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Bridging the Gap: Understanding the UK-US Productivity Decoupling

Leonardo Indraccolo

SIP/2025/112

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Bridging the Gap: Understanding the UK-US Productivity Decoupling

Prepared by Leonardo Indraccolo

Authorized for distribution by Luc Eyraud
August 2025

ABSTRACT: The UK's productivity gap with the US has widened over the past two decades, with productivity growth rates decoupling after the Global Financial Crisis (GFC). This paper complements existing studies by using sectoral and firm-level data to discuss different microeconomic drivers of the diverging trends. While the loss of pre-GFC growth engines, in particular the leverage-driven boom in the financial sector, accounts for a large part of the productivity slowdown relative to the US, it is only part of the explanation. Outside the financial sector, the UK's publicly listed companies, especially frontier firms, have lagged behind the US due to a significant decline in post-GFC total factor productivity (TFP) growth, resulting in widening efficiency gaps within firms. We discuss how reduced investment in intangible capital following the GFC, along with lower R&D spending compared to the US, may contribute to subdued TFP growth among UK firms. To revive productivity, this analysis suggests a two-pronged approach aimed at: 1) building on the UK's strengths and revitalizing traditional growth engines, especially the financial and ICT sectors; and 2) fostering a more conducive environment to business innovation through greater access to scale-up finance and continued efforts to retain high skilled individuals.

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SELECTED ISSUES PAPERS

Bridging the Gap: Understanding the UK-US Productivity Decoupling

United Kingdom

Prepared by Leonardo Indraccolo[1]

[1] The author would like to thank Luc Eyraud, Andrew Hodge, Kristina Kostial and Pragyan Deb for helpful comments. The paper also benefitted from excellent suggestions and insights from Prof. John Van Reenen and Sophie Piton, as well as seminar participants at the HM Treasury and colleagues from the Bank of England.

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UNITED KINGDOM

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July 1, 2025

Approved By
European Department

Prepared By Leonardo Indraccolo

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BRIDGING THE GAP: UNDERSTANDING THE UK-US PRODUCTIVITY DECOUPLING[1]

The UK's productivity gap with the US has widened over the past two decades, with productivity growth rates decoupling after the Global Financial Crisis (GFC). This paper complements existing studies by using sectoral and firm-level data to discuss different microeconomic drivers of the diverging trends. While the loss of pre-GFC growth engines, in particular the leverage-driven boom in the financial sector, accounts for a large part of the productivity slowdown relative to the US, it is only part of the explanation. Outside the financial sector, the UK's publicly listed companies, especially frontier firms, have lagged behind the US due to a significant decline in post-GFC total factor productivity (TFP) growth, resulting in widening efficiency gaps within firms. We discuss how reduced investment in intangible capital following the GFC, along with lower R&D spending compared to the US, may contribute to subdued TFP growth among UK firms. To revive productivity, this analysis suggests a two-pronged approach aimed at: 1) building on the UK's strengths and revitalizing traditional growth engines, especially the financial and ICT sectors; and 2) fostering a more conducive environment to business innovation through greater access to scale-up finance and continued efforts to retain high skilled individuals.

A. Introduction: The Decoupling From the US

1. Over the past two decades, the labor productivity gap between the UK and the US has grown substantially. In the early 2000s, the UK experienced strong aggregate labor productivity growth, nearly matching the US's average annual rate of 2 percent. However, the Global Financial Crisis (GFC) marked the beginning of a significant divergence, with the UK achieving only half the productivity gains seen in the US since 2010 (Figure 1).[2] Although many advanced economies, particularly in Europe, experienced a drop in productivity growth following the GFC, the UK's decline was notably severe, with the country recording the lowest productivity growth among G7 economies, except Italy. Today, the UK's aggregate labor productivity level is approximately 20 percent lower than in the US, while it was just about 10 percent lower in the early 2000s.[3] Low productivity growth has been the main driver of subdued medium-term growth prospects, and revitalizing it is a key priority for the authorities.

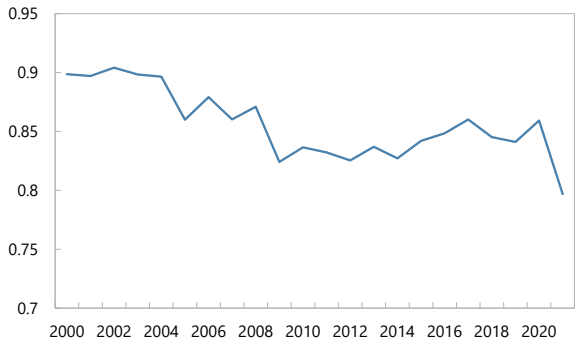
[1] Prepared by Leonardo Indraccolo. Gloria Li provided excellent research assistance. The paper greatly benefited from comments by Luc Eyraud, Andrew Hodge, Kristina Kostial, and Pragyan Deb. Additionally, it received excellent suggestions and insights from Prof. John Van Reenen and Sophie Piton, as well as seminar participants at the HM Treasury and colleagues from the Bank of England.

[2] According to national accounts data from ONS (2023) between 2000 and 2008 the UK experienced average labor productivity growth, measured as output per hour worked, of approximately 1.8 percent, close to the US's 2.1 percent growth rate. After the financial crisis labor productivity growth slowed down in both countries, but while the US maintained a growth rate of around 1 percent, the UK's rate fell to 0.5 percent.

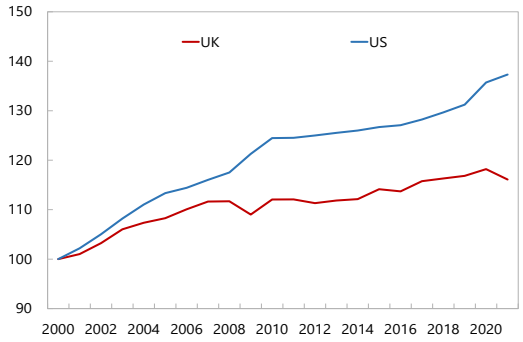
[3] Annex I describes how labor productivity is measured in ONS (2023).

Figure 1. United Kingdom-United States Aggregate Labor Productivity Decoupling

Ratio of United Kingdom-United States Aggregate Labor Productivity



Aggregate Labor Productivity Trends
(Index, 2000=100)



Source: ONS (2023) and IMF Staff Calculations.
Note: Labor productivity is measured as output per hour worked.

2. This paper mainly focuses on the evolution of labor productivity defined as output per worker. Labor productivity is the fundamental driver of long-term economic growth and improvements in living standards. We measure firms' labor productivity, a key metric for assessing how effectively input factors are utilized in production processes, as real output per worker (see Box 1 for a discussion of different measures). A related productivity concept is firms' total factor productivity (TFP), which captures all residual economic factors that contribute to increasing a firm's output beyond increases in labor and capital. While not the primary focus of this paper, we will also discuss TFP as an underlying driver of firms' labor productivity.

