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Mid-Tech Europe? Sectoral Patterns of Total Factor Productivity Growth in the EU vs the US

This article analyses patterns in total factor productivity (TFP) in the EU in comparison with the US using the EU-KLEMS dataset. TFP growth in both regions has been largely driven by a few key sectors. In the aftermath of the global financial crisis (2013-2019), services played a major role in TFP growth on both sides of the Atlantic. However, the drivers differed: in the US, high-skill sectors like IT, professional services and finance led the way, while in the EU, lower-skill services such as wholesale and retail trade contributed more. The contribution of manufacturing also diverged. In the EU, sectors like transport equipment, chemicals and electronics made meaningful contributions to TFP growth, whereas in the US, among manufacturing sectors only computer and electronics had a significant impact. While the share of high-tech and high-TFP growth sectors in EU value added has been rising, the gap with the US remains substantial and is not closing.

There is consensus that the competitiveness gap of the EU is rooted in a disappointing productivity growth performance, which is largely due to slow total factor productivity (TFP) growth and lower capital intensity, particularly in terms of intangible capital. Analysing these patterns on a sectoral basis is key for a better understanding of challenges and policy responses to relaunch the EU's competitiveness.¹

Productivity is key for long-term growth, but its measurement is subject to many difficulties. Over the long run, productivity growth, and especially TFP, is the most important driver of economic growth among advanced economies. Assessing TFP dynamics is problematic, however, as witnessed by the debate on what has caused the productivity slowdown in the EU and the US since the 2000s (see OECD, 2017; Syverson, 2017).

¹ As indicated, e.g. in Draghi (2024a, 2024b).

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This article analyses productivity across the EU using the latest vintage of the EU-KLEMS database, focusing on TFP. EU-KLEMS originated as an industry-level, growth and productivity research project, initially financed under EU research framework programmes. The objective is to allow a better breakdown of the sources of productivity growth, capturing the contributions of the changing compositions of labour and capital types, and allowing a more precise estimation of TFP obtained as a residual. The latest vintage of the database, dubbed EU-KLEMS & INTAN-Prod (henceforth referred to as EU-KLEMS), compared with previous versions, provides a better disentangling of intangible capital as a contributor of productivity growth.²

The analysis covers patterns of productivity growth in the EU and the US across industries and time periods, looking at a finer disaggregation of productivity growth sources. The growth accounting uses data for ten different capital assets (both tangible, such as buildings and machinery, and intangible, such as software and R&D) and eight labour force types (based on age, gender and educational attain-

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² The EU-KLEMS & INTANProd database was developed by the Luiss Lab of European Economics at Luiss University in Rome, Italy.

ment). Disaggregating by industry allows consideration of up to 42 different industries. As a substantial share of TFP growth originates in relatively narrowly defined sectors, a sufficiently fine disaggregation is required for a satisfactory analysis of sectoral productivity growth patterns. Comparisons are carried out between the EU and the US.

Concretely, the analysis in the article aims at describing productivity growth patterns by source, industry and sub-periods for the EU as an aggregate, and the US. It also seeks to assess the contribution of each industry to overall TFP growth by sub-periods. This disentangles the extent to which TFP growth differences between the EU and the US were associated with differences in within-industry TFP growth rates or rather linked to differences in the composition of value added across sectors. Finally, the analysis examines the evolution of industry size, in particular whether industries characterised by higher TFP growth have been growing in relative terms.

Computing TFP and labour productivity from EU-KLEMS data

Over time, EU-KLEMS has become an important reference when it comes to harmonised, industry-level data to analyse productivity growth across the EU, the US and other high-income economies.³ The 2023 release of EU-KLEMS & INTANProd updates previous editions of EU-KLEMS, incorporating additional measures of intangible investment not included in national accounts, following the definition proposed in the seminal work by Corrado et al. (2005). The database provides data for the 27 EU member states, the UK, the US and Japan across 42 industries and 15 industry aggregates over the timespan 1995-2020.

EU-KLEMS computes TFP growth with a fine disaggregation of factor inputs. Hence, TFP growth can be expressed as

$$\Delta \ln A_j = \Delta \ln V_j - v_{L,j} \Delta \ln H_j - v_{LC,j} \Delta \ln LC_j - v_{ktict,j} \Delta \ln CAPTICT_j - v_{ktnict,j} \Delta \ln CAPTNICT_j - v_{kint,j} \Delta \ln CAPIntang_j \quad (1)$$

where the v terms are factor shares in value added, $\Delta \ln H_j$ is the log change in hours worked, $\Delta \ln CAPTICT_j$, $\Delta \ln CAPTNICT_j$, $\Delta \ln CAPIntang_j$ denote, respectively, the log

change in tangible ICT, tangible non-ICT and intangible capital inputs, while

$$\Delta \ln LC_j = \Delta \ln L_j - \Delta \ln H_j = \sum_l v_{L,l,j} \Delta \ln H_{lj} - \Delta \ln H_j \quad (2)$$

is the log change in labour composition, which is calculated as the difference between the sum of the log change in hours across all l individual labour types weighted by the share of each type in total labour compensation and the log change in unweighted total hours.⁴

Labour productivity growth decomposition is obtained from equation (1) by subtracting the log change of hours worked from both sides, rearranging terms and using the constant returns to scale technology assumption:

$$\begin{aligned} \Delta \ln V_j - \Delta \ln H_j &= \Delta \ln A_j + v_{L,j} \Delta \ln LC_j + v_{ktict,j} (\Delta \ln CAPTICT_j \\ &\quad - \Delta \ln H_j) + v_{ktnict,j} (\Delta \ln CAPTNICT_j - \Delta \ln H_j) \\ &\quad + v_{kint,j} (\Delta \ln CAPIntang_j - \Delta \ln H_j) \end{aligned} \quad (3)$$

The next section discusses contributions to labour productivity growth by sector. Subsequent sections instead focus on TFP growth patterns, analysing first the evolution of the importance of each industry to overall TFP growth, and then whether stronger TFP growth is associated with a relative expansion of the sector in the total economy.

