital outside national accounts refers to intangible assets that are not included in national accounts but are covered within the CHS asset boundary.

Table C5—: Unweighted relative level of factor inputs, SNA market economy

	United Kingdom	United States	France	Germany
1997 Level				
Labour composition	100.0%	111.4%	103.1%	124.3%
Capital intensity	100.0%	119.1%	108.4%	162.6%
Tangible capital intensity	100.0%	108.5%	103.2%	156.6%
Intangible capital intensity	100.0%	110.1%	105.9%	103.6%
2007 Level				
Labour composition	100.0%	114.6%	102.2%	117.5%
Capital intensity	100.0%	111.4%	106.1%	135.0%
Tangible capital intensity	100.0%	97.9%	99.7%	131.2%
Intangible capital intensity	100.0%	114.6%	106.9%	102.9%
2017 Level				
Labour composition	100.0%	119.3%	106.2%	115.1%
Capital intensity	100.0%	115.7%	118.0%	126.8%
Tangible capital intensity	100.0%	98.2%	106.5%	122.2%
Intangible capital intensity	100.0%	120.0%	111.7%	103.8%
2018 Level				
Labour composition	100.0%	119.1%	105.9%	114.0%
Capital intensity	100.0%	115.9%	117.9%	126.5%
Tangible capital intensity	100.0%	97.7%	105.7%	121.6%
Intangible capital intensity	100.0%	120.5%	112.2%	104.2%
2019 Level				
Labour composition	100.0%	118.7%	107.0%	112.7%
Capital intensity	100.0%	116.7%	118.1%	127.4%
Tangible capital intensity	100.0%	97.5%	105.4%	121.8%
Intangible capital intensity	100.0%	121.2%	112.7%	104.7%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023*c*).
Notes: Labour composition and capital intensity are the absolute levels relative to the UK, which are not weighted by labour or capital shares. The relative levels of tangible and intangible capital intensity are weighted by the share of each type of capital over the total capital stock.

Table C6—: Unweighted relative level of factor inputs, CHS market economy
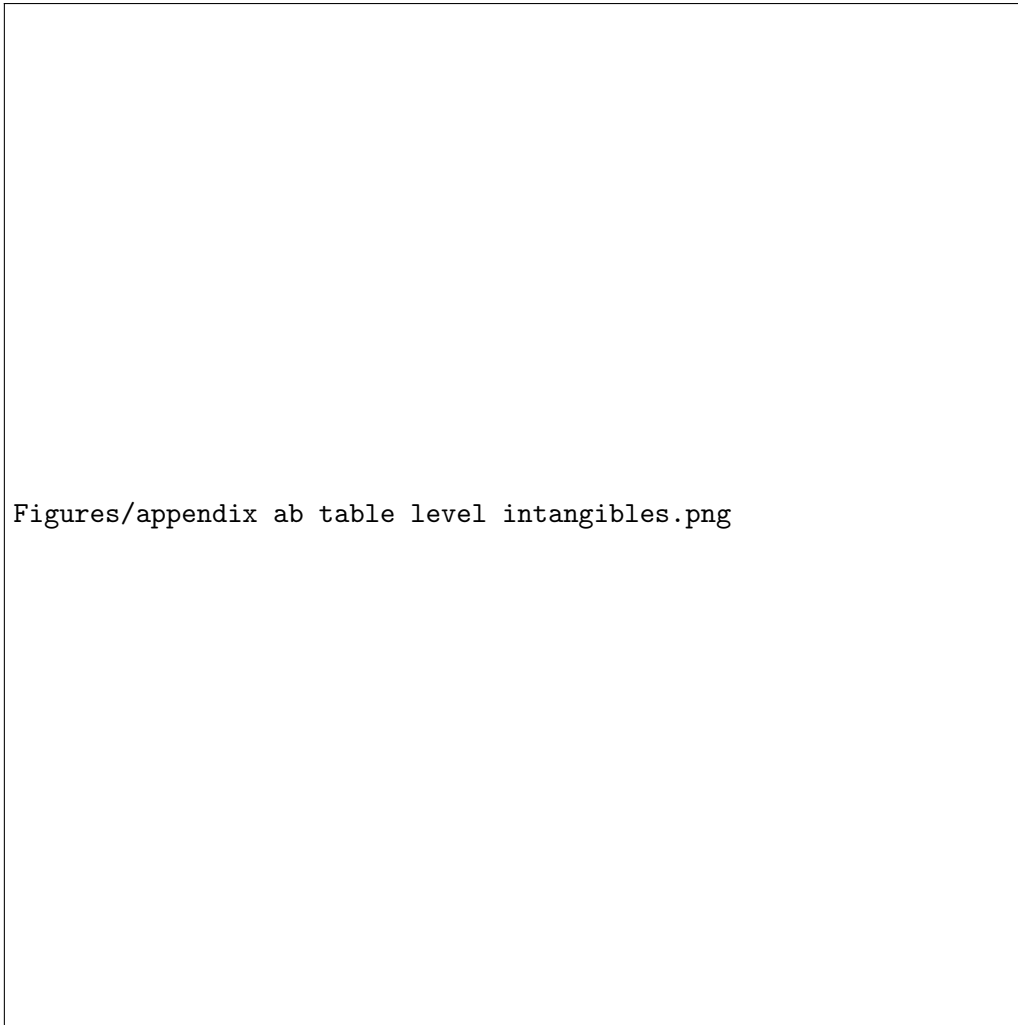
Figures/appendix ab table level intangibles.png