3. We contribute to the existing literature by taking a microeconomic and comparative approach to shed light on the factors driving the UK's productivity growth slowdown. This paper examines different hypotheses that can account for the UK's sluggish productivity growth and decoupling from the US. We begin with a sectoral analysis by assessing the extent to which structural changes in industry size and performance can explain the diverging productivity patterns, using data from EU-KLEMS (see Box 1 for description of the dataset). Then, to better understand the underlying microeconomic origin of the observed aggregate trends, we turn to firm-level data from Compustat. In particular, we evaluate whether US productivity has grown faster because of better allocation of resources across firms (*between-firm* component), or because of firms' greater internal efficiency (*within-firm* component). After finding evidence in favor of the latter explanation, we examine possible reasons why US firms have been more efficient compared to those in the UK after the GFC. Our analysis suggests that low investment in intangible capital and R&D spending has contributed to a slowdown in UK firms' TFP growth since 2010, thereby widening the efficiency gap of UK firms with those in the US. We conclude by discussing how fostering a more conducive environment to business innovation through greater access to scale-up finance and continued efforts to retain high skilled individuals can have the potential to revive UK's productivity growth.

4. The paper is organized in four main sections. The first section reviews traditional explanations to the UK's productivity puzzle and illustrates how this paper contributes to existing work. After that, section two focuses on sectoral patterns. Section three discusses the role of between versus within-firm factors while the last two sections examine further within-firm productivity differences across UK and US firms. The last section concludes and provides policy recommendations to narrow UK's productivity gap with the US.

Box 1. United Kingdom: Description of the Datasets

- **This paper relies primarily on firm-level data from Compustat, complemented with sectoral-data from EU-KLEMS.** For firm-level information we rely on Compustat, which contains detailed balance sheet information on publicly-listed firms in the US and the UK covering the period 2000 to 2023 and is compiled by Standard & Poor's. For the sectoral analysis we rely on data from EU-KLEMS which provides harmonized cross-country sectoral level data on employment, productivity and intangible capital constructed from national accounts over 2000–21. The advantage of EU-KLEMS is that it covers all sectors of the economy.

- **In both datasets labor productivity is measured as real output per worker.** In Compustat, firm-level labor productivity is measured at the firm level as real revenues per number of employees, where revenues are converted to a common currency using PPPs and deflated using one-digit sectoral deflators. In EU-KLEMS labor productivity is measured at the sectoral level as real sectoral value added per total employment.

- **Firm-level data from Compustat capture the broad trends of productivity recorded in national accounts data.** Aggregate productivity trends in Compustat align with national accounts patterns, with the productivity gap between UK and US-listed firms widening over time, and productivity growth rates diverging after the GFC (see Annex I for a discussion).

- **Nonetheless this dataset has limitations.** First, Compustat only covers publicly-listed firms, representing a sample of businesses, which are, on average, larger than the average firm in the economy. This implies that our findings do not necessarily extend to smaller firms. Second, the dataset does not allow entry and exit of firms to be observed explicitly, so that we cannot directly address issues related to business dynamism. Third, financial sector firms are excluded given challenges with estimating TFP for these firms (Li and others 2022).

B. UK's Productivity Puzzle: A Review of Existing Explanations

The strong decline in the UK's productivity growth since the GFC is often referred to as the UK's productivity puzzle. While there is no single, straightforward answer to this puzzle, this section reviews the most commonly proposed explanations and how this paper's analysis relates to existing findings.

5. Macroeconomic studies have traced the UK's productivity slowdown to low aggregate TFP growth. Aggregate labor productivity growth can be decomposed into changes in labor supply, capital accumulation and total factor productivity (TFP). Recent work by Fernald and others (2025), Goldin and others (2024) and IMF (2024a) has used a production function decomposition applied

to national accounts data to show that most of the UK's slowdown in aggregate labor productivity growth over time can be attributed to a decline in TFP growth, with labor supply and capital intensity playing a minor role. Statistically, aggregate TFP is measured as the residual part of a country's aggregate output not explained by labor and capital inputs. As such, it is a measure of "ignorance", with a range of different factors potentially affecting it. In the context of the UK, several factors have been discussed to explain the decline in TFP growth, including persistent scarring effects after the GFC, subdued productivity growth in key trading partners, declining business dynamism contributing to resource misallocation, and the lack of sufficient technology diffusion within the country (see, for instance, Ilzetzki 2020; Haldane 2018, Adler and others 2017). While analyses based on macroeconomic data are useful for identifying *where* the problem lies, microeconomic studies rely on firm-level data to understand better *why* labor productivity has slowed down.

6. At the microeconomic level, low investment among firms is one of the most common explanations behind sluggish productivity growth. Understanding what drives productivity improvements at the firm-level is a challenging area of research (see, for example, Blackwood and others 2021). In the case of the UK, firms' chronic underinvestment is among the most cited explanations (Ayantola and Coyle 2023). Business investment as a share of GDP in the UK is below that of many other G-7 economies, and has been low for the past two decades. Establishing a direction of causality between business investment and productivity is complex, as both variables affect each other at the same time. However, persistent economic shocks, difficulties for SMEs in accessing finance, planning restrictions and frequent policy changes creating an uncertain and unstable environment for businesses are contributing factors (see Carella and others 2023; Oliveira Cunha and others 2021).

7. Moreover, weak management practices and skills gaps in the workforce have been found to weigh on UK firms' productivity growth by hindering the adoption of new and more efficient technologies and processes. Although the UK has leading universities, there have been challenges in translating scientific advances into productivity gains (see, for instance, Haldane 2018). This is partly due to skills gaps in the workforce, compared with the US. While the average skill level in the economy is above that of other advanced economies, businesses report skills shortages in some sectors, with the degree of skill mismatch in the UK being higher than the OECD average, resulting in the sub-optimal use of the labor force (Deb and Li 2024). These mismatches and skills gaps complicate the adoption of new technologies, contributing to firms' subdued productivity growth (Criscuolo and others 2021; D.Grimshaw and others 2023). Additionally, weak management practices have been found to hinder the adoption of new technologies and organizational procedures within firms (see Bloom and others 2012).

8. Fewer papers have put the UK's productivity puzzle into international perspective. Most academic and policy papers have analyzed the UK's productivity puzzle over time, through a

combination of macro and micro data, however cross-country comparisons are more limited. There are some notable exceptions based on aggregate macro and sectoral level data, including Van Reenen and Xuyi (2024), who argues that low rates of capital deepening played an important role in explaining the productivity divergence vis-à-vis other countries. Other exceptions are Fernald and others (2025), who examine aggregate TFP slowdowns across the UK and other advanced economies, De Loecker and others (2024) who study the role of business dynamism and Pittaway (2025) who highlights the role of specific sectors, particularly the UK's healthcare sector, in explaining the UK's productivity growth divergence from the US after the pandemic. Finally, IMF (2024b) has recently focused on Europe's productivity slowdown and divergence from the US showing that low business dynamism and a smaller footprint of high-growth firms in the economy have contributed to widening gaps.

9. This paper offers new insights to the debate, based on cross-country comparisons, using a firm-based approach. Compared to previous analyses, we examine the role of both sectoral shifts and firm-level differences to explain the UK's productivity decoupling from the US. Our approach differs from the existing literature in several aspects. First, we conduct a cross-country comparison, while most of the literature on the UK has focused on domestic developments. Second, we base our analysis on publicly-listed firms, which has not been the primary focus of other papers. This helps us center our analysis on larger firms which tend to be more productive. Third, comparing the UK with the US provides valuable insights, revealing that while frontier firms have performed relatively well compared to other UK firms, they have not fared as well against their US counterparts.

