Are UK Regional Productivity Disparities Really Narrowing? An Investigation into Recent Productivity Data Revisions

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Abstract

Recent UK data revaluations by the UK Office for National Statistics (ONS) on regional productivity data suggest that, after decades of interregional productivity divergence, the UK may finally once again be returning to something of an interregional productivity convergence framework. The aim of this article is to examine these data carefully, and to identify precisely what the recent ONS data really do tell us about UK regional productivity growth. We argue that the published data produce results from which it is difficult to infer anything about regional productivity convergence or divergence.

Nowadays it is generally well understood that UK interregional differences in productivity are amongst the highest in the industrialized world (McCann, 2020), and that over the last four decades, London and its close hinterland regions have steadily pulled away and decoupled from the rest of the United Kingdom on almost every economic and socio-economic dimension (McCann 2016, 2024). Indeed,

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the United Kingdom was the first OECD country to shift from a pattern of national economic growth being accompanied by interregional productivity convergence to one in which national economic growth is associated with interregional productivity divergence. This four decade-long divergence process has been documented extensively.[2]Today, the fact that the United Kingdom exhibits amongst the highest interregional productivity disparities of any OECD country (McCann, 2020) means that half of the UK population are living in regions which are poorer than the Czech Republic or the US state of Mississippi, and whose multi-dimensional quality of life is similar to Alabama or Tennessee (Veneri and Murtin, 2019). Indeed, these enormous regional productivity and prosperity disparities are argued to have been a major contributor to the Brexit vote and the levelling up debates (McCann and Ortega-Argilés, 2021). This raises profound questions regarding economic policy and governance, especially in a highly centralized unitary state such as the United Kingdom (McCann, 2023).

Recently, the UK Office for National Statistics (ONS, 2024a) has published results which suggest that the tide may be turning, and that the productivity growth of the London economy is underperforming relative to the rest of the United Kingdom. In particular, the period spanning the Covid-19 lockdowns saw profound shocks on the UK national and regional economies. The new ONS data suggest that these shocks adversely impacted on the London economy and favoured other regions.

In other words, after decades of interregional productivity divergence, these findings suggest that the United Kingdom may finally once again be returning to something of an interregional productivity convergence framework, akin to the earlier post-war decades (McCann, 2016; Carrascal-Incera *et al.*, 2020). These findings have garnered significant high-level coverage in the media (Romei, 2024a and 2024b), and form the basis of recent high-level political and policy debates. In particular, the apparent switch from interregional divergence to convergence appears to lend powerful support to the recent efforts of the government to 'level up' the UK economy (HM Government, 2022), while at the same time concerns regarding the performance of the London economy as a global economic powerhouse have increased.

The aim of this article is to examine these claims carefully, and to identify precisely what the recent ONS estimations really do tell us about UK regional productivity growth. The ONS regional data revisions to GVA per hour worked show that London's GVA per hour worked fell substantially over 2019-2022, while GVA per hour worked rose on average in the rest of the country, and in every other region except Wales. London's decrease in GVA per hour worked was a result of a small fall in GVA and a large increase in hours worked,

2 See McCann, 2016, 2020, 2024; Carrascal-Incera *et al.*, 2020; McCann and Yuan, 2022; Martin and Sunley, 2023; Allen, 2024; Bhattacharjee *et al.*, 2024a and 2024; and Farquharson *et al.*, 2024)

while many other regions displayed increasing GVA along with falling hours worked.

These results seem somewhat surprising for two reasons. First, the total number of labour hours worked at the regional level in London appears to move in the opposite direction to the rise of the population in the London. Second, the labour productivity results - which combine changes in GVA and hours worked - imply a negative or inverse production function operating at a region-wide scale, something which prima facie would appear to be difficult to understand. The years spanning the Covid-19 lockdown represent a profoundly atypical period so our conclusion is that we cannot infer any behavioural or structural changes from the data of this period.

In order to demonstrate these issues, the rest of the article is organized as follows. The first section will set out the UK economic geography of productivity, and will explain the key patterns and features of UK regional growth over the last four decades, right up to the eve of the Covid-19 lockdown period. This provides us with the wider context against which any Covid-19 era regional productivity shocks can be assessed and interpreted. In the second section, we discuss in detail the recent evidence produced by the ONS (ONS, 2024a) on the productivity performance of UK regions during the period of 2019-2022 which points to a UK shift from interregional productivity divergence to one of convergence. The third section reports on other contemporaneous evidence also produced by the ONS which, as with evidence reported in the second section here from other sources, appears to tell a somewhat different story from that which the revised ONS estimates suggest. In the fourth section, we examine in detail the recent evidence produced by the ONS in order to identify the precise sources of these new results, which appear to differ from much of the other available evidence. What we uncover is that the results depend almost entirely on revised data and the changes in the number of London's 'productivity hours' worked and 'productivity jobs'. These changes are very noticeable in the London area, and differ markedly from anywhere else in the United Kingdom. Our analysis also shows that London's 'productivity hours' worked and 'productivity jobs' produce regional productivity results which are difficult to understand from the perspective of production function analyses, as are those of seven other UK regions. We discuss in the fifth section with what we consider to be the likely reasons for these unusual productivity results and what we can infer from them. The sixth section concludes.

Regional Productivity Growth

In this section we provide a concise explanation of the major features of UK regional growth patterns over the last four decades, right up to the eve of the Covid-19 lockdown period, so as to provide a context against which any Covid-19 era regional productivity shocks can be assessed and interpreted.

In the postwar decades up until the 1980s, UK regional productivity disparities were comparatively low by the standards of advanced economies (Carrascal-Incera *et al.*, 2020), with the London economy typically displaying a GDP per capita premium of the order of 25 per cent-28 per

cent over the UK regional average (McCann, 2016), and with the city-size distribution conforming most closely to Zipf's Law in the late 1970s (McCann, 2020). During this period, while the national economy grew the UK interregional economic system displayed productivity convergence processes (Carrascal-Incera *et al.*, 2020), as did almost every other industrialized economy (Blanchard and Katz 1992; Barro and Sala-i-Martin 1995; Barro 1997; Carrascal-Incera *et al.*, 2020). However, from the late 1980s onwards the UK shifted from a regime of interregional productivity convergence to interregional productivity divergence in which UK regional productivity growth and overall regional economic growth has been dominated by the London economy. The first observable shift in the data appears around 1988, with London's GDP per capita surging over the next two decades to something of the order of 170-175 per cent of the UK average (McCann, 2016) [3] and output per hour worked as 135 per cent of the UK average,[4], where it still remains.

In marked contrast, during this same period, the regions of the North and Midlands of England plus Wales and Northern Ireland all relatively declined in productivity such that today they display overall GDP per capita levels of between 40 per cent-50 per cent of those of the London economy. Meanwhile, during this four-decade period, as well as London, the other southern and eastern English regions plus Scotland steadily improved their productivity performance relative to the other weaker English and Celtic regions (McCann and Yuan, 2020). The decline and limited recovery of many cities in the former industrial regions means that once London is removed from the sample of UK cities, today there are no systematic urban scale-productivity relationships across the UK urban system (McCann and Yuan, 2020). The United Kingdom is unique in this regard amongst OECD countries.