Sources & notes: Intangible capital in NatAcc refers to intangible assets within the SNA boundary. Intangible capital outside NatAcc refers to intangible assets that are not included in national accounts but are covered within the CHS asset boundary. For more data sources and table notes, see Table C5.

Table C7—: Relative labour productivity level using alternative labour composition measure, SNA market economy

	United Kingdom	United States	France	Germany
Productivity	100.0%	129.5%	121.8%	114.5%
Productivity after adjusting for capital	100.0%	123.1%	113.5%	109.3%
Productivity after adjusting for capital and skills (TFP)	100.0%	114.4%	113.6%	114.6%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023c); Average years of schooling (Barro and Lee, 2013).
Notes: Levels in each cell are relative to the UK's level. Productivity level is measured in 2015 constant prices and converted to international dollars using the constant 2015 PPP series. The adjusted productivity in the second and third rows of each panel accounts for the relative level differences in factor inputs. "Capital" refers to capital intensity (i.e. capital stock per hour). Labour composition levels are estimated using the alternative human capital measure based on Equation 4. See Table C9 for level accounting results.

Table C8—: Relative labour productivity level using alternative labour composition measure, CHS market economy

	United Kingdom	United States	France	Germany
Productivity	100.0%	127.6%	113.3%	114.5%
Productivity after adjusting for capital in NatAcc	100.0%	121.5%	107.3%	105.5%
Productivity after adjusting for capital in NatAcc and broader intangibles	100.0%	113.0%	107.0%	106.5%
Productivity after adjusting for skills and capital	100.0%	105.8%	111.6%	106.6%

Sources & notes: Labour composition levels are estimated using the alternative human capital measure based on Equation 4. "Capital in NatAcc" refers to the tangible and intangible capital within the SNA boundary. "Broader intangibles" refer to intangible capital not included in national accounts but included in the CHS assets boundary. See Table C7 for data sources and additional notes. See Table C10 for level accounting results using CHS framework.

Table C9—: Labour productivity level decomposition using alternative labour composition measures, SNA market economy

	United Kingdom	United States	France	Germany
Productivity	100.0%	129.5%	114.5%	121.8%
Labour composition	100.0%	107.6%	95.4%	100.0%
TFP	100.0%	114.4%	114.6%	113.6%
Capital intensity	100.0%	105.2%	104.7%	107.2%
Tangible capital intensity	100.0%	99.2%	101.4%	105.7%
Intangible capital intensity	100.0%	107.5%	103.9%	101.6%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023c); Average years of schooling (Barro and Lee, 2013).
Notes: Labour composition is estimated using the alternative human capital measure in Equation 4. The relative levels of labour and capital inputs are weighted by their respective cost shares.

Table C10—: Labour productivity level decomposition using alternative labour composition measures, CHS market economy

	United Kingdom	United States	France	Germany
Productivity	100.0%	127.6%	113.3%	114.5%
Labour composition	100.0%	106.8%	95.9%	100.0%
TFP	100.0%	105.8%	111.6%	106.6%
Capital intensity	100.0%	113.0%	105.9%	107.5%
Tangible capital intensity	100.0%	99.2%	101.7%	106.6%
Intangible capital intensity	100.0%	115.7%	104.6%	100.7%
Intangible capital intensity in national accounts	100.0%	107.5%	104.5%	101.8%
Intangible capital intensity outside national accounts	100.0%	107.5%	100.2%	99.0%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); Productivity Statistics (OECD, 2014); PPP (OECD, 2023*c*); Average years of schooling (Barro and Lee, 2013).
Notes: Labour composition is estimated using the alternative human capital measure in Equation 4. Intangible capital in national accounts refers to intangible assets within the SNA boundary. Intangible capital outside national accounts refers to intangible assets that are not included in national accounts but are covered within the CHS asset boundary.