C. Breaking Down Aggregate Productivity: Sectoral Patterns

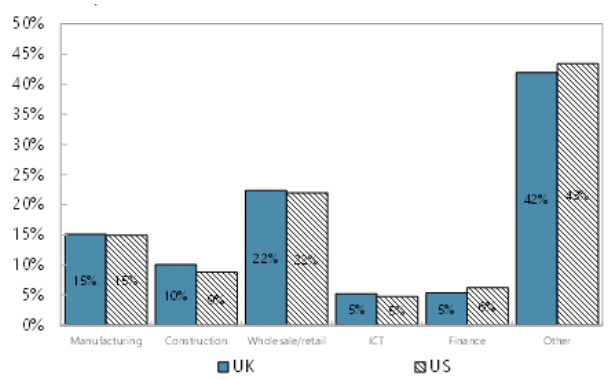
We start the analysis using sectoral data from EU-KLEMS to assess the extent to which structural changes in sectoral size and performance can explain the diverging productivity patterns.

10. This section evaluates how different sectors have contributed to the UK's productivity slowdown vis-a-vis the US. Using data from EU-KLEMS we decompose annual aggregate labor productivity growth into sectoral contributions for the period pre-GFC (2000–2008) and post-GFC (2010-2021).[4] For simplicity, we plot the sectoral contributions of manufacturing, construction, retail, finance, food services and ICT which make up more than 60 percent of total employment in the economy and define the remaining sectors residually as "other sectors" (Figure 2).

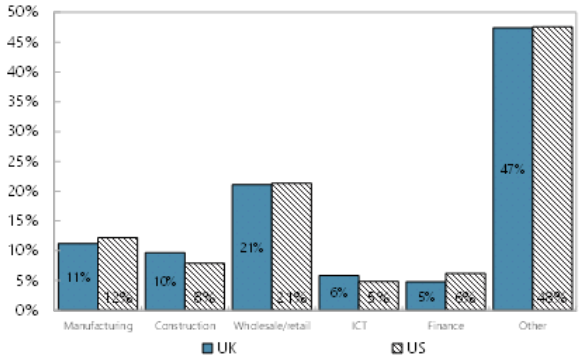
[4] We decompose aggregate productivity growth of the non-agricultural market economy. The Appendix describes the mathematical formula.

Figure 2. Sectoral Structure United Kingdom-United States

Sectoral Employment Shares
(Pre-GFC, percent)



Sectoral Employment Shares
(Post-GFC, percent)



Source: EU-KLEMS and IMF Staff Calculations.

11. The productivity contribution of the UK's financial sector pre-GFC was both high and likely unsustainable, leading to a substantial fall in its productivity growth post-GFC being a driver of the productivity decoupling from the US. While productivity growth slowed down across several sectors in both countries after the GFC, the decline in the UK's financial sector contribution stands out when compared to the US (Figure 3).[5] In the immediate years preceding the GFC, the expansion of the UK's financial sector sustained both the economy's GDP and productivity growth, after which its contribution turned from largely positive to negative. Different hypotheses have been proposed to explain the slowdown (see Brennan and others 2010). Besides potential mismeasurement issues related to quantifying output of financial service activities, the main explanation is that high leverage and risk tolerance artificially boosted profits and income in the years leading up to 2008. Higher asset prices and credit growth may have attracted resources from other sectors, contributing to a rapid expansion of the financial sector. When the GFC hit, these channels reversed, leading to falls in asset prices, wealth, and higher uncertainty, while structural weaknesses in other sectors slowly emerged.

12. Beyond the financial sector, wholesale and retail trade has also contributed to the decoupling. While the role played by the financial sector stands out, the wholesale and retail trade sector has also been a driver of widening productivity gaps. The contribution of wholesale and retail trade to the UK's productivity growth declined vis-à-vis the US after the GFC and this resulted from lower sectoral productivity growth, rather than a declining sectoral share in the economy.

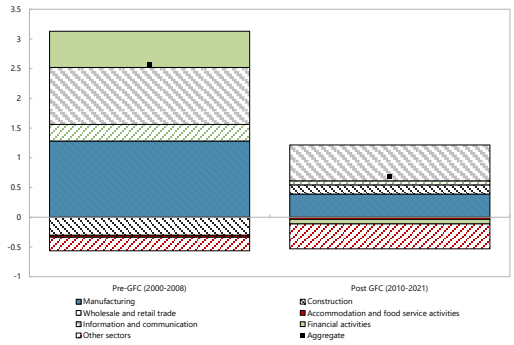
[5] Bank of England (2021) finds a smaller role of UK's financial sector contribution to productivity growth before the GFC by examining a longer pre-GFC time period (1997-2007) and after accounting for methodological changes to GDP measurement introduced by the ONS in 2021. In general, measuring output of financial firms and their contribution to GDP and productivity growth can be challenging as discussed in Burgess (2011) and in Akritidis and others (2017).

13. The decline of the UK manufacturing sector explains the productivity slowdown over time, but not the decoupling from the US. The manufacturing sector's contribution to productivity growth declined significantly after the GFC. However, the US experienced a similar pattern, suggesting a common or related set of sectoral structural shifts might have been driving the trends. Among other forces, difficulties competing with global manufacturing firms offering cheaper products are likely to have crystallized in the aftermath of the GFC, when the sector's high labor costs could no longer be offset by greater investment in physical capital, as in the early 2000s (Tenreyro 2018).

Figure 3. Sectoral Productivity Patterns

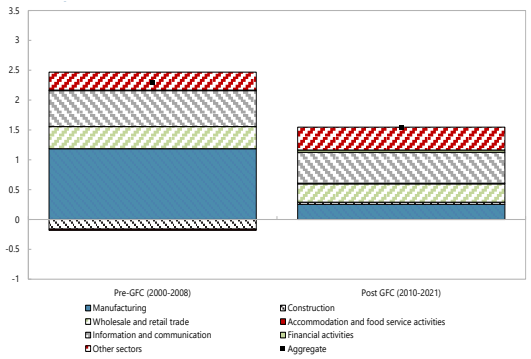
United Kingdom: Sectoral Contributions to Productivity Growth

(Pre and Post GFC, pp)



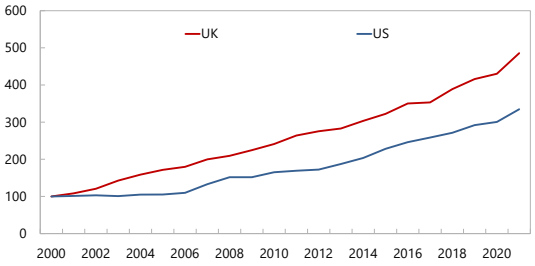
United States: Sectoral Contributions to Productivity Growth

(Pre and Post GFC, pp)



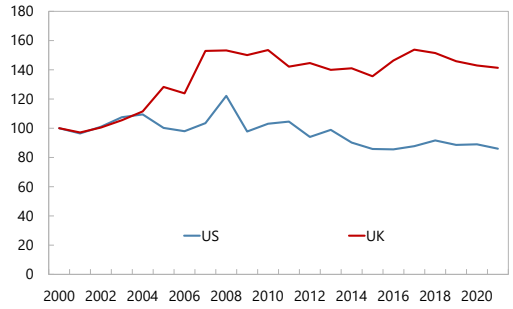
ICT Sector: Evolution of Labor Productivity