Dissecting the contributions to labour productivity growth by industry

As detailed in equation (3), the growth of labour productivity, measured as gross value added per hour worked, is decomposed into the contributions of several items: (i) the growth of capital per hour worked ratios for the different types of capital (tangible non-ICT, such as buildings, machines and equipment; tangible ICT, such as computer hardware and communications equipment; and intangibles, such as computer software and databases and R&D); (ii) the change in labour composition; and (iii) TFP growth. Hence, labour productivity grows when capital per hour (capital deepening) increases, when there is a change in labour composition towards more skilled labour, and when TFP increases due to rising production efficiency.

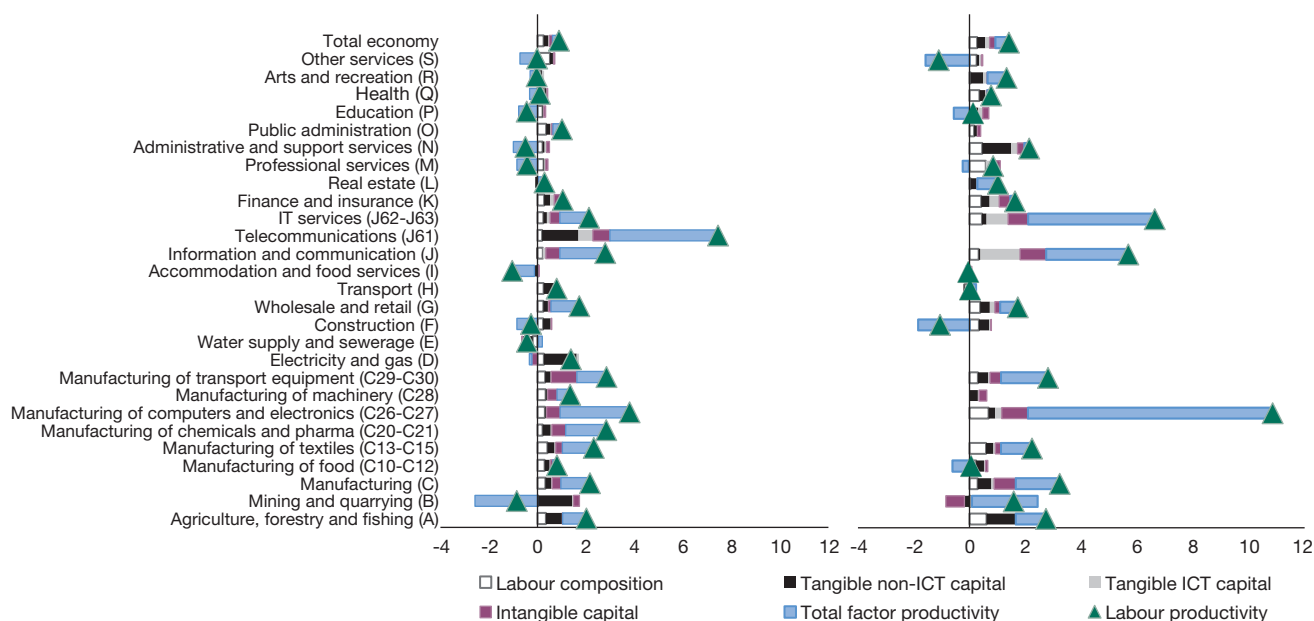
3 The name EU-KLEMS stands for EU levels of capital (K), labour (L), energy (E), material (M) and service (S) inputs. The original project started in 2003 and involved 18 European research institutes in a joint effort to gather and harmonise the necessary data, under the coordination of the Groningen Growth and Development Centre. Subsequently, the database has been updated several times, involving a wide network of researchers and institutions.

4 Since production factors are paid their marginal product, a change in composition of hours towards more highly remunerated categories would imply an increase in the contribution of labour composition to value added. In EU-KLEMS, the labour types are classified by gender (male, female), age (15-29, 30-49, 50 years and over), and educational qualification (high, medium, low), as well as by 18 worker types.

Figure 1

Labour productivity growth and its contributors across sectors in the EU (left panel) and the US (right panel), 2000-2019

in percentage points



Notes: Average for 2000-2019. EU is the value-added weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE.

Source: Authors' elaborations on EU-KLEMS data.

Labour productivity growth and its main sources are reported for the total economy and the main sectoral aggregates (manufacturing, agriculture, mining and the main service categories). In addition, to capture productivity dynamics taking place at a finer level of disaggregation, values are reported at the level of the NACE Rev.2 nomenclature and, for manufacturing and information and communication services, also at the two-digit level of the NACE Rev.2. Hence, the breakdown needs to be interpreted with caution in view of overlaps. For example, the overall manufacturing sector, denoted by C, is reported together with manufacturing of transport equipment, denoted by C29-C30, which is contained in C.

Figures are reported for the EU as a whole (across available countries, excluding countries in southern, central and eastern Europe for which data are unavailable for a longer timespan), and for the US.⁵

In addition to showing evidence for the post-2000 period, the period available for both the EU aggregate used

in the analysis (see point above) and the US, developments after the recovery from the global financial crisis (GFC, post-2012) are displayed and discussed. Since the latest available data points, i.e. years coinciding with the COVID-19 pandemic, exhibit highly non-representative productivity dynamics, they are excluded and the sample used in the analysis that follows ends in 2019.