Table C11—: Decomposition of labour productivity growth, SNA market economy, 1995-2019

	Overall (1995-2019)	Pre-GFC (1995-2007)	Post-GFC (2007-2019)
United Kingdom			
Productivity	1.43%	2.54%	0.48%
Labour composition	0.31%	0.39%	0.23%
TFP	0.57%	1.22%	0.06%
Capital intensity	0.55%	0.93%	0.20%
Non-ICT tangible capital intensity	0.15%	0.26%	0.05%
ICT tangible capital intensity	0.20%	0.40%	0.01%
Intangible capital intensity	0.23%	0.32%	0.15%
United States			
Productivity	1.99%	2.79%	1.22%
Labour composition	0.36%	0.44%	0.29%
TFP	0.74%	1.27%	0.20%
Capital intensity	0.88%	1.09%	0.73%
Non-ICT tangible capital intensity	0.27%	0.33%	0.22%
ICT tangible capital intensity	0.31%	0.44%	0.21%
Intangible capital intensity	0.32%	0.33%	0.31%
France			
Productivity	1.32%	2.05%	0.58%
Labour composition	0.52%	0.34%	0.65%
TFP	0.44%	1.29%	-0.33%
Capital intensity	0.36%	0.42%	0.27%
Non-ICT tangible capital intensity	0.14%	0.24%	0.03%
ICT tangible capital intensity	0.04%	0.05%	0.03%
Intangible capital intensity	0.18%	0.12%	0.21%
Germany			
Productivity	1.35%	1.88%	0.92%
Labour composition	0.12%	-0.08%	0.26%
TFP	0.86%	1.45%	0.43%
Capital intensity	0.37%	0.51%	0.23%
Non-ICT tangible capital intensity	0.13%	0.22%	0.05%
ICT tangible capital intensity	0.08%	0.16%	0.02%
Intangible capital intensity	0.15%	0.13%	0.16%

Sources & notes: See Figure 1 for data sources and notes.

Table C12—: Decomposition of labour productivity growth, CHS market economy, 1995-2019

	Overall (1995-2019)	Pre-GFC (1995-2007)	Post-GFC (2007-2019)
United Kingdom			
Productivity	1.58%	2.65%	0.71%
Labour composition	0.27%	0.34%	0.20%
TFP	0.46%	1.14%	-0.07%
Capital intensity	0.85%	1.17%	0.58%
Tangible capital intensity	0.41%	0.66%	0.18%
Non-ICT tangible capital intensity	0.24%	0.34%	0.15%
ICT tangible capital intensity	0.17%	0.31%	0.03%
Intangible capital intensity	0.43%	0.51%	0.37%
Intangible capital intensity in national accounts	0.08%	0.11%	0.04%
Intangible capital intensity outside national accounts	0.35%	0.40%	0.33%
United States			
Productivity	2.05%	2.73%	1.40%
Labour composition	0.33%	0.40%	0.26%
TFP	0.48%	0.91%	0.04%
Capital intensity	1.24%	1.42%	1.10%
Tangible capital intensity	0.54%	0.75%	0.37%
Non-ICT tangible capital intensity	0.20%	0.26%	0.16%
ICT tangible capital intensity	0.34%	0.49%	0.22%
Intangible capital intensity	0.70%	0.67%	0.73%
Intangible capital intensity in national accounts	0.40%	0.42%	0.39%
Intangible capital intensity outside national accounts	0.29%	0.25%	0.34%
France			
Productivity	1.38%	1.99%	0.74%
Labour composition	0.46%	0.31%	0.57%
TFP	0.01%	0.67%	-0.60%
Capital intensity	0.91%	1.02%	0.77%
Tangible capital intensity	0.40%	0.58%	0.21%
Non-ICT tangible capital intensity	0.32%	0.47%	0.17%
ICT tangible capital intensity	0.08%	0.11%	0.05%
Intangible capital intensity	0.51%	0.43%	0.55%
Intangible capital intensity in national accounts	0.29%	0.26%	0.32%
Intangible capital intensity outside national accounts	0.22%	0.18%	0.24%
Germany			
Productivity	1.41%	1.90%	1.00%
Labour composition	0.11%	-0.07%	0.25%
TFP	0.62%	1.12%	0.28%
Capital intensity	0.67%	0.85%	0.48%
Tangible capital intensity	0.39%	0.60%	0.19%
Non-ICT tangible capital intensity	0.23%	0.33%	0.13%
ICT tangible capital intensity	0.16%	0.27%	0.06%
Intangible capital intensity	0.28%	0.25%	0.29%
Intangible capital intensity in national accounts	0.13%	0.10%	0.14%
Intangible capital intensity outside national accounts	0.15%	0.15%	0.15%