(Year 2000=100)



Financial Sector: Evolution of Labor Productivity

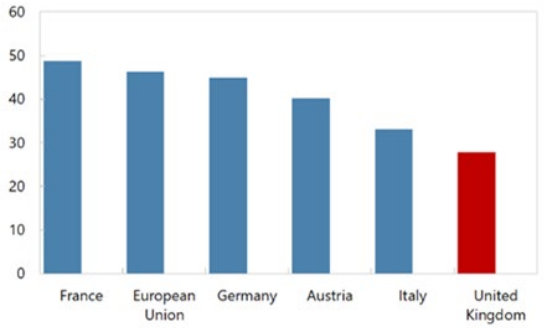
(Year 2000=100)



Source: EU-KLEMS and IMF Staff Calculations

14. The ICT sector has been fairly resilient in the UK, although it could not make up for the slowdown in other sectors. The ICT sector experienced sustained productivity growth in the past two decades, although with some signs of slowdown in recent years (Figure 3; OECD 2019; Ilzetzki 2020; Pittaway 2025 for the sector's slowdown post Covid). However, its impact as a growth driver for the rest of the economy does not seem as large as in the US. This may in part reflect the fact that, compared to other advanced economies, UK firms lag behind in terms of access to digital infrastructure, like high-speed internet (Figure 4), which slows the adoption of the latest digital technologies. Recent studies have also documented that the lack of appropriate skills in the labor market makes it hard for smaller firms to leverage new technologies, thus constraining the potential spillover effects from ICT (see Tuckett and others 2017; Deb and Li 2024; Criscuolo and others 2021).

Figure 4. Share of Businesses With Broadband Download Internet Speed of at Least 100 Mbit/s
(Percent)



Source: The OECD Going Digital Toolkit, based on the OECD ICT Access and Usage by Business Database.

D. Has Resource Misallocation Played a Big Role?

Besides the idiosyncratic pattern of UK's financial sector, this section uses firm-level data to explore whether widening productivity gaps between UK and US businesses emerged in the rest of the economy because of misallocation of resources between firms, or because US firms became increasingly more efficient internally.[6]

15. Productivity differences across countries can reflect both differences in "within-firm" production efficiency or "between firm" allocation of input factors. Aggregate productivity depends on the productivity of the average firm in the economy (*within-firm* component) and to what extent resources are being allocated to the most productive businesses (*between-firm* component, also called resource misallocation). Aggregate productivity can be decomposed as the sum of these two components through a framework initially proposed by Olley and Pakes (1996).[7] *Within-firm* productivity hinges on firms' ability to improve their production processes and produce more output using the same amount of inputs by adopting more innovative technologies. This ultimately depends on firms' ability to invest in research and development (R&D), attract and retain high skilled workers, and improve their internal efficiency.[8] On the other hand, the *between-firm*

[6] This section is based primarily on the Compustat dataset, which does not cover financial sector firms and firms that are not publicly listed.

[7] The appendix describes the decomposition formula.

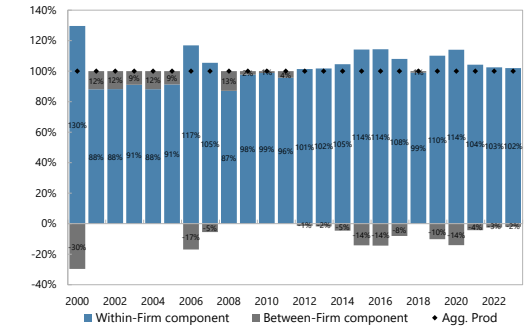
[8] The exercise is a simple accounting decomposition; as such it does not reflect how factors interact with each other, and reforms aimed at improving the allocation of productive resources can have an effect on a firm's internal productivity and vice versa.

component captures whether less efficient firms are absorbing resources, resulting in production factors being misallocated in the economy. If an economy's resources do not flow to the most innovative and efficient companies those enterprises cannot grow and drive economic progress. If this is the case, policies that promote the reallocation of workers and financial capital towards the most productive businesses could boost aggregate productivity.

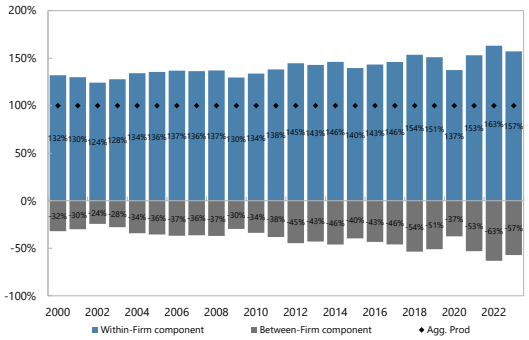
16. The decomposition shows that, outside of the financial sector, the widening productivity gap between the UK and the US is largely due to a divergence in within-firm productivity growth. Figure 5 shows the results of the static decomposition framework developed by Olley and Pakes (1996). Between-firm factors contribute negatively to the level of aggregate productivity in the US, while explaining a much smaller fraction of it in the UK. Despite the larger negative contribution from the between-firm component, aggregate productivity in the US is higher than in the UK. This reflects the fact that the US experienced average within-productivity growth of 2.5 percent per year, against only 0.9 percent for the UK over the sample period. Strong "within" productivity growth in the US was the main factor contributing to the widening productivity gap between firms in the two countries.

Figure 5. Olley-Pakes Decomposition of Aggregate Productivity

United Kingdom: Olley-Pakes Decomposition
(Percent)



United States: Olley-Pakes Decomposition
(Percent)

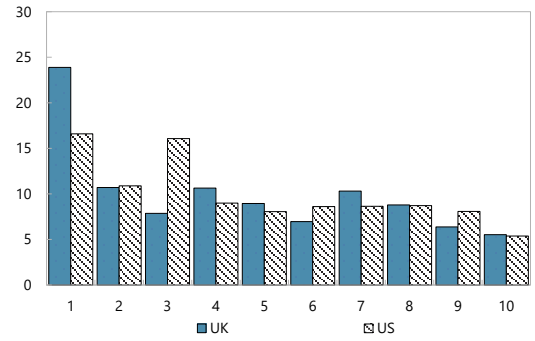


Source: Compustat and IMF Staff Calculations.

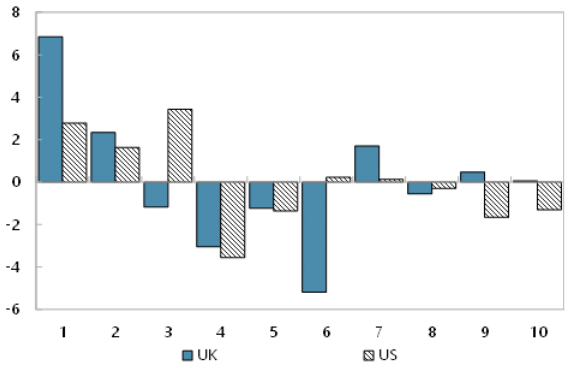
17. Other stylized facts also suggest that resource misallocation is not the primary driver of the decoupling from the US. There are many ways to assess how well resources are allocated across firms in an economy. A straightforward approach is to examine the share of total employment across firms at different productivity deciles; a higher proportion of workers employed in low-productivity firms indicates poorer resource allocation. Figure 6 reveals that the share of workers employed in the lowest productivity decile of UK firms is higher than in the US. However, when looking at the evolution over time, the picture is slightly different the US experienced a stronger reallocation towards less productive firms after the GFC, with a sharper decline in the share of workers employed in the most productive firms (those in the top two deciles of the productivity distribution). The right panel of Figure 6 illustrates the point by showing the change in employment shares for firms at different productivity deciles between the post and pre GFC period.