Figures 1 to 3 present the different labour productivity growth sources for the EU and the US distinguishing relevant sub-periods. Several observations stand out.

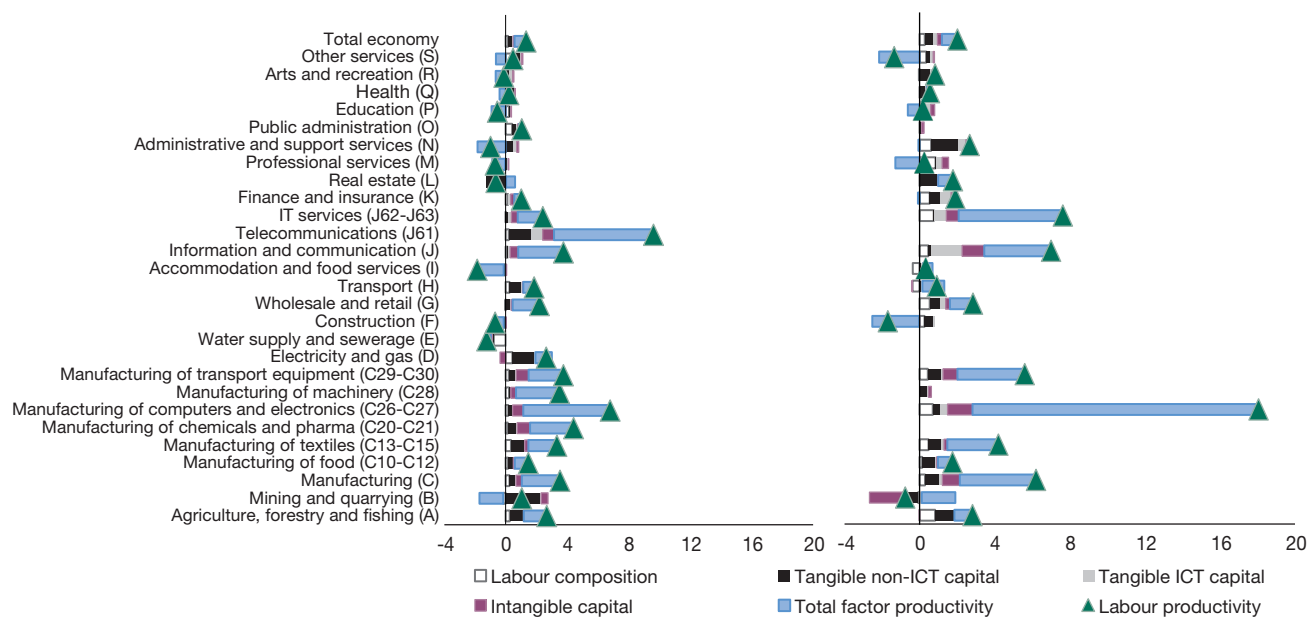
Fact 1. The main source of labour productivity growth over the period analysed is TFP, although its role has been diminishing while the contribution of intangible capital has been rising. For “total economy”, both in the EU and the US, the main contributor to productivity growth appears to be TFP, followed by tangible and intangible capital deepening (Figures 1 to 3). TFP growth also explains most of productivity growth dispersion across sectors.

The contribution of TFP growth has declined over time, a trend that is visible both in the EU and the US. After the recovery from the GFC, intangible capital provided a stronger contribution, especially in manufacturing in the

5 In this article, the EU consists of the countries for which growth accounting across a broad set of industries is available over a sufficiently long time period. Labour productivity decomposition is unavailable for certain industries in the US in the growth accounting data (C20-C21, C28, D, E, J61, O).

Figure 2

Labour productivity growth and its contributors across sectors in the EU (left panel) and the US (right panel), 2000-2007
in percentage points



Notes: Average for 2000-2007. EU is the value-added weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE.

Source: Authors' elaborations on EU-KLEMS data.

EU, and notably in sectors linked to the production of transport equipment. Previously, tangible capital played a bigger role than intangible capital. A stronger contribution is observed also for labour composition, as labour shedding over the GFC fell mainly on unskilled labour.

Fact 2. TFP growth over the whole period appears particularly strong in several manufacturing and services industries, both in the EU and the US. The manufacturing sectors with higher TFP growth are manufacturing computers and electronics (with a relevant role played by dynamic scale economies in line with Moore's law), transport equipment, and chemicals, while services with strong TFP dynamics comprise public utilities, IT, professional and administrative services, and wholesale and retail trade.

Fact 3. Sectoral TFP patterns differ to some extent between the EU and the US. The most remarkable difference is the much stronger TFP growth recorded in the US in manufacturing of computers and electronic equipment and IT services. This is not surprising considering most IT innovations over recent decades originated in the US, and considering the operation of dynamic scale economies linked to Moore's law. In the most recent years, TFP growth in computer manufacturing has been slowing (although remaining above rates recorded in the EU), while a major acceleration was recorded in IT services, notably in the US.