There has been some recent evidence which tentatively suggests that the UK regional productivity divergence may be slowing down or even ameliorating. If we consider the pre-lockdown periods, using a slightly different measure of productivity, namely output per job at constant prices, Rodrigues and Bridgett (2023) argue that during the pre-crisis period 1998-2007, annual productivity growth in London outstripped the annual productivity growth in the rest of the UK by some 1.4 percentage points, at almost twice the rate of the rest of the United Kingdom, whereas during the period 2007-2019 London's annual productivity grew by 0.1 percentage points below that of the rest of the United Kingdom (Rodrigues and Bridgett 2023). This suggests that in the post-crisis period, London was relatively sluggish in its productivity growth performance in comparison to other regions, and the London downturn itself was a major explanation for the UK's post-crisis productivity growth down-

3 https://www.statista.com/statistics/1168072/uk-gdp-per-head-by-region/

4 https://www.productivity.ac.uk/the-productivity-lab/the-tpi-productivity-scorecards-for-english-regions-and-devolved-nations/

turn (Rodrigues and Bridgett, 2023).

This phenomenon of London's slowdown in output per hour worked has been documented extensively by the Data Lab[5] of The Productivity Institute. At the same time, however, during the period 2010-2021, London had the highest rate of job growth, and given its size, also a higher absolute increase in the number of jobs (ONS, 2023a) than any other part of the United Kingdom, alongside an average unemployment rate (Powell, 2021) and relatively low long-term sickness rates (ONS, 2023c). Declining output per hour worked was associated with strong job growth and high participation and activity rates in London, with a result that GDP per capita increased consistently. As such it is unclear on the basis of these data whether the sluggish growth in output per job (Rodrigues and Bridgett, 2023) or output per hour worked of the London economy is due to genuine shifts in the underlying regional convergence-divergence growth regimes, or rather due to a diminishing marginal productivity associated with greater employment and output expansion in the London economy.

On this point, other evidence is also useful. Recent evidence on the wage and employment trajectories of university educated graduates (Stansbury *et al.*, 2023) suggests that constant returns to scale to higher education are evident in the London economy, whereas other UK cities display diminishing returns to higher education. Indeed, these findings concur with the observation of a lack of any systematic scale-productivity relationships in UK cities (McCann and Yuan, 2022), an observation which is also in marked contrast to US cities which all display increasing returns to higher education (Burn-Murdoch, 2023).

While London's post-crisis productivity growth performance was clearly far weaker than its pre-crisis performance, it is also the case that these types of analyses and the conclusions derived by Rodrigues and Bridgett (2023), are sensitive both to the particular productivity index used and also the starting year chosen for a time-series comparison. The reason is that London experienced a productivity surge during 2006-2008 which was noticeably above the 1998-2005 trend, and which resulted in a marked London productivity spike in the immediate pre-crisis years. As such, using 2007 or 2008 as a starting year for a time-series gives a rather different picture from using starting years such as 1998, 2005 or 2010 (Martin and Sunley, 2023).

On this specific point, using ONS data on regional Gross Value Added (GVA) at 2019 prices applied to ITL1 regions in which all UK regions are indexed to a value of 100 in 1998, Martin and Sunley (2023) show that the growth in overall scale of the ITL1 London economy has continued to outpace all other parts of the United

5 https://www.productivity.ac.uk/the-productivity-lab/the-tpi-productivity-scorecards-for-english-regions-and-devolved-nations/

6 ITL1 stands for International Territorial Level 1, and these represent the 12 large UK statistical regions with an average population of over 5.5 million people. ITL2 represent 41 smaller definitions of regions, and ITL3 represent the 182 smallest definitions of internationally comparable regions. In order to ensure comparability

Kingdom, and that this was true both during the pre-crisis period 1998-2008 as well as during the post-crisis period 2009-2020.[6] These findings also concur with research by National Institute (NIESR) which finds that that London's real GVA (Bhattacharjee *et al.*, 2024a and 2024b) and real household income (Bhattacharjee *et al.*, 2024a) increased between 2019 and 2024 relative to the rest of the United Kingdom, a finding which is also broadly consistent with the IFS's judgement that any progress towards 'Levelling Up' during the period 2019-2024 has been 'glacial' (Farquharson *et al.*, 2024) at best, and in some respects is moving in the opposite and wrong direction.

The online supplementary material to this article also discusses other ONS evidence produced at broadly the same time, which, as with the evidence from other sources reported here, appears to tell a somewhat different story from that which the revised ONS (2024a) estimates suggest.[7] In particular, these other pieces of evidence suggest that London's GDP and GVA did not decrease notably during this period and was recovering rapidly from a sharp decline during the Covid-19 lockdown period.

On the basis of all of these pieces of evidence, the overall outcome of these four decade-long diverging regional growth patterns is that the more geographically peripheral regions of the United Kingdom which were also previously heavily industrialized, have declined the most relative to London and its hinterland, resulting today in a marked core-periphery economic structure of the United Kingdom. In the post-crisis period London's productivity growth has slowed markedly, even slightly below other regions, but allied with faster employment growth and the prevailing productivity gaps, the overall interregional gaps in GDP per capita appear not to have narrowed, except for the results of the recent ONS data revaluations as discussed below.

ONS Data on UK Regional Growth Contractions and Expansions 2019-2022

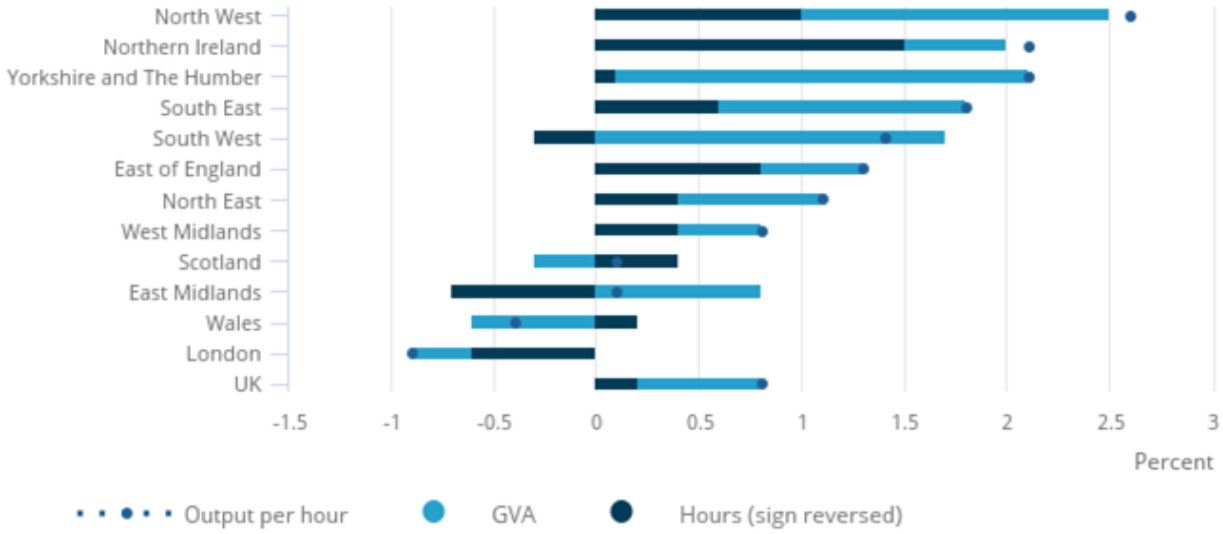
In this section we discuss in detail the new evidence recently produced by the ONS (ONS, 2024a) on the productivity performance of UK regions during the years 2019-2022 spanning the Covid-19 lockdowns, evidence which points to an apparent UK shift from interregional productivity divergence to one of convergence.