Figure 6. Distribution of Employment by Productivity Deciles

Share Employment by Productivity Decile
(Post GFC, percent)



Change in Employment Shares Post-Pre GFC
(Employment shares by productivity decile, percent)



Source: Compustat and IMF Staff Calculations.

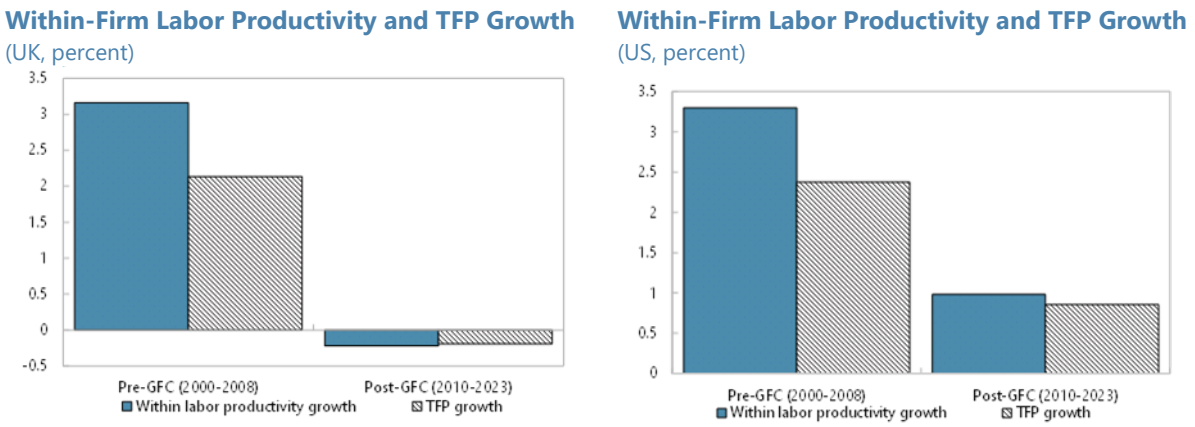
E. Understanding the Within-Firm Productivity Growth Divergence

We estimate firm-level production functions to identify the drivers of labor productivity: TFP and capital intensity. Our findings suggest that the decoupling with the US is largely due to sluggish firm-level TFP growth, especially among the UK's frontier firms. Among other contributing factors, low levels of investment in intangible capital and R&D spending in the UK are likely explanations for slow TFP growth.

18. We use an accounting framework to decompose within-firm labor productivity growth into capital intensity and TFP components. Labor productivity increases if firms have higher capital intensity and/or if they are able to generate more TFP. We measure TFP at the firm level by estimating production functions of individual firms (see the Appendix for the methodology). This allows us to decompose within-firm productivity growth as the sum of TFP growth and a capital intensity component.

19. Compared to the US, UK firms have experienced a stronger decline in TFP growth after the GFC. Growth in capital per worker and TFP growth both contributed to within-firm productivity growth in the decade leading up to the GFC. But afterwards, while growth in capital intensity has been broadly flat in both countries, the TFP patterns differed: while for US firms annual TFP growth declined from approximately 2.5 percent to 1 percent, the decline was more pronounced for UK businesses, explaining most of the divergence from the US (Figure 7).

Figure 7. Firm-Level TFP Growth United Kingdom-United States



Source: Compustat and IMF Staff Calculations.

20. The decline in firm-level TFP growth after the GFC has been particularly apparent among UK frontier firms. Frontier firms[9] play a crucial role in expanding a country's technological frontier through disruptive innovations (Andrews and others 2015). Our evidence shows how the decline in TFP growth was much stronger among UK frontier firms than laggards, as captured by a shift of the distribution. On the other hand, the distribution of TFP growth rates among US frontier firms has remained broadly unchanged (Figure 8). While the UK's top-performing businesses were experiencing labor productivity gains above their US counterparts until the GFC, this pattern reversed thereafter. Since then, UK frontier firms have experienced cumulative labor productivity growth below that of their US counterparts and even below US laggard firms (Figure 9).

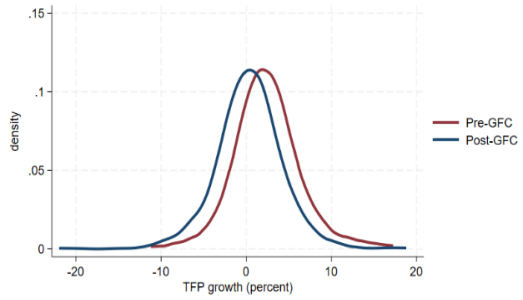
21. While multiple factors explain firm-level TFP growth, firms' ability to innovate is among the most important. Firms' ability to innovate and develop new products is a key engine of within-firm productivity growth (Aghion and others 2015). Over the past thirty years, an increasing share of innovations have been intangible in nature, especially in the ICT sector where innovations have taken the form of new software, computer codes and algorithms (Crouzet and others 2022). Intangible capital includes copyrights, audio and video material, and notably software and patents, with investment into intangible capital playing a growing role as a source of innovation-led productivity growth. However, the GFC led to a significant drop in investment into intangible capital by publicly-listed firms in the UK, more so than in the US. Prior to the GFC, UK firms' investment rate into intangible capital was approximately 4 percent, similar to the US. Post-GFC, US publicly-listed firms maintained an average investment rate of 3 percent in intangible assets, whereas in the UK the rate fell to 1 percent. By 2019, the UK's intangible capital stock level was lower than it had been at the onset of the financial crisis (Figure 10). [10]

[9] Frontier firms are defined as those firms belonging to the top decile of the labor productivity distribution, while middle firms are defined as those belonging to the 90th and 50th percentile. Laggard firms are defined as firms that belong to the bottom 50 percent of the labor productivity distribution in each sector.

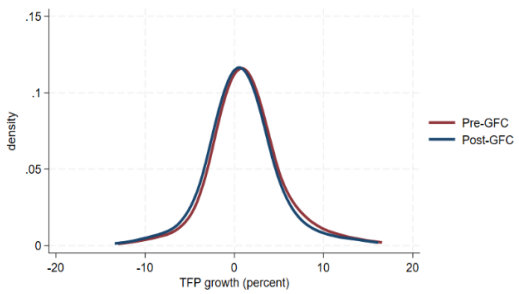
[10] The firm's investment rate is defined as the growth rate of intangible capital in this paragraph.