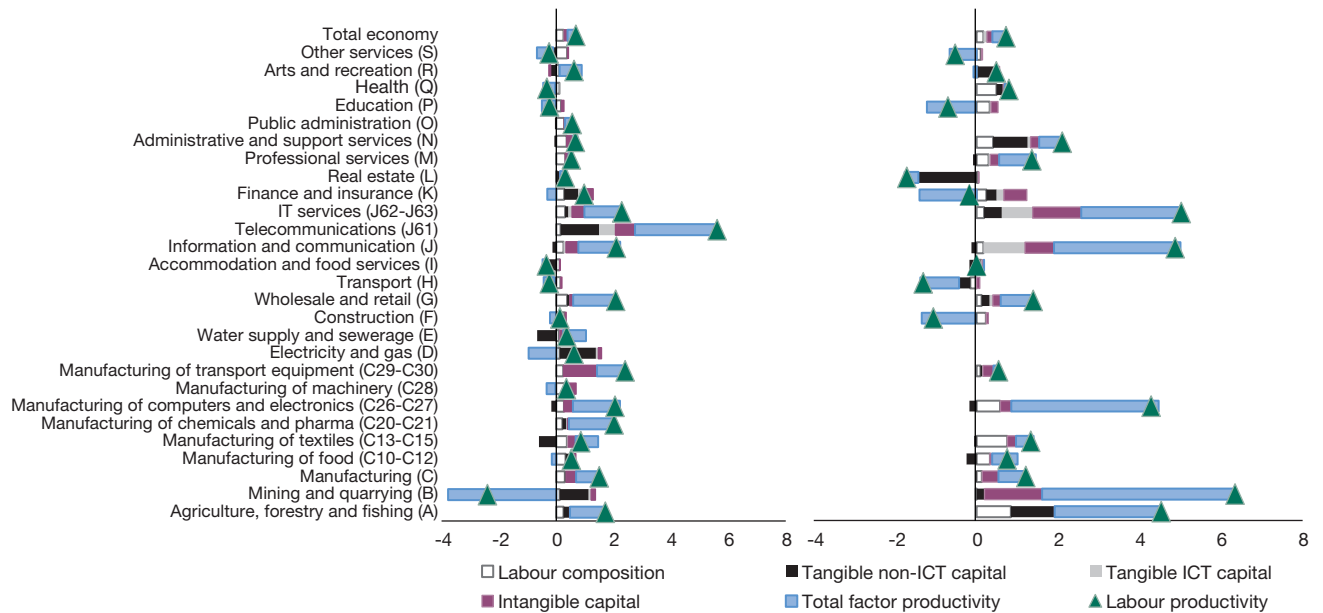
TFP growth was remarkably stronger in the EU compared with the US in few sectors: telecommunications and other network industries before the GFC, and some manufacturing sectors like transport equipment over the post-GFC recovery.

Fact 4. Sectoral TFP dynamics evolved over time, driven partly by structural transformations, and partly by cyclical effects linked to fluctuations in capacity utilisation. The latter played a particularly strong role over the GFC. In the EU, in the pre-GFC years, relatively strong TFP growth in telecommunication and other network industries was linked to liberalisations and pro-competitive reforms. Over that period, TFP growth in wholesale and retail trade was partly due to the changing average scale of retail firms and better exploitation of scale economies, partly because of cyclical effects related to capacity utilisation (Mc Morrow et al., 2010; Planas et al., 2013).

The post-GFC recovery (2013-2019) is characterised by milder labour productivity and TFP growth rates compared with pre-GFC years (Figure 3). In the EU, the deceleration is visible in the sectors where TFP growth was typically stronger pre-GFC, notably manufacturing of computers and electrical equipment and in network industries. Negative growth rates are recorded in services where capacity contracted after the crisis, such as transport, energy and finance.

Figure 3

Labour productivity growth and its contributors across sectors in the EU (left panel) and the US (right panel), 2013-2019
in percentage points



Notes: Average for 2013-2019. EU is the value-added weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE.

Source: Authors' elaborations on EU-KLEMS data.

Disentangling the industry contribution to aggregate TFP growth

The analysis needs to consider not only the change in TFP in each industry, but also the contribution of each of the industries' TFP changes to the TFP change of the total economy (a weighting factor).⁶ While the sectoral breakdown of labour productivity growth presented in the previous section shows overlaps – due to different levels of aggregation reported in the same figure – in this section, the change in the total economy TFP is decomposed into the contributions of different industries in such a way that the contribution of all industries sums up to the total. A set of relatively small industries is grouped in a residual category labelled “Rest”.⁷

We compute the sectoral contributions to the total economy TFP change over the period between t and T by first

computing the annualised change (%) in total economy TFP as follows:

$$\Delta_t^T TFP_{agg} = 100 * \left(\left(\frac{TFP_{agg}^T}{TFP_{agg}^t} \right)^{\frac{1}{T-t}} - 1 \right),$$

where TFP_{agg}^T measures aggregate TFP in period T . $\Delta_t^T TFP_{agg}$ is then decomposed into industry contributions, by attributing to each industry i the following proportion:

$$\frac{s_i^T * TFP_i^T - s_i^t * TFP_i^t}{TFP_{agg}^T - TFP_{agg}^t},$$

where s_i^T measures the share of industry i in total economy value added in period T .

Since $\sum_i (s_i^T * TFP_i^T)$ equals TFP_{agg}^T , these proportions sum up to 1. The contribution of industry i to the annualised change in total economy TFP between t and T is therefore computed as

$$contrib_{t,i}^T = \left(\frac{s_i^T * TFP_i^T - s_i^t * TFP_i^t}{TFP_{agg}^T - TFP_{agg}^t} \right) * \Delta_t^T TFP_{agg}.$$

These industry contributions sum up to $\Delta_t^T TFP_{agg}$.