Recent data revaluations on UK regional productivity published by the UK Office for National Statistics (ONS) on 17 June 2024 (ONS, 2024a) show that between 2019 and 2022, output per hour worked in the London economy fell annually by 0.9 per cent and cumulatively by 2.7 per cent (Romei, 2024a), whereas across the UK during the same period output per hour worked increased annually by 0.8 per cent (ONS, 2024a) and cumulatively by 2.5 per cent

post-Brexit, the UK ITL1 regions are the same as the UK's OECD-TL2 definition of regions, the UK's ITL2 regions are consistent with the Eurostat NUTS2 regions, and the UK's ITL3 regions are the same as the OECD-TL3 regions. See: https://www.ons.gov.uk/methodology/geography/ukgeographies/eurostat

7 The online appendix can be found here: https://csls.ca/ipm/48/IPM_Supplementary_Material.pdf.

Chart 1: Cumulative Average Annual Growth Rates for Output per Hour Worked, Gross Value Added, and Total Hours Worked for UK ITL1 Regions and the United Kingdom, 2019-2022



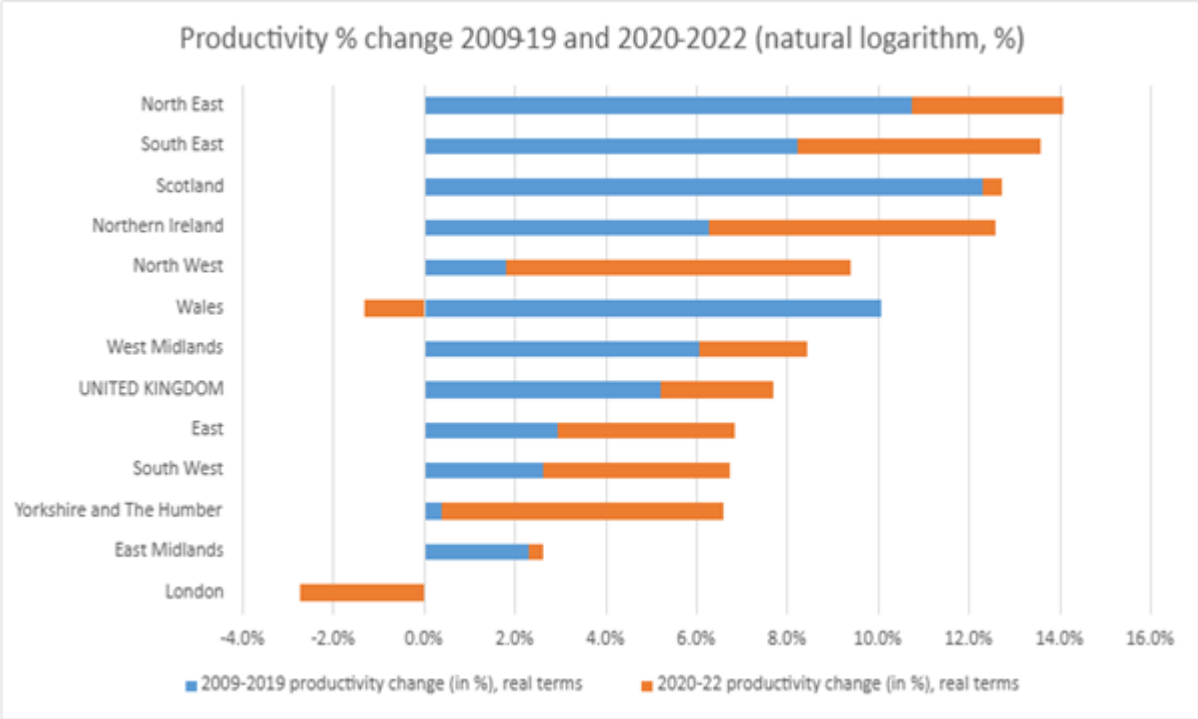
Source Table 3 in ONS, 2024a.

(Romei, 2024a). These new data revisions led to excited headlines in the *Financial Times* concerning how the capital's losses have 'upended' London's post-pandemic growth story (Romei, 2024b), and indeed apparently, London's whole growth trajectory since the 2008 global financial crisis (Romei, 2024a). However, whether in fact these data revaluations do imply an underlying shift from interregional divergence to convergence requires some careful consideration.

In Chart 1 we reproduce exactly Figure 3 from ONS (2024a) which reports these results in detail. The logic of the construction of Chart 1 is as follows. For each ITL1 UK region, as for the United Kingdom as a whole, the chart superimposes the contribution to regional productivity growth (in terms of output per hour worked) of annual GVA growth 2019-2022, calculated cumulatively across these three years, along with the growth in hours worked (sign reversed for ease of exposition). The annual GVA growth 2019-2022 is coloured in light blue/turquoise, while the growth in the number of hours worked is coloured in black . Note that the sign-reversal means that a black bar to the left implies an increase (positive growth) in the total number of hours worked while a black bar to the right implies a decline (negative growth) in the total number of hours worked. The dark blue dot represents the annual growth in output per hour, calculated across 2019-2022.

In terms of the first group, namely the regions experiencing a combination of output growth and falling hours worked, we see in Chart 1 that the North West comes out as the region whose annual productivity growth spanning the pandemic years was

Chart 2: Cumulative Regional Productivity Growth Rates (GVA per Hour Worked) Between 2009-2019 and 2020-2022



Source: Van Ark 2025 based on ONS, 2024a

the strongest. At 2.6 per cent, the region's annual growth in output per hour was comprised of annual output (GVA) growth was 1.5 per cent, while the labour hours worked fell by 1 per cent.[8] This is followed by Northern Ireland, whose annual growth in output per hour of 2.1 per cent was comprised of a 0.5 per cent annual growth in GVA plus an annual decline of 1.5 per cent in hours worked. This type of pattern, namely a growth in output per hour comprised of a combination of a growth in GVA and falling hours worked is also repeated in descending order in the cases of Yorkshire and Humber, South East, East of England, North East and West Midlands.

In terms of the second group, namely those regions which exhibit output growth and increasing in hours worked, the two regions in this category are the South West and the East Midlands, with the annual growth output per hour of the former (1.4 per cent) being much higher than the latter (0.1 per cent). The third category are the regions displaying output falls and declining hours worked, and in this category there are only Scotland and Wales. The fourth category are the regions displaying both falling output and also increasing hours worked. This is only the case for London, with London's output (GVA) falling annually by 0.3 per cent and the number of hours worked increasing by 0.6 per cent.