Sources & notes: Intangible capital in NatAcc refers to intangible assets within the SNA boundary. Intangible capital outside NatAcc refers to intangible assets that are not included in national accounts but are covered within the CHS asset boundary. For more data sources and table notes, see Figure 1.

Table C13—: Decomposition of labour productivity growth with alternative cut-off years, SNA market economy, 1995-2019

	1995-2008	2008-2019	1995-2007	2008-2019
United Kingdom				
Productivity	2.36%	0.32%	2.54%	0.32%
Labour composition	0.32%	0.23%	0.39%	0.23%
TFP	1.13%	-0.08%	1.22%	-0.08%
Capital intensity	0.91%	0.17%	0.93%	0.17%
Non-ICT tangible capital intensity	0.27%	0.03%	0.26%	0.03%
ICT tangible capital intensity	0.38%	0.00%	0.40%	0.00%
Intangible capital intensity	0.31%	0.15%	0.32%	0.15%
United States				
Productivity	2.62%	1.25%	2.79%	1.25%
Labour composition	0.48%	0.29%	0.44%	0.29%
TFP	0.99%	0.26%	1.27%	0.26%
Capital intensity	1.14%	0.70%	1.09%	0.70%
Non-ICT tangible capital intensity	0.37%	0.21%	0.33%	0.21%
ICT tangible capital intensity	0.43%	0.19%	0.44%	0.19%
Intangible capital intensity	0.35%	0.30%	0.33%	0.30%
France				
Productivity	1.85%	0.59%	2.05%	0.59%
Labour composition	0.34%	0.70%	0.34%	0.70%
TFP	1.08%	-0.41%	1.29%	-0.41%
Capital intensity	0.42%	0.30%	0.42%	0.30%
Non-ICT tangible capital intensity	0.24%	0.04%	0.24%	0.04%
ICT tangible capital intensity	0.05%	0.03%	0.05%	0.03%
Intangible capital intensity	0.13%	0.23%	0.12%	0.23%
Germany				
Productivity	1.69%	0.83%	1.88%	0.83%
Labour composition	-0.05%	0.32%	-0.08%	0.32%
TFP	1.24%	0.28%	1.45%	0.28%
Capital intensity	0.49%	0.24%	0.51%	0.24%
Non-ICT tangible capital intensity	0.21%	0.05%	0.22%	0.05%
ICT tangible capital intensity	0.15%	0.01%	0.16%	0.01%
Intangible capital intensity	0.13%	0.17%	0.13%	0.17%

Sources & notes: See Table C11 for data sources and table notes.

Table C14—: Growth accounting using alternative input shares, SNA market economy, 1995-2019

Alpha	United Kingdom			United States			France			Germany		
	Bilateral	Mutilateral	Standard	Bilateral	Mutilateral	Standard	Bilateral	Mutilateral	Standard	Bilateral	Mutilateral	Standard
Productivity	1.43%	1.43%	1.43%	1.99%	1.99%	1.99%	1.32%	1.32%	1.32%	1.35%	1.35%	1.35%
Labour composition	0.31%	0.32%	0.32%	0.36%	0.38%	0.38%	0.52%	0.49%	0.49%	0.12%	0.12%	0.12%
Capital intensity	0.55%	0.52%	0.51%	0.88%	0.81%	0.80%	0.36%	0.42%	0.41%	0.37%	0.41%	0.40%
TFP	0.57%	0.60%	0.60%	0.74%	0.80%	0.81%	0.44%	0.41%	0.42%	0.86%	0.83%	0.84%

Sources & notes: See **??** for data sources and table notes.