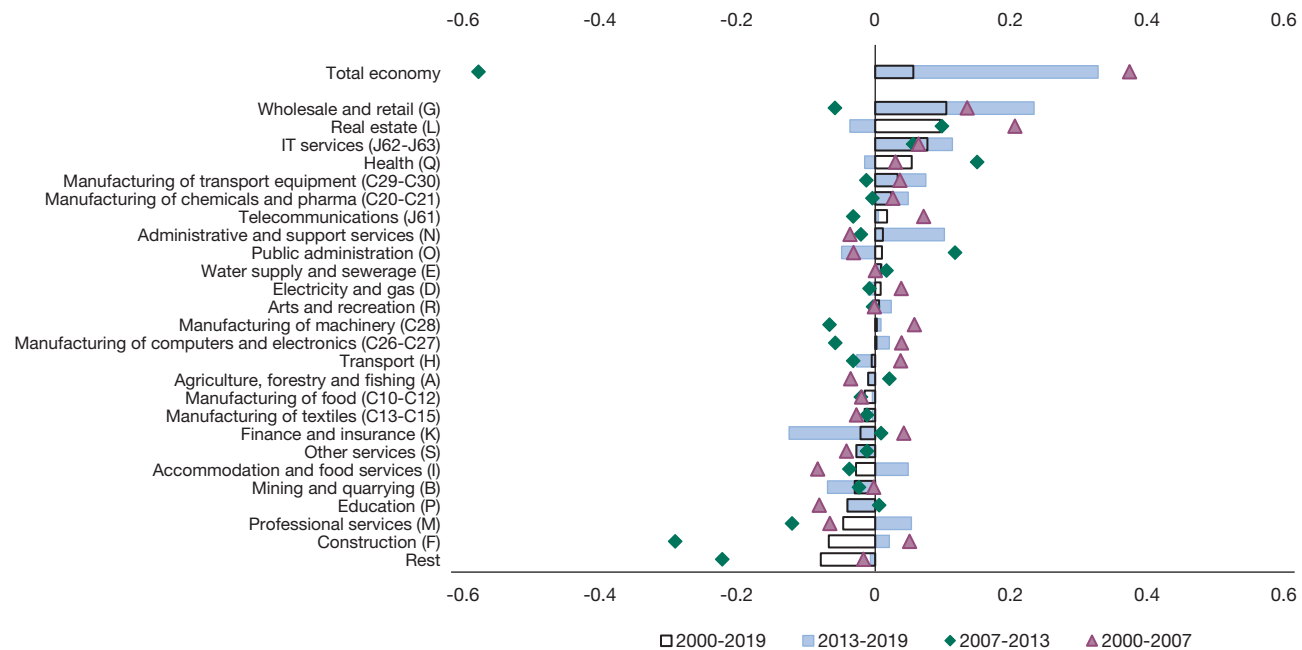
Figures 4 and 5 report the contributions to total economy TFP growth across industries for the EU and the US, respectively, distinguishing by sub-periods.

⁶ Aggregate EU TFP growth figures mask considerable differences among EU countries. In particular, countries with a lower starting level of TFP in purchasing power parity terms generally display faster TFP growth, in line with intersectoral reallocation linked to transition dynamics and consistently with predictions from “neo-Schumpeterian” growth models where lag-gard countries benefit from a higher rate of adoption of new technologies (e.g. Aghion & Howitt, 2006). For further details, see Nikolov et al. (2024).

⁷ In addition, industry coverage for the EU and the US is not completely identical, as data for certain industries (C20-C21, C28, D, E, J61, O) are not available for the US.

Figure 4

Contribution to the annualised growth in total economy TFP in the EU between 2000 and 2019 by industry
in percent



Notes: EU is the GDP-weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE.

Source: Authors' elaborations on EU-KLEMS data.

Fact 5. *The contributions of some industries were strongly affected by cyclical factors.* In particular, the drop in capacity utilisation over the GFC resulted in large swings in TFP in sectors like retail, construction, professional and administrative services. The reduction in the EU TFP growth gap with respect to the US in the post-GFC period is partly linked to the recovery from more protracted and profound cyclical TFP reductions over the GFC in Europe.

Fact 6. *Since the post-GFC recovery, in the US, the bulk of the overall TFP contribution comes from IT and professional services, while in the EU, manufacturing still plays a role.* In both the EU and the US, the contribution coming from services has been growing over time compared with that of manufacturing. In both the EU and the US, the increase in the contribution of IT, professional and administrative services is noteworthy. However, while in the US the strongest role is played by IT and professional services and finance, in the EU there is a remarkable growth in the contribution of the *wholesale and retail* sector, partly driven by cyclical effects and partly by structural transformations in the industry allowing more room for exploiting scale economies similar to those in the US. Instead, retail services in the US exhibit a falling contribution, mainly due to its falling share in the total economy.