The decade-long slowdown and recent re-

8 The numbers may not sum exactly in that they are based on the additions of raw percentage figures rather than additions of logarithmic transformations.

versal in the London productivity performance is shown in Chart 2. London flatlined for a decade, followed by a dip during the Covid-19 crisis period. The ONS data (ONS, 2024a) show that, in terms of real output per hour (2019=100), productivity in London barely changed between 2010 (99.45) and 2019 (100), with a decline since 2019, leaving London's real output per hour in 2022 (97.34), some 3.7 per cent below its 2007 peak of 101.04 and 2.66 per cent below its 2019 level (ONS, 2024a; Romei, 2024a). As of 2022, London was 26.2 per cent more productive in terms of output per hour worked than the UK average, a lower hourly productivity premium than at any stage since 1998, and well below the 2007 peak of close to 40 per cent (Romei, 2024a).

At a more detailed geographical scale, the recent data revaluations suggest that the 2019-2022 productivity decline in London was associated with declines in output in all three Outer London ITL2 areas and also zero growth in Inner London East, accompanied by increases in the total hours worked in Inner London East and in two other Outer London areas for the 2019-2022 period (ONS, 2024a). Meanwhile, during this same period of 2019-2022, hourly productivity in the United Kingdom as a whole grew annually by 0.8 per cent, comprised of a 0.6 per cent annual increase in overall GVA and a 0.2 per cent fall in the number of hours worked (ONS, 2024a). This was a period during which the South East and North West regions contributed the most to national growth, with the North West enjoying the highest annual productivity growth rate of 2.6 per cent (ONS, 2024a).

Overall at the national level, labour productivity in terms of output per hour worked increased in 30 out of the 41 ITL2 subregions of the UK between 2019 and 2022, and in 7 out of the 12 ITL1 regions this productivity growth was achieved primarily by the number of hours worked falling while overall GVA increased (ONS, 2024a), while in 2 ITL1 regions (East Midlands and South West) rising GVA was also accompanied by to a lesser extent by a rising number of hours worked. In Scotland falling GVA was accompanied by even greater falls in hours worked, thereby increasing hourly productivity (ONS, 2024a). In contrast, London experienced a falling GVA output of 0.3 per cent per annum alongside increasing hours worked of 0.6 per cent per annum, leading to annual falls in hourly labour productivity of 0.9 per cent (ONS, 2024a).

For the period 2019-2022 the recent data revaluations point to possible changes in UK regional growth trajectories associated with the Covid-19 lockdown shocks. The data suggest that the lockdown period was associated with major changes in both the annual and cumulative regional GVA growth rates alongside the changes in hours worked. The ONS evidence as discussed in the previous sections implies that London faced the second highest fall in output 2019-22 (after Wales) and the second highest increase in hours worked (after East Midlands), the combination of which led to the highest overall regional fall in output per hour worked. In other words, while London's productivity and overall economic growth performance deteriorated markedly during the years traversing the Covid-19 lockdowns relative to the rest of the United Kingdom, other regions

Table 1. London Productivity Jobs and Productivity Hours, 2019–2022 (ITL2 and ITL3)

	Jobs % Change				Hours % Change			
	% Change 2019-2022	Annual % Change 2019-2022	Annual % Change 2020	Annual % Change 2021	% Change 2019-2022	Annual % Change 2019 -2022	Annual % Change 2020	Annual % Change 2021
LONDON	3.49	1.16	-1.33	0.75	1.80	0.61	-11.07	7.97
Inner London West	3.56	1.19	-2.76	3.48	1.22	0.41	-10.89	9.42
Inner London East	6.31	2.10	-0.56	0.37	4.77	1.58	-10.04	6.96
Outer London East & North East	2.34	0.78	-1.99	-0.67	2.95	0.98	-8.65	4.02
Outer London South	4.22	1.41	0.57	-1.82	0.04	0.02	-12.51	6.22
Outer London West & North West	-0.42	-0.14	0.16	-2.35	-0.14	-0.05	-13.85	8.40

Source: ONS (2024b)

of the United Kingdom appeared to have improved both their productivity growth and overall economic growth performance in relative terms during this same period.

Yet, at the same time, other evidence discussed above and also in the online supplementary material suggests that London's Covid-19 fall in output was only temporary and its ongoing recovery was relatively fast (ONS, 2025a,b,c). As such, the trends are still somewhat unclear. These recent data revaluations therefore raise the question as to whether the different regional growth changes observed during the years 2019-2022 are transient or represent more fundamental and permanent post-Covid shifts in regional growth trajectories from the pre-Covid period of interregional divergence to a post-Covid interregional convergence trajectory.

Productivity Jobs, Productivity Hours Worked, and Population Changes

A key issue concerns the revised number of 'productivity hours worked' and 'productivity jobs' used to calculate the revised output per hour estimates. The specific data which the ONS (2024a) used in their recently revised 'productivity hours per week' worked and 'productivity jobs per year' calculations are given in Table A1 and Table A2 of the online supplementary material, respectively, and which themselves are derived from Tables 12 and 13, respectively, of ONS (2024b). Here in Table 1 we report simply the growth rates in the productivity jobs and the productivity hours and in Table 2 we also report the population changes for London.

As we see in Table 1, between 2019 and 2022, London increased its number of productivity hours by 0.6 per cent per annum, while the number of productivity jobs increased by 1.16 per cent per annum

Table 2: London Population Changes 2019-2022 (ITL2 and ITL3)

	Pop Change 2019-22	% Change 2019-22	Annual % Change 2019-22	Annual % Change 2020-21
LONDON	-95,809	-1.07	-0.36	-2.29
Inner London West	-111,328	-9.19	-3.06	-12.25
Inner London East	-65,332	-2.69	-0.89	-4.21
Outer London East & North East	12,946	0.67	0.22	0.24
Outer London South	5,416	0.41	0.14	-0.12
Outer London West & North West	62,489	2.98	0.99	2.11

Note: The change 2019-2020 is from mid-2019 to mid-2020, and this continues for the following years. The detailed mid-year population estimates are discussed in the online supplementary material.
Source: ONS (2024e)

during the same period 2019-2022. This was comprised of a 2020 fall of 11.7 per cent in productivity hours and a fall of 1.3 per cent in the productivity jobs, followed immediately by rapid increases in the number of both productivity hours and jobs in 2021, representing a greater recovery than any other region except the East Midlands. However, these revised 'productivity hours' and 'productivity jobs' figures (ONS, 2024b) which are used in the revised regional productivity estimates (ONS, 2024a), appear to be inconsistent with estimates for the total population over the same period.

London's population fell at precisely the same time that both its 'productivity jobs' and 'productivity hours' increased. Table A3 in the online supplementary material reports the various detailed mid-year population estimates for ITL1, ITL2 and ITL3 London (ONS, 2024c) while Table 2 here provides the population growth rates for the ITL1 London region and its ITL2 component sub-regions. As we see in Table 2 for London as a whole, the ITL1 London population contracted annually by 0.36 per cent per annum between 2019 and 2022. This ITL1 London population contraction was accounted for entirely by population falls in the ITL2 Inner London areas of 3.1 per cent per annum for Inner London West and 0.9 per cent per annum for Inner London East, respectively. Meanwhile, during this period 2019-2022, all three Outer London ITL2 regions experienced very low population growth rates.