Figure 8. Distribution of TFP Growth of Frontier and Laggard Firms

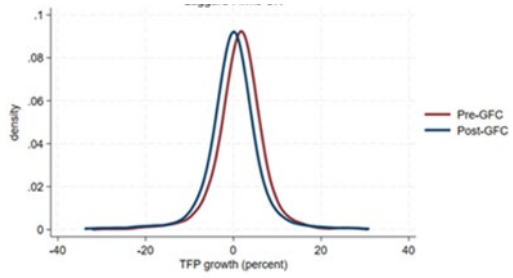
Distribution of TFP Growth
(Frontier firms UK)



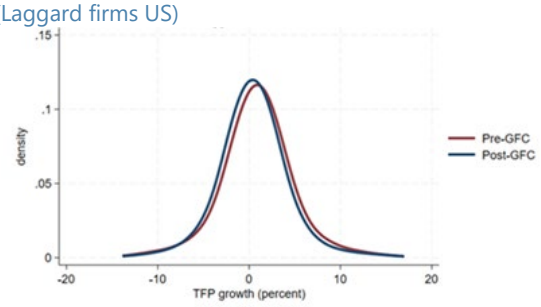
Distribution of TFP Growth
(Frontier firms US)



Distribution of TFP Growth
(Laggard firms UK)



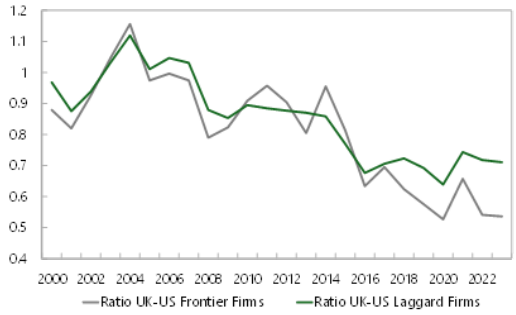
Distribution of TFP Growth
(Laggard firms US)



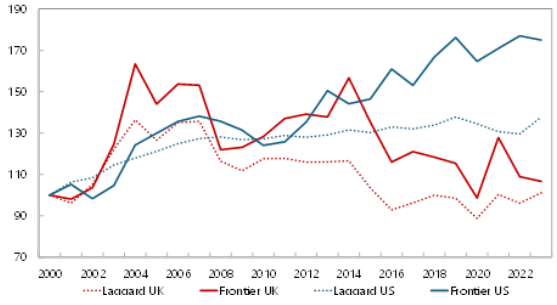
Source: Compustat and IMF Staff Calculations.

Figure 9. Labor Productivity of Frontier and Laggard Firms

Labor Productivity Gap
(Ratio of productivity levels, frontier and laggard firms)



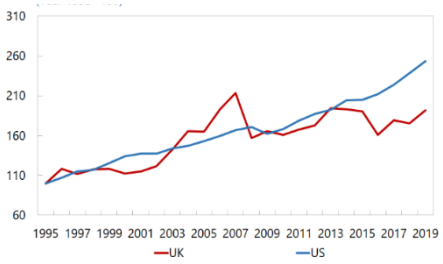
Labor Productivity of Frontier and Laggard Firms
(Year 2000=100)



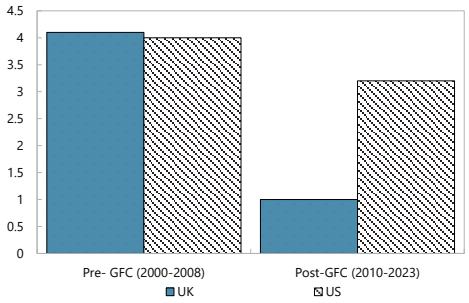
Source: Compustat and IMF Staff Calculations.

Figure 10. Investment in Intangible Capital

Real Intangible Capital Stock
(Index, year 1995=100)



Real Intangible Investment, United Kingdom vs United States Firms
(Average annual growth rates, percent)

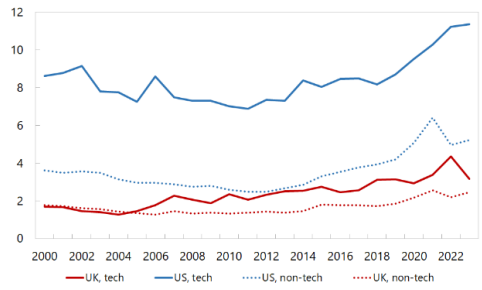


Source: INTANProd module of EU-KLEMS, Compustat and IMF Staff Calculations.

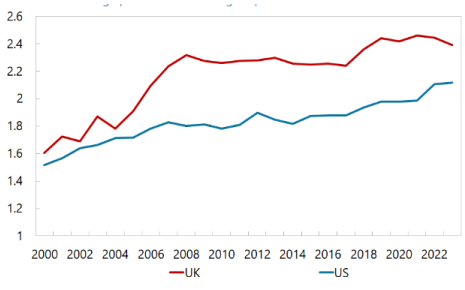
22. Spending on R&D by UK firms has lagged behind the US, despite generous tax policy incentives. Spending on R&D is the main component of intangible investment driving innovation. Although the UK is among the countries with the most generous R&D tax policies measures in place, aggregate spending on R&D as a share of GDP has lagged behind the US and other advanced countries. Even publicly listed firms, which are the largest firms in the economy, spend less on R&D as a share of their sales compared to US firms (Figure 11). This holds true across sectors, but is particularly striking among firms operating in tech, which has partly sustained US productivity growth in recent years (IMF 2024b). Moreover, the returns to knowledge capital—the stock generated by R&D investment—is more dispersed in the UK than the US (right panel of Figure 9). This also implies that there are productivity gains to be obtained by reallocating knowledge capital from low to high return firms in the UK.[11]

Figure 11. R&D Spending by Publicly Listed Firms

R&D Spending as a Fraction of Sales
(Percent)



Misallocation of R&D
(Std of average product of knowledge capital)



Source: Compustat and IMF Staff Calculations.

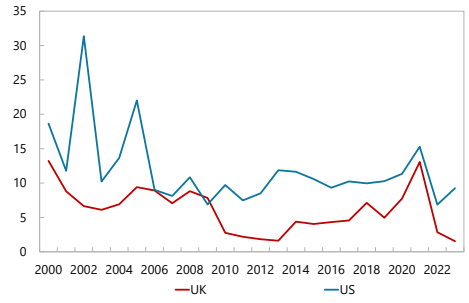
[11] Firm-level returns to knowledge capital are computed as the ratio of firm revenues to knowledge capital. The latter is constructed by applying the perpetual inventory method to R&D spending.

F. Possible Determinants of Firm-Level R&D Investment

While several factors can lead to differences in R&D spending across countries, this section focuses on the role of access to finance and trade openness. Investment into R&D is generally riskier compared to more traditional forms of investment, as the benefits of R&D are harder to quantify and may take longer to materialize. Firms' access to finance, including investors' risk-taking behavior, global competition and the size of the market to which new products can be sold, all contribute to innovation-driven productivity growth. We discuss the potential role of these factors in the UK and the US.