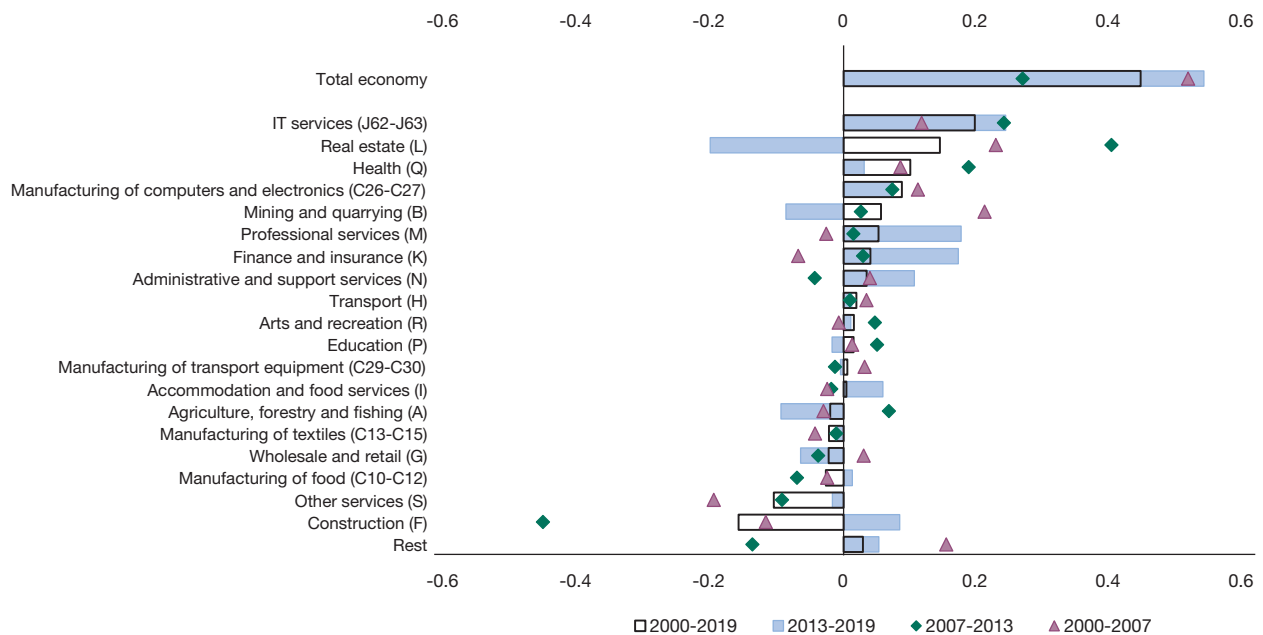
There are more manufacturing sectors providing a positive contribution to total economy TFP growth in the EU than in the US. While in the EU a few manufacturing sectors, including transport equipment, chemicals, computers and electronic equipment, provided a positive contribution to overall TFP growth, in the US the only manufacturing sector with a positive non-negligible contribution to aggregate TFP growth is the manufacturing of computers and electronics. In the US, the manufacturing of computers and electronics represented a big part of the TFP growth between 2000 and 2007, while it has been contributing less after 2013. Nonetheless, the role of this sector in the US for total TFP growth remains larger than in the EU. The finding is both due to the higher rate of TFP growth in this sector in the US as well as the fact that the share of this sector on total value added is higher in the US than in the EU.

Total factor productivity, technology and changing relative industry size

Below we explore whether the relative size of a particular industry was driven by TFP growth in the cross section of country/sector groups by means of between-effects panel regressions as follows:

Figure 5

Contribution to the annualised growth in total economy TFP in the US between 2000 and 2019 by industry
in percent



Source: Authors' elaborations on EU-KLEMS data.

$$\Delta s_{c,s,t} = \alpha + \beta_1 \Delta \ln a_{c,s,t-1} + \gamma_1 D_c + \varepsilon_{c,s,t} \quad (4)$$

where $\Delta s_{c,s,t}$ is the change in the share in total economy value added of an industry s , in country c , during time period t , $\Delta \ln a_{c,s,t-1}$ is the lagged change in the log TFP index, D_c are country dummies and $\varepsilon_{c,s,t}$ are country-sector-time error terms for which the usual assumptions apply. The sample covers the ten EU countries and the 25 industries described above, and regressions are run for the overall period 2000-2019 and for the most recent post-GFC period 2013-2019. The panel between regressions estimates the relation across time averages of country-sector groups. The inclusion of country fixed effects permits the capture of the cross-section variation across sectors.

Results for the specification (4) above are reported in columns (1) and (2) of Table 1. The estimated coefficient in column (2) indicates a positive association between lagged TFP growth and the change in the industry's share in total economy value added for the period 2013-2019. In contrast, when the whole period 2000-2019 is considered (column 1), the estimated association is negative and statistically significant. This means that the association between relative growth of industries and past TFP performance has turned positive in relatively recent times, after years where the sectors with lower TFP growth were

growing while those with higher TFP growth were shrinking. Moreover, despite the significant regression coefficient for TFP, low R-squared statistics indicate that TFP provides an overall limited contribution to the explanation of the cross-sectional variation of sectoral shares.

Next, we modify equation (4) to include dummy variables that indicate whether an industry is considered high-tech (D_h) or mid-tech (D_m), in analogy with the taxonomy provided in Fuest et al. (2024).⁸ This specification aims at checking the often-argued claim that mid-tech industries fare comparatively well in the EU, while high-tech industries are not growing as strongly. Equation (5) assesses if an industry being mid-tech or high-tech matters for its relative growth on top of its productivity performance.

$$\Delta s_{c,s,t} = \alpha + \beta_1 \Delta \ln a_{c,s,t-1} + \gamma_1 D_c + \gamma_2 D_h + \gamma_3 D_m + \varepsilon_{c,s,t} \quad (5)$$

⁸ The industries that are considered high-tech are: Manufacturing of computers and electronics (C26-C27), IT services (J62-J63), and Professional services (M). Mid-tech industries are defined as: Manufacturing of chemicals and pharma (C20-C21), Manufacturing of machinery (C28), Manufacturing of transport equipment (C29-C30), Transport (H), Telecommunications (J61), and Finance and insurance (K). The inclusion of health in the high-tech group or moving chemicals and pharma from mid- to high-tech does not modify the qualitative conclusions of the analysis.