During the period 2019-2022, London's 'productivity hours' worked and 'productivity jobs' are therefore both apparently increasing (ONS, 2024b) at precisely the same time that London's population is contracting at its fastest rate for more than five decades (ONS, 2020), a contraction due to the Covid-19 lockdown (ONS, 2024c). In particular, as we see in Table 2, between 2020 and 2021, when London's population fell by 2.29 per cent in one year (ONS, 2024c), we see in Table 1 that the number of 'productivity hours' worked in Lon-

don apparently increased by 7.97 per cent and the number of 'productivity jobs' increased by 0.75 per cent (ONS, 2024b), respectively. From Table 2 we also see that for the Inner London areas between 2020 and 2021, the population of Inner London West fell by 12.25 per cent, while that of Inner London East fell by 4.21 per cent. At the same time, apparently, the number of 'productivity hours' worked in Inner London West increased by 9.42 per cent and in Inner London East by 6.96 per cent. In other words, the overall London pattern is that the productivity jobs and productivity hours were increasing at the same time that London's population was falling.

Meanwhile, 'productivity hours' worked fell in the North West, North East, Yorkshire and Humber, West Midlands, East, South East, Scotland, Wales and Northern Ireland; in other words in 9 out of the 11 other ITL1 regions, at precisely the same time that these same regions experienced population growth (ONS, 2024d and 2024e). Of course, one might argue that changes in total residential population and the total number of productivity hours worked might a priori not need to be highly correlated. Indeed, employment, participation, unemployment and activity rates vary by location, income group, household types, employment tenures and demographic structures.

However, these differences tend to be observed at small neighbourhood or small-town scales. In larger territories, such as regions, these differences tend to disappear, except for the case of regions with high in-migration of retired people, primarily for lifestyle and natural amenity reasons. Other than these cases, once we consider ITL1 region-wide populations sizes of between 2 million and 9 million, these differences tend to largely disappear, such that we would expect that population growth and the growth in the total number of productivity hours worked move in a similar direction for ITL1 regions. It therefore seems very difficult to reconcile the population figures for London with the revised data for the number of 'productivity hours' worked or the number of 'productivity jobs'. This requires us to consider these population and labour input data in more detail.

Data Checks

In order to try to reconcile the GDP, GVA, labour inputs and population data for London reported in section 3 and in the online supplementary material with the revised ONS (2024a) data reported in section 2, we need to delve even deeper into the data revisions to seek further clues as to how these changes may have arisen.

In order to better understand the nature, scale and pattern of the changes in regional productivity drivers and outcomes which are associated with the 2024 revised estimates, we can plot the relationships between the estimates published in 2023 and 2024 from a broad range of perspectives.

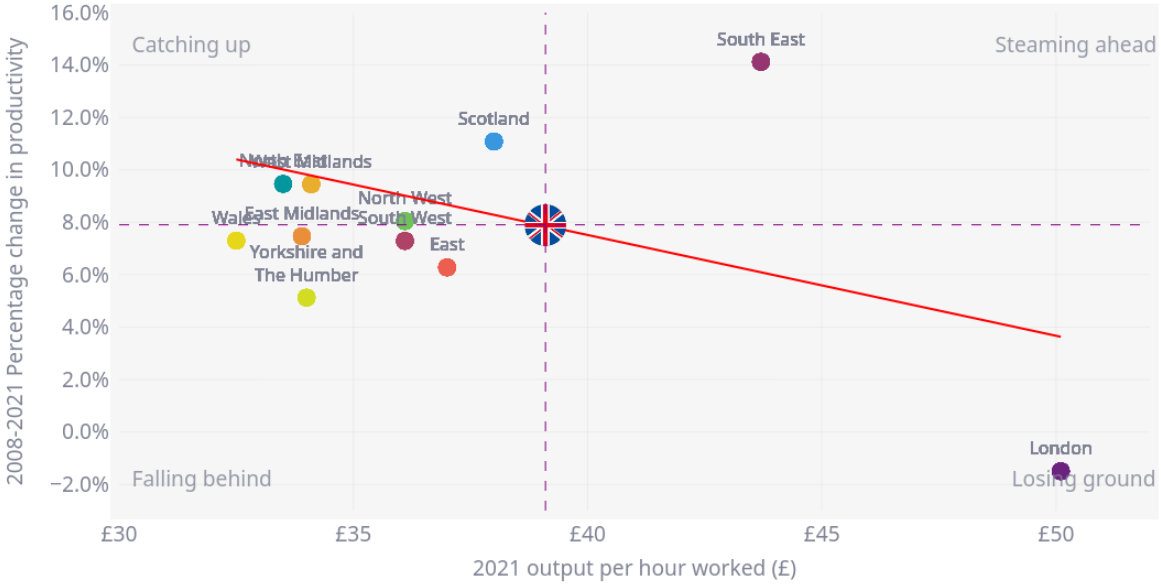
Charts 3 and 4 compare the relationships between the regional nominal smoothed GVA per hour with the productivity changes 2008-2021 for both the 2023 and 2024 data releases, respectively. As we see, the 2024 data release noticeably downgrades the productivity growth performance of London and Wales with respect to the rest of the UK regions.

Chart 3: UK ITL 1 Regions 2021 Nominal Smoothed GVA per hour, versus 2008-2021 Productivity Change (2023 Data Release)

TPI visualisation, based on ONS Subregional Productivity June 2023 release

Source: 2023 ONS data release

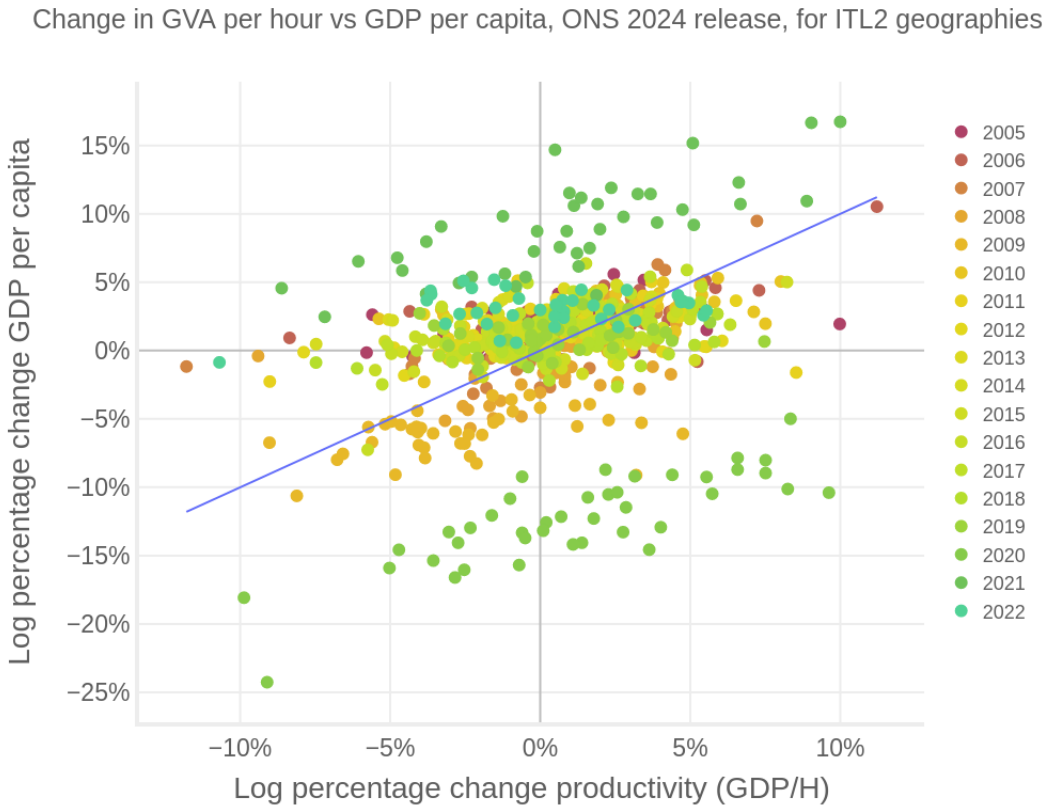
Chart 4: UK ITL 1 Regions 2021 Nominal Smoothed GVA per hour versus 2008-2021 Productivity Change (2024 Data Release)