Table C15—: Output growth decomposition, SNA market economy, 1995-2019

Market Economy	UK			US			France			Germany		
	Pre-GFC	Post-GFC	Change	Pre-GFC	Post-GFC	Change	Pre-GFC	Post-GFC	Change	Pre-GFC	Post-GFC	Change
GVA	3.12%	1.38%	-1.74%	3.45%	1.64%	-1.81%	2.81%	1.16%	-1.66%	1.75%	1.37%	-0.38%
LC	0.40%	0.23%	-0.18%	0.46%	0.31%	-0.14%	0.33%	0.60%	0.27%	-0.08%	0.26%	0.34%
Hour	0.39%	0.63%	0.24%	0.44%	0.25%	-0.18%	0.56%	0.43%	-0.13%	-0.11%	0.30%	0.41%
TFP	1.30%	0.05%	-1.25%	1.33%	0.33%	-1.00%	1.25%	-0.37%	-1.62%	1.41%	0.44%	-0.97%
CAP	1.03%	0.46%	-0.56%	1.22%	0.75%	-0.48%	0.68%	0.50%	-0.18%	0.53%	0.37%	-0.16%
TangNICT	0.44%	0.21%	-0.23%	0.24%	0.39%	0.16%	0.55%	0.14%	-0.41%	0.11%	0.11%	0.00%
TangICT	0.42%	-0.02%	-0.44%	0.46%	0.21%	-0.25%	0.06%	0.04%	-0.02%	0.15%	0.03%	-0.13%
Intang	0.36%	0.21%	-0.15%	0.38%	0.37%	-0.01%	0.19%	0.26%	0.07%	0.13%	0.19%	0.06%

Sources & notes: LC — labour composition, Hour —total hours worked, CAP — total capital service volume, TangNICT — tangible non-ICT capital service volume, TangICT — tangible ICT capital service volume, and Intang — intangible capital service volume in national accounts. See Figure 11 for data sources.

Table C16—: Cumulative change in employment rate (working-age) for the pre-GFC vs. post-GFC, total economy

	Data Availability					Cumulative Change	
	1995	2003	2005	2007	2019	Δ 95-07	Δ 07-19
UK	✓	✓	✓	✓	✓	3.15	3.47
US	✓	✓	✓	✓	✓	-0.75	-0.42
France	✗	✓	✓	✓	✓	-	1.65
Germany	✗	✗	✓	✓	✓	-	6.68

Sources: Employment rate indicator (OECD, 2023*a*).

Notes: "X" indicates that data is unavailable for this year, and "✓" indicates that data is available. The employment rate is calculated as the ratio of the employed to the working-age population aged 15-64. Cumulative change is the annual employment rate in the last year minus the rate in the first year for each period.

Table C17—: Cumulative change in employment-to-population ratio pre-GFC vs. post-GFC, total economy

	Data Availability					Cumulative Change	
	1995	2003	2005	2007	2019	Δ 95-07	Δ 07-19
UK	✓	✓	✓	✓	✓	3.10	1.20
US	✓	✓	✓	✓	✓	0.10	-2.20
France	✓	✓	✓	✓	✓	1.60	-0.90
Germany	✓	✓	✓	✓	✓	1.40	5.90

Sources: Employment/population ratio (OECD, 2023*b*).

Notes: "X" indicates that data is unavailable for this year, and "✓" indicates that data is available. The employment-to-population ratio is calculated as the ratio of the employed to the total population. Cumulative change is the employment-to-population ratio in the last year minus the ratio in the first year for each period.

Table C18—: Cumulative change in employment rate and labour productivity for the pre-GFC vs. post-GFC period, SNA market economy

Market Economy	1995-2007				2007-2019			
	UK	Germany	US	France	UK	Germany	US	France
Employment Rate	3.01%	1.02%	0.04%	2.62%	3.47%	6.68%	-0.42%	1.65%
Labour Productivity	30.50%	22.53%	34.89%	24.56%	3.82%	9.98%	7.04%	14.96%
Labour Composition	4.72%	-0.97%	4.53%	4.14%	2.79%	3.72%	8.12%	3.56%
Capital Intensity	10.84%	6.57%	15.00%	4.84%	1.99%	2.97%	3.94%	8.31%
TFP	14.94%	16.94%	15.36%	15.58%	-0.97%	3.30%	-5.02%	3.10%

Sources: EUKLEMS & INTANProd 2023 (Bontadini et al., 2023); OECD productivity statistics (OECD, 2014).
Notes: Growth accounting is estimated based on Equation 3. Labour composition and capital intensity changes are weighted by their respective cost shares. Cumulative change is the value of each variable in the last year minus its value in the first year for each period.

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