Table 1

Regression results for relationship between TFP growth and industry shares in total economy in the EU

Dependent variable: change in share of total value added	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variables	2000-2019	2013-2019	2000-2019	2013-2019	2000-2019	2013-2019
TFP growth, lagged	-0.00532*** [-2.671]	0.0125*** [5.334]	-0.00545** [-2.505]	0.0124*** [5.269]	-0.00415 [-1.446]	0.0155*** [5.462]
Dummy mid-tech			-0.00005 [-0.535]	-0.000262** [-2.057]	-0.000146 [-1.294]	-0.0002 [-1.523]
Dummy high-tech			0.000247** [2.140]	0.000419*** [2.725]	0.000433*** [3.442]	0.000440** [2.383]
TFP growth, lagged * Dummy mid-tech					0.00381 [0.810]	-0.0104* [-1.957]
TFP growth, lagged * Dummy high-tech					-0.0195*** [-3.001]	-0.00582 [-0.523]
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,936	1,736	4,936	1,736	4,936	1,736
Number of sectors/countries	248	248	248	248	248	248
R-squared	0.029	0.107	0.053	0.16	0.098	0.173

Notes: T-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1. Results are displayed for regressions across country/sector groups over the time period reported. Dummy mid-tech and high-tech are equal to 1 if the sector is considered, respectively, middle tech or high tech (see Fuest et al., 2024). The sample includes the following countries: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Italy, Netherlands and Sweden and the following sectors: Agriculture, forestry and fishing (A), Mining and quarrying (B), Manufacturing of food (C10-C12), Manufacturing of textiles (C13-C15), Manufacturing of chemicals and pharma (C20-C21), Manufacturing of computers and electronics (C26-C27), Manufacturing of machinery (C28), Manufacturing of transport equipment (C29-C30), Electricity and gas (D), Water supply and sewerage I, Construction (F), Wholesale and retail (G), Transport (H), Accommodation and food services (I), Telecommunications (J61), IT services (J62-J63), Finance and insurance (K), Real estate (L), Professional services (M), Administrative and support services (N), Public administration (O), Education (P), Health (Q), Arts and recreation(R), Other services (S).

Source: Elaborations on EU-KLEMS data.

The results are shown in columns (3) and (4) of Table 1. The negative association between TFP growth and the change in industry's share between 2000 and 2019 (column (3)) and the positive one between 2013 and 2019 (column (4)) persist. The signs of the coefficients γ_2 and γ_3 indicate that the high-tech industries tend to grow as a share of the total economy, while mid-tech ones tend to decline, controlling for TFP growth. This is valid not only in the latest period, 2013-2019, but also during the whole period in consideration.

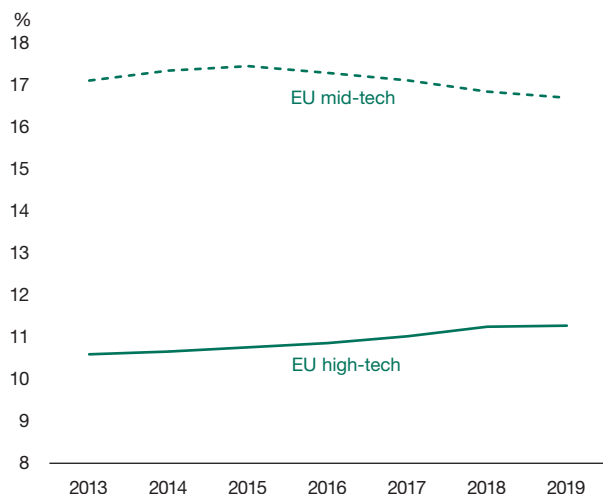
Finally, to trace which industries drive the association between TFP growth and the change in the industry's share in total economy value added, we estimate a specification where we interact the dummy variables for high- and mid-tech industries with the TFP growth variable as follows:

$$\Delta s_{c,s,t} = \alpha + \beta_1 \Delta \ln a_{c,s,t-1} + \gamma_1 D_c + \gamma_2 D_h + \gamma_3 D_m + \gamma_4 \Delta \ln a_{c,s,t-1} * D_h + \gamma_5 \Delta \ln a_{c,s,t-1} * D_m + \varepsilon_{c,s,t} \quad (6)$$

The results are shown in columns (5) and (6) of Table 1. The interpretation of coefficient β_1 in this case applies only to industries that are neither high- nor mid-tech, while the relation between TFP growth and industries' relative size is given by $\beta_1 + \gamma_4$ and by $\beta_1 + \gamma_5$ for high- and mid-tech industries, respectively. It is visible that for industries that are neither mid- nor high-tech, the link between shares and TFP growth is insignificant for the whole sample and positive after 2013. For mid-tech industries, the relation with TFP is also insignificant for the whole period, but turns slightly positive after 2013. Conversely, the share of high-tech industries shows a negative relation with TFP growth for the whole period, which turns positive after 2013. It seems therefore that the post-GFC tendency that industries with a relatively high TFP growth start expanding in relative terms is associated with these industries being low- or high-tech, while this association is weaker for mid-tech industries.

As shown in Table 1, high-tech industries have been growing while mid-tech industries have been shrinking, ir-

Figure 6
Industry's share in total economy value added in the EU



Notes: EU is composed of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE. See Footnote 8 for definitions of high- and mid-tech industries.

Source: EU-KLEMS.