TPI visualisation, based on ONS Subregional Productivity June 2024 release

Source: 2024 ONS data release

Chart 5: The Relationship Between GVA per Hour Worked and GDP Per Capita with Respect to the Year



Source: 2024 ONS data release

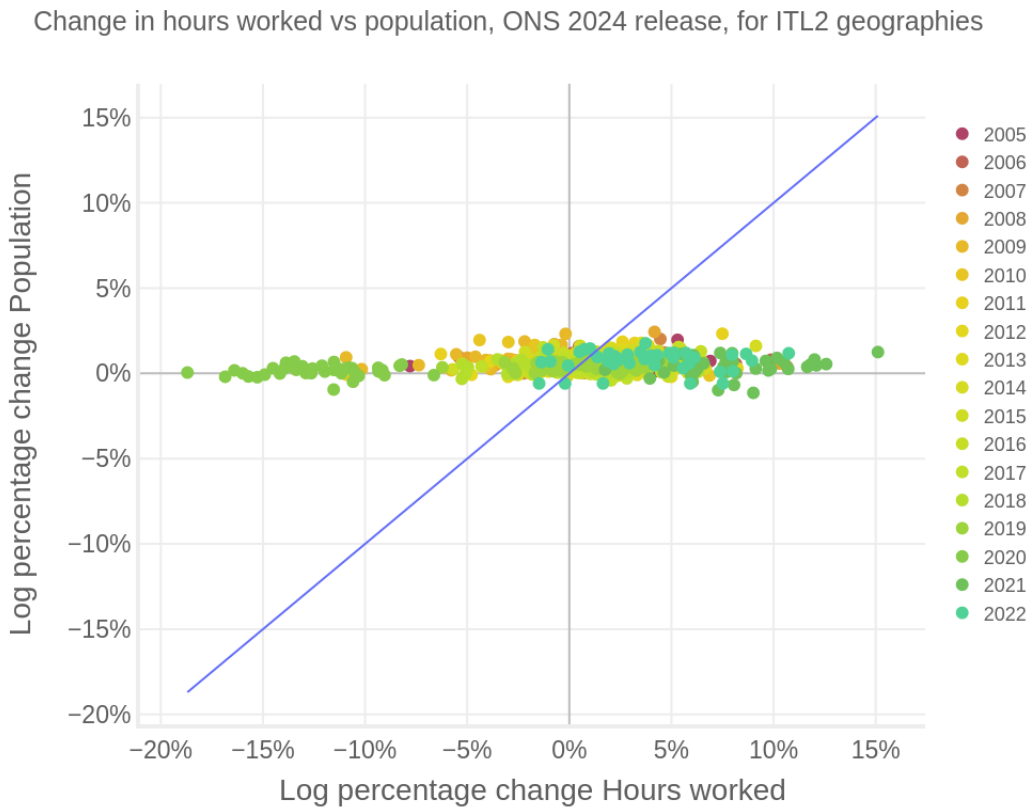
Charts 3 and 4 suggest that the 2024 data revaluations of the 2023 data release are not marginal in terms of their impacts on our perceived understanding of the long-run convergence or divergence relationships of the UK interregional economic system.

The 2024 data revisions, however, have not impacted evenly across all time period or places. Chart 5 shows the scatterplot of the relationship between GVA per hour worked and GDP per capita for ITL2 regions with respect to the year. As we see, for the 2020 and 2021 data there is far less correspondence with each other than might have been expected from numerous economic studies, with the data for the years of 2020 and 2021 appearing to behave markedly different to other years.

Meanwhile, there is almost no discernible UK-wide difference in the reported hours worked between the 2023 and 2024 releases, except that in the 2024 data release there has been a large correction from the 2023 release for 2021. However, as we see in Chart 6, if we consider the total hours worked and the population data with respect to the year, the relationships bear little or no resemblance to each other, with rather unusual separated clusters of regions, again for the years 2020 and 2021.

If we also consider the total hours worked and the population data with respect to the ITL2 region, again these relationships bear little or no resemblance to each other,

Chart 6: The Relationship Between the Change in 'Productivity Hours' Worked and the Change in Population with Respect to the Year