23. UK listed firms rely more on debt financing compared to their US counterparts, which is less suited to fund investment into R&D. Investment in R&D tends to be riskier compared to more traditional forms of investment like machinery and equipment, as the benefits of R&D investment are harder to quantify and may take longer to materialize. In addition, this investment is mostly intangible in nature, meaning it is difficult for firms to provide collateral for debt financing. Given these two factors, equity financing is generally better suited for investment in intangible capital, including R&D activities. In the UK, publicly listed firms rely less on equity financing compared to the US. Figure 12 shows net equity issuance as a share of firms' total assets. After averaging approximately 10 percent in both countries in the four years preceding the GFC, the difference in equity issuance has widened over time. Less reliance on equity financing implies that UK's largest firms have less capacity for undertaking riskier projects, which may have contributed to subdued spending on R&D.

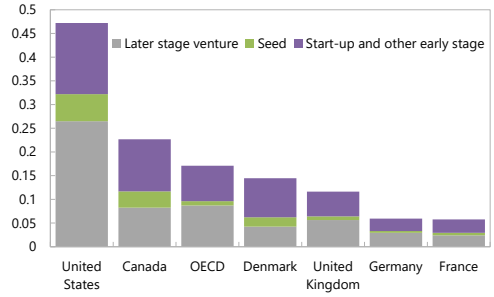
Figure 12. Net Equity Issuance of United Kingdom and United States Listed Firms
(Share of total assets, percent)



Source: Compustat and IMF Staff Calculations.

24. Compared to the US, difficulties in scaling up businesses with high growth potential, especially in the ICT sector, may limit investment into R&D. Firms that cannot grow have fewer incentives to spend on R&D because they are unlikely to expand their market to recoup the costs of this investment. The UK is known for having the largest venture capital market in Europe, providing valuable funds to start-ups and aspiring entrepreneurs. However, when compared to the US, the size of the UK market lags behind, particularly in specific sectors of the economy. Figure 13 shows the UK's venture capital investment in the ICT

Figure 13. Venture Capital Investment in ICT Sector, 2023
(Percent of GDP)



Source: OECD Venture Capital Investment Database and IMF Staff Calculations

sector as a share of GDP, decomposed into different funding stages. In the ICT sector, venture capital investment in the UK has recently lagged behind not only the US but also other advanced economies like Canada and Denmark. Anecdotical evidence from commercial banks' reports additionally shows that while the UK's venture capital market provides adequate funds for early stage funding, firms that reach a certain size and need additional funding to scale up operations further, often prefer the US where more funds are available (FT 2025; BVCA 2024).

25. Lower trade openness and higher trade costs following Brexit may have also contributed to reducing firms' incentives to innovate. In the face of heightened global competition, the most productive companies typically invest in R&D to develop superior products and grow their market share. Conversely, trade barriers can limit firms' market size, deterring them from pursuing R&D investments that yield greater returns in a larger customer base, as noted in IMF (2024b). In the context of the UK, academic studies such as Bloom and others (2019), have shown that higher trade costs following Brexit have negatively affected firms' productivity by lowering the incentives to spend on R&D and develop better products to compete on the global market. Additionally, Ampudia and Pardy (2023) find that firms' rate of technological adoption decreased after Brexit due to future bureaucratic costs, as well as decreased demand. A second key aspect of R&D investment involves hiring highly skilled individuals whose expertise drives innovation. Brexit has further complicated firms' ability to attract and retain global talent by making immigration to the UK more difficult (Van Reenen 2016).

G. Conclusions and Policy Recommendations

Revitalizing the UK's Traditional Growth Engines

26. One pillar of a strategy to boost productivity growth could build on the UK's traditional sectoral strengths, like in finance and ICT. While the loss of pre-GFC growth engines, such as the leverage-driven boom in the financial sector, explains a large part of the productivity slowdown relative to the US, the authorities have launched strategies to give these sectors a welcome boost.

- Although it is unlikely that the **financial sector** will again make the same contribution to productivity growth as it did pre-GFC, as this would require unsustainable increases in leverage, there is still potential to bolster its role in driving economic growth. As outlined in the Article IV report, the authorities have initiated important measures to enhance the financial sector's contribution to growth. To further boost the UK's competitiveness as a financial center, reforms aimed at streamlining data collection and revising firms' listing requirements have the potential to boost the sector's efficiency. The simplification of existing regulatory rules should be conducted cautiously to preserve financial stability.

- The UK has the potential to exploit the latest technological advancements in the **ICT sector**, including AI. The IMF's AI readiness index shows that the UK is well-positioned to capitalize on AI technologies, with the index score surpassing the average of other advanced economies because of the large share of workers employed in cognitive-intensive jobs (Cazzaniga and

others 2024). In addition, the authorities' reforms in the area of construction planning are expected to speed up the delivery of critical infrastructure needed for AI development. Furthermore, improving skills could allow more widespread adoption of digital technologies, so that productivity gains from the latest technological developments, including AI, are not concentrated in too few firms. Expanding tax credits or tax allowances for SMEs that invest in employees' training can facilitate upskilling the workforce and narrowing existing skill gaps.

The Road Ahead: Boosting Firm Innovation

27. Another pillar of the strategy could focus on fostering firms' innovation by improving access to scale-up finance and retaining talent. Compared to the US, the UK's leading frontier firms have experienced slower TFP growth since the GFC. Two sets of policies can stimulate TFP growth by fostering an environment conducive to R&D investment and innovation by firms.

- Further improving **access to scale-up finance** can support innovation at the frontier. While start-ups and young businesses in their early stages benefit tremendously from the UK's vibrant venture capital market, obtaining sufficient funding to significantly scale up operations can be more challenging in the UK compared to the US. Policies that incentivize the participation of institutional investors, like pension funds, in domestic venture capital markets can help firms of high growth potential to expand their operations within the country. The authorities' plans to consolidate pension funds are welcome as they have the potential to expand access to diverse asset classes.

- The authorities' ongoing efforts to create innovation hubs and intensify the collaboration between universities and businesses go in the right direction of supporting the development of new ideas that can be commercialized. Hiring workers with high levels of human capital and advanced skills is an important component of R&D investment. The UK has a strong record of attracting high-skilled individuals, but **talent retention** has become harder. In this regard, measures that help retain talent and encourage labor mobility of high-skilled workers should be prioritized. In a world where competition for talent is global, it is crucial to provide the right incentives for researchers and highly educated individuals to come and stay in the UK.

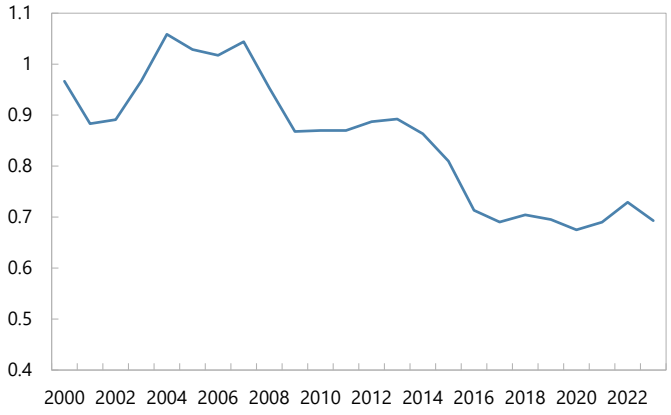
Annex I. Productivity Trends in Compustat Data and National Accounts

1. Productivity patterns of UK and US listed firms qualitatively align with national accounts data. Compustat data only contains information on publicly-listed firms and as such is not representative of the average firm in the economy. However, the qualitative patterns of aggregate productivity trends observed in the national accounts and Compustat are well-aligned. The table below shows labor productivity growth of the average publicly listed firm in the UK and the US pre- and post-GFC, as well as aggregate productivity growth (weighted by firms' employment share). UK and US publicly listed firms experienced similar labor productivity growth rates up to 2008, before diverging thereafter. The decline in labor productivity growth among UK firms after 2008 was stronger than the decline experienced by similar firms in the US. Figure 14 shows the evolution of the ratio between the productivity of the median UK and US publicly listed firm, which displays a declining trend over time, indicating widening productivity gaps.