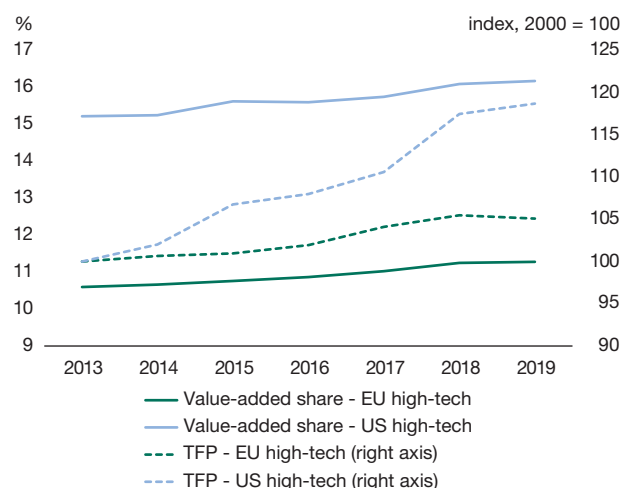
respective of their TFP performance. This is visible from Figure 6. Despite the increase in the relative share of high-tech industries, their size remains much below that in the US. As shown in Figure 7, the EU and the US both display a remarkably steady increase in the share of high-tech industries between 2013 and 2019. Yet, the gap between the two major economies, already evident in 2013, has further widened over time.

What is most remarkable from Figure 7 is the difference in TFP growth for high-tech industries between the EU and the US. As shown in the previous sections, the EU-US TFP growth gap is concentrated in ICT manufacturing and services, and some other high-skill services. The implication is that over time the gap in terms of TFP levels between the EU and the US has been widening mainly in high-tech industries.

Conclusions and implications for policy

This article discusses EU TFP growth in comparison with the US, relying on the EU-KLEMS database. The analysis unveils sectoral patterns of productivity growth with a comparatively fine disaggregation of different sources of productivity growth. Such patterns are analysed across different periods between 2000 and 2019, with a view to illustrating how sources of productivity growth have been changing over time and how industry patterns

Figure 7
Evolution of TFP and value-added share, high-tech industries



Notes: TFP for this technology level is computed as a weighted average across Manufacturing of computers and electronics (C26-C27), ICT services (J62-J63) and Professional services (M) (using sectoral value added as weight). EU is composed of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE. See Footnote 8 for definition of high-tech industries.

Source: EU-KLEMS.

have been evolving. The analysis permits distilling several key messages.

TFP is in general the component that accounts for the biggest share of productivity growth in the EU and the US sectors, followed by tangible and intangible capital deepening. TFP growth also accounts for the bulk of labour productivity growth dispersion across industries. However, both in the EU and the US, the contribution of TFP growth has been declining over time, while that of intangible capital and labour composition has been growing since the GFC.

The bulk of aggregate TFP growth is recorded in relatively few industries. Over the post-GFC period (2013-2019), total TFP growth across the EU is mostly driven by services, such as wholesale and retail trade, IT services, and administrative, support and professional services. Among manufacturing, large contributions originate from manufacturing of transport equipment, chemical, computer and electronics. TFP growth rates in network industries have strongly declined when compared with values recorded in previous decades (in many cases linked to one-off improvements in scale economy exploitation in light of liberalisation processes).

EU sectoral TFP patterns differ from those of the US in several respects. Notably, the US displays much higher

productivity growth in IT services and manufacturing of computers and electronics (linked to the origination of innovations benefiting from Moore's law). Strong TFP spurts in the US are followed with some lag by TFP acceleration in the same sector in the EU.

The US TFP growth advantage over the EU is linked both to higher TFP growth rates in sectors generating large TFP gains, e.g. IT services, and to larger shares of these industries in total value added.

In general, despite the fact that the share of high-tech industries is growing across the EU, the gap compared with the US is not narrowing. Moreover, these industries exhibit much more moderate TFP gains in the EU as compared with the US. Sectors that belong to mid-tech manufacturing (transport equipment, chemicals, machinery) are not growing in share across the EU. However, it is in these sectors that R&D and intangible capital have grown comparatively strong since the post-GFC period, and where contribution to TFP growth has been comparatively strong. In this respect, Fuest et al. (2024) describe the EU as being in a middle technology trap, whereby it is mid-tech sectors that absorb a comparatively large share of total R&D, unlike in the US, where firms in high-tech services such as ICT and manufacturing of electronics are the largest R&D spenders.

The results from the present analysis have several implications for policy.

The fact that TFP growth rates differ substantially across industries has implications for policies to improve the allocation of resources (both within as well as across industries) to their most efficient use. Relevant policy levers in this regard are, inter alia, regulations affecting firm entry and exit and labour mobility, policies to enhance access to capital, and policies addressing obstacles for investment, especially those holding back the most dynamic sectors.

Persistent differences in TFP growth within the same industries across the EU and the US largely reflect differences in the innovation performance. Existing innovation gaps require, inter alia, mobilising private capital towards investment in R&D and innovative activities, adequate, effective and well-targeted government support to fundamental research, R&I systems that are endowed with strong governance and are able to retain and attract talent, and school systems providing adequate supply of high-level human capital.

The evidence suggests that the sectoral patterns of TFP dynamics in the EU were to a lesser extent driven by radi-

cal innovations. The EU was in a lagging position in industries linked to ICT in past decades and is currently lagging in ICT services as compared with the US. These are industries where the potential for productivity gains via innovation is particularly strong. Conversely, the EU has a relative TFP growth advantage in industries characterised by more stable and mature innovation trajectories. Consistently, only a small share of fast-growing companies in high-tech sectors, so-called unicorns, are based in Europe (Testa et al., 2022). Arguably, the still underdeveloped EU equity, venture capital, and public venture financing require further strengthening to overcome this gap.

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