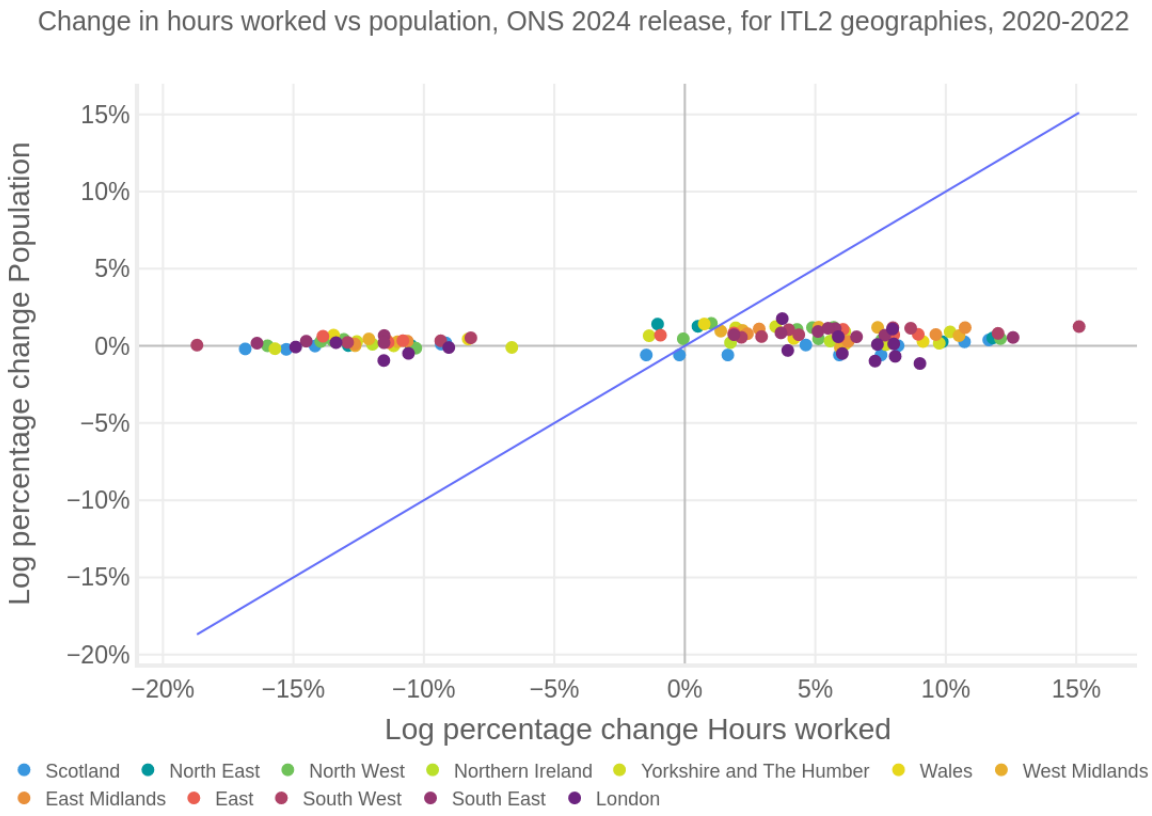


Source: 2024 ONS data release

with very unusual separated clusters of regions, as depicted in Chart 7. In particular, the largest differences occur in the links between population data and the numbers of hours worked for the ITL1 London region and its ITL2 sub-regions of London, where in the 2023 release the reported rate of population decline in 2021 was 13 per cent for Inner London West, whereas this has been revised to a decline of just 1.1 per cent in the 2024 release. Meanwhile, according to the 2024 release the growth in the number of hours worked in 2021 for London stays roughly the same at around 9 per cent, whereas the growth in hours worked for 2022 is again high for both the London and Scotland ITL1 regions, but generally more modest for the North West. The addition of 2022 does create large differences in productivity growth for a few regions, most notably (and negatively) for London. This can be seen from the comparison of the volume of GVA with GDP which are reasonably well aligned and where the London ITL2 areas seem to do reasonably well in both measures. Therefore, the drop in productivity is due to the large reported increase in hours worked in London.

As we see in the online supplementary material, combining all of these data suggests that for most regions the GVA data and the GDP data are broadly consistent between the 2023 and 2024 data revaluations. There are no dramatic differences

Chart 7: The Relationship Between the Change in 'Productivity Hours' Worked and the Change in Population with Respect to the ITL2 Region



between GDP volumes and GVA volumes in either the 2023 or 2024 data releases, and also that GVA is internally consistent between the regional GDP and productivity data. Where there are differences, these are from 2019 onward, most notably during the Covid-19 crisis for the years 2020 and 2021. Nominal GVA measures are the most heavily revised figures, and especially downward revisions for London and Wales, and it appears that the 2024 data revaluations are 'correcting' some of the extreme values from the 2023 release. For example, according to the 2023 release Inner London West's GVA per capita was growing by 20.1 per cent in 2021, whereas in the 2024 release this has dropped to 11.5 per cent.

In general, the combination of the lack of correspondence between the GVA per hour and the GDP per capita ITL2 data for 2020 and 2021, alongside the rather unusual, separated clusters of regional data for the years 2020 and 2021, suggests that there are likely to be problems with the revised data regarding the number of hours worked and the implied price deflators. The data on the numbers of hours worked in each region is likely to be a reason for the lack of expected correspondence between the 2023 and revised 2024 figures on productivity, and this also arises from a reconsideration of Chart 1 above.

Explaining the Unusual Productivity Results

Lack of Economic Rationale

Returning to our initial observations, Chart 1 implies that seven UK ITL1 regions (North West, Northern Ireland, Yorkshire & Humber, South East, East of England, North East and West Midlands) experience a combination of total output growth and falling total hours worked during the years spanning the Covid-19 era. All of these regions exhibited population growth during this period (ONS, 2024f and 2024g), even though they also exhibited falling hours worked. In contrast, London which is by far the UK's most productive and technologically advanced ITL1 region, displays falling total output while increasing the total hours worked during this same period 2019-2022. Moreover, London is the only ITL1 region facing a falling population between 2020 and 2021 and between 2019 and 2022 (ONS, 2024f,g). Again, the hours worked and the population change appear to be at odds with each other. In other words, during the period spanning the Covid-19 lockdowns, the UK regions, each of which involves millions of people and many hundreds of thousands of firms, displayed aggregate features which appear to be the opposite of those typically understood in the economics of regional productivity.

Following a very standard production–function logic, Q_{rt}-regional output at time t-is assumed to depend on the technological level ϕ, the regional capital stock K_r, and the regional labour stock L_r:

$$Q_{rt} = A\, e^{\phi t} K_r^{\alpha} L_r^{1-\alpha} \qquad (1)$$

Expressed in labour-productivity growth rates, this becomes

$$\dot{Q}_{rt} - \dot{L}_{rt} \;=\; \phi + \alpha(\dot{K}_{rt} - \dot{L}_{rt}) \qquad (2)$$

In other words, labour productivity growth in terms of output per hour, is positively related to the level of technology plus the (weighted) growth in the capital-labour ratio. Assuming that in the short-term the rate of growth of capital is very small, and especially during the Covid-19 lockdown, then increasing labour hours worked would be expected to be associated with a diminishing rate of labour productivity growth, but increasing total output growth. Similarly, falling labour hours worked imply increasing labour marginal productivity growth but falling total output.

Regarding the results reported in Chart 1 (Chart 3 in ONS, 2024a), only four out of the twelve UK regions correspond to these relationships defined by equations (1)-(2) in which the growth of regional output Qrt is positively related to the number of hours worked. These are the South West, East Midlands Scotland and Wales. Both the South West and the East Midlands are expanding both in terms of output growth and the hours worked, while Scotland and Wales are both declining both in terms of output growth and the hours worked.

In contrast, there are eight regions whose productivity relationships are in fact the complete opposite of the relationships

sketched out in equations (1)-(2). These regions are North West, Northern Ireland, Yorkshire & Humber, South East, East of England, North East, West Midlands and London. Indeed, during the 2019-2022 period spanning the Covid-19 pandemic, these eight regions, which together account for two-thirds of the overall UK population, appear to correspond to a production function which looks like it is written as:

$$Q_{rt} = -Ae^{\phi t} K_r^{\alpha} L_r^{1-\alpha}, \qquad (3)$$

This apparently *negative* or *inverse* production function is difficult to understand in economic terms of the relationship between the regional labour hours worked L_r, and the output Q_r produced.