Table I.1. United Kingdom: Productivity Trends in Compustat

	Average Labor Productivity Growth	Aggregate Labor Productivity Growth
UK pre- GFC (2000-2008)	3.1%	4.3%
UK post- GFC (2010-2021)	-0.3%	-0.2%
US pre- GFC (2000-2008)	3.4%	2.2%
US post- GFC (2010-2021)	1.1%	0.9%

Figure I.1. Ratio of Median Productivity of United Kingdom-United States Firms



Sources: Compustat and IMF Calculations.

2. In national accounts data labor productivity can be measured as output per worker or output per hour worked. Labor productivity is defined as real output per labor input. Output per worker and output per hour worked are the most common measures of labor productivity. These two measures correlate strongly, but do not necessarily always align. Regardless of the measure of labor productivity, the qualitative patterns of UK's productivity decoupling from the US remain unchanged. The table below summarizes different measures of average productivity growth provided by the ONS (2023). For comparisons of levels of productivity, ONS (2023) use current price GDP, converted to a common currency using purchasing power parities (PPPs). To compare productivity growth rates, GDP at constant prices (volume measure) in national currencies is utilized.

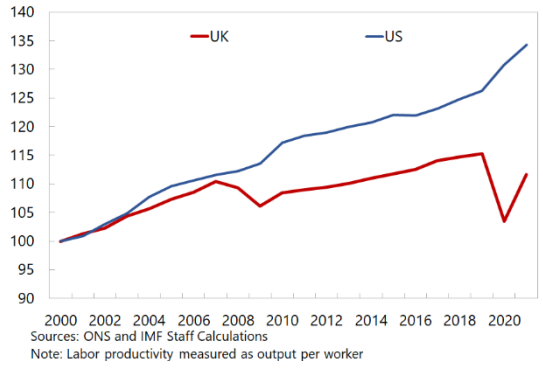
Table I.2. United Kingdom: Productivity Trends in National Accounts

	Growth Rate Output per Worker	Growth Rate Output per Hour Worked
UK pre- GFC (2000-2008)	1.3%	1.7%
UK post- GFC (2010-2021)	0.5%	0.5%
US pre- GFC (2000-2008)	1.5%	2.1%
US post- GFC (2010-2021)	1.4%	1%

Figure I.2. Labor Productivity Comparisons

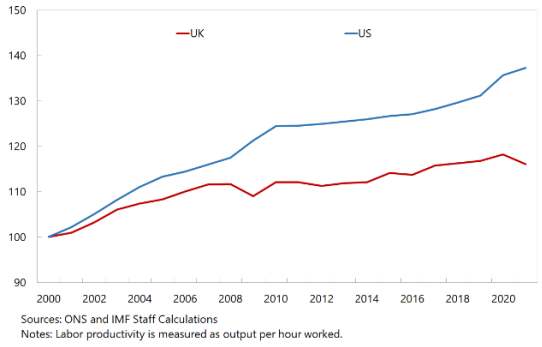
Aggregate Labor Productivity Trends

(Output per worker)



Aggregate Labor Productivity Trends

(Output per hour worked)



Source: ONS (2023) and IMF Staff Calculations.
Notes: Output in each country is measured as real GDP, chained volume measure.

Appendix I. Mathematical Appendix

1. Decomposition of aggregate productivity growth in sectoral contributions. Aggregate labor productivity growth in year t can be decomposed as follows: $G\_prod_t \approx \sum_{i=1}^{N} y_{i,t-1} * g\_prod_i$, where y_{it-i} is the nominal value-added share of sector i in year $t-1$ and g_prod_{it} is the labor productivity growth rate of sector i in year t. Nominal value added shares are computed as shares of total value-added of the non-agricultural market economy. Sectors are defined at the NACE 1-digit aggregation level.

2. Olley-Pakes decomposition framework. Following the static decomposition framework developed by Olley and Pakes (1996), aggregate productivity can be decomposed as the sum of within and between firm productivity. More formally, aggregate productivity at time t, P_t, can be decomposed as follows: $P_t = \sum_{i=1}^{N} p_{it} s_{it} = \overline{p_t} + \sum_{i=1}^{N} (p_{it} - \overline{p_t})(s_{it} - \overline{s_t})$. Where p_{it} is labor productivity of firm i at time t , s_{it} is the employment share of firm i, and $\overline{p_t}, \overline{s_t}$ are respectively the average labor productivity and employment share at time t . The first term of the equation, $\overline{p_t}$, captures the productivity of the average firm in the economy, also known as within-firm productivity, as it does not depend on the firm's weight. The second term is the covariance between firm productivity and the employment share. This component captures how well resources are allocated and is also known as the between-firm component. Essentially, the higher the covariance between firm-level productivity and the employment share, the more efficiently resources are allocated, as more productive firms utilize a larger share of resources in the economy.

3. Production function and TFP estimation at the firm-level. Estimating production functions at the firm-level to compute TFP is known to be complex because of challenges in estimating factor input elasticities. We estimate a Cobb-Douglas production function in logs:

$$y_{it} = \alpha + \beta_l l_{it} + \beta_k k_{it} + \omega_{it} + e_{it}$$

where e_{it} is an i.i.d idiosyncratic shock, while ω_{it} is the unobserved firm-level total factor productivity we seek to estimate. The standard concern in estimating β_l and β_k via OLS is that ω_{it} is generally correlated with input factors l_{it} and k_{it}, so an OLS estimator for β_l and β_k will deliver biased estimates. The literature on production function estimation has proposed several methods to deal with this omitted variable bias, see Levinsohn and Petrin (2003), Wooldridge (2009) for an overview. We follow the recent literature and employ a non-parametric approach used by IMF (2024b) and developed by Gandhi and others (2020).

4. Decomposition of labor productivity growth into capital intensity and TFP growth. By rearranging the firm-level production function one can express firm-level productivity growth into capital intensity and a TFP component. By subtracting l_{it} from both sides above, productivity growth at time t can be approximated by log changes:

$$\Delta prod_i t = (\beta_l - 1)\Delta l_i t + \beta\_k \Delta k\_it + \Delta u\_it$$

Where $u_i t = \omega_i t + e_i t$. By averaging across all firms at time t and using the fact that under constant returns to scale $\beta_k = 1 - \beta_l$, we can decompose within-firm productivity growth (the average productivity growth) as:

$$\Delta \text{prod}_t = (1 - \beta_l)(\Delta k_t - \Delta l_t) + \Delta \omega_t$$

Where the first term captures the growth rate in capital intensity and the second term is the growth rate in total factor productivity (TFP).

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