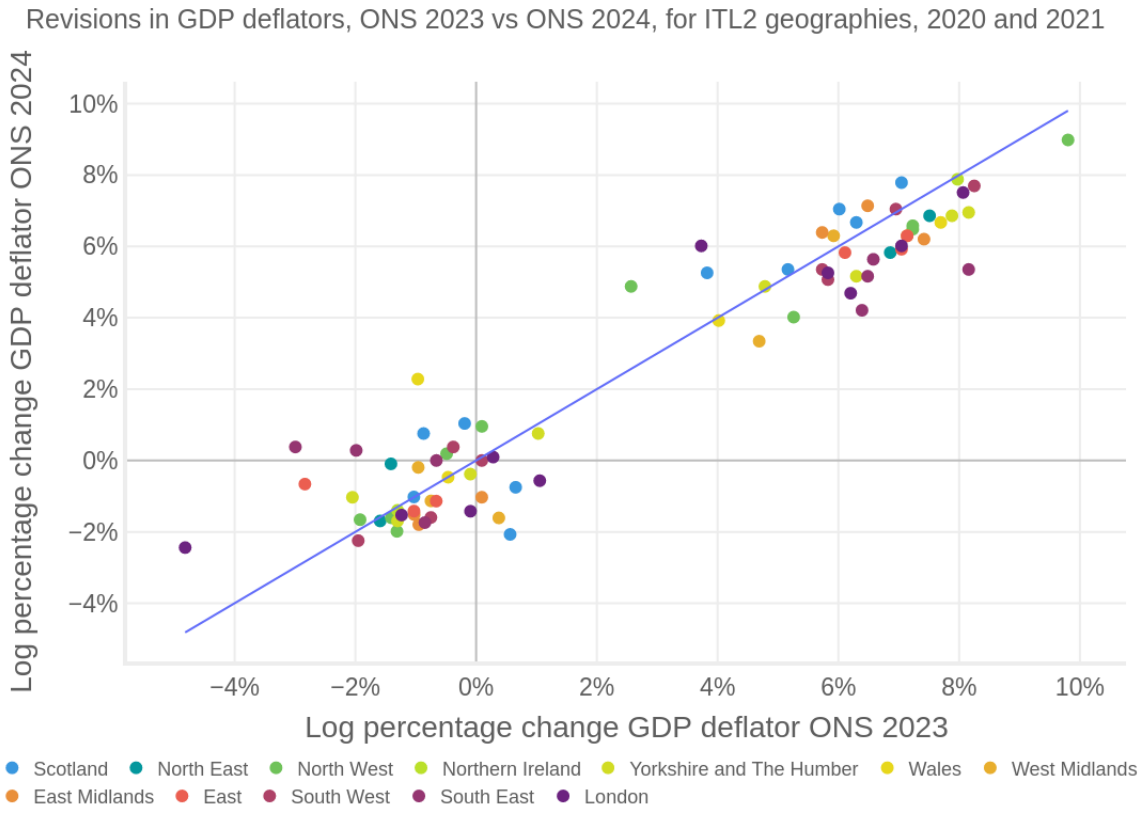
Possible Regional Productivity Effects of the Covid-19 Lockdowns

At a stretch, it might be argued that for some unexplained reason the Covid-19 pandemic lockdown might somehow have provided a large negative 'technology' ϕ shock to the London region, and a simultaneous positive 'technology' ϕ shock to seven other regions (North West, Northern Ireland, Yorkshire & Humber, South East, East of England, North East, West Midlands) while leaving Scotland, South West, East Midlands and Wales, largely unaffected in terms of how 'technology' interacts with the rest of the regional production function elements.

In this regard, for the London region, one of the features of the pandemic era was the so-called 'donut effect', whereby across OECD countries many people relocated away from large city centres to suburbs, smaller towns or rural areas (Bond-Smith and McCann, 2024), and the population data suggests that indeed London was alone amongst ITL1 regions in experiencing population decline during 2019-2022, after which it recovered beyond its pre-2019 population levels. Given that GVA is calculated at the workplace, this 'donut' effect may have had an adverse shock effect on London's productivity (McCann and Vorley, 2021) if out-migrants re-registered their work locations outside of London. However, during the pandemic, most workers who shifted to hybrid online work were still working for firms with the same registered workplaces in London. Moreover, large cities with higher shares of tertiary-educated white-collar workers who were better able to adapt to new technologies such as Zoom, Teams, Google-Meet, typically passed through the pandemic relatively unscathed in comparison to smaller places with relatively more blue-collar workers (Bond-Smith and McCann, 2024). London has much higher shares of tertiary educated workers employed in activities more amenable to new communications technologies than other large UK cities and regions, casting doubt on the argument that London faced an adverse technological shock in comparison to all other UK regions. Conversely, it is very difficult to identify why Covid-19 lockdowns would systematically provide a positive technology shock to so many other regions whose industrial, labour market and employment profiles were much less amenable to the hybrid work-from-home online technologies.

Similarly, as we see in Chart 8, it is difficult to identify any systematic Covid-19

Chart 8: The Relationship Between the ITL2 Regional Price Deflators for the ONS, 2023 and 2024 Releases



lockdown-related effects on regional price deflators which would account for the revised ONS (2024a) results, with the implied regional price deflators splitting into two separated clusters for no immediately obvious reason. In addition, we also have other information on regional deflators in the years leading to the onset of the Covid-19 pandemic in the form of regional capital deflators at both the ITL1 and ITL2 levels (Becker and Martin, 2023a). What we observe is that during these years immediately prior to the pandemic lockdown, there was very little change in regional deflators and almost no change whatsoever in the deflators relating to regional ICT investments (Becker and Martin, 2023b), the very technology most associated with the work-from-home revolution (Bond-Smith and McCann, 2024) driven by the pandemic lockdown itself. Similarly, if we consider regional real estate cost deflators, the pandemic shocked city centre business district office markets, most notably London (Strauss, 2024a). However, the evidence suggests that this process has recently been reversed (Byers, 2023; Oliver, 2024), with real estate demand in London now outpacing other regions (Romei, 2024c and 2024d;, 2025a; Oliver, 2025). In other words, price deflators for central London would be expected to be lower than for other areas adjacent to London 2019-2022, but increasing markedly by 2023-2024. As such, the patterns of regional capital deflators and regional real estate price deflators

that we observe also do not appear to account for the (ONS, 2024a) revised figures.

More fundamentally, however, is the fact that even a pandemic lockdown-induced 'donut' effect on large cities would not in any way account for London's combination of falling total output and increasing total hours worked. Nor would it account for the combinations apparently enjoyed by seven other regions (ranging in population from 1.9m to 9.2m) of rising total output and falling total hours worked. Indeed, much of the country during 2020 and 2021 was being supported by the government-funded 'Coronavirus Job Retention Scheme', commonly known as the 'furlough scheme' (Clark, 2021), and this was especially important in economically weaker regions. Given that so many businesses and commercial transactions were frozen during the 2020-2021 lockdown period, it is difficult to understand how these other regions could have experienced a combination of increasing total output allied with falling total hours worked.

Conclusions

In this article we have examined whether the recent UK regional productivity revisions point to an underlying shift from regional divergence to one of regional convergence. In order to do this, we have surveyed the range of different data sources produced from different arenas, including official statistics, and examined these in detail, in order to identify the likely drivers of the observed regional productivity shifts.

Our analysis points to major data revisions for the years 2020 and 2021 which heavily impact on the reported productivity performance of UK regions for the period 2019-2022 spanning the Covid-19 lockdown. We highlight that some of these revisions lead to results and distributions which are very difficult to understand in terms of economics, even in the light of the Covid-19 lockdown shock. Instead, rather than any underlying Covid-19-related technological, structural or behavioural changes inducing a shift from interregional divergence to convergence, the most likely explanation for the data pointing towards a shift from regional divergence to regional convergence is to be found in terms of the quality and reliability of the official statistics in development for the period 2019-2022.

The Covid-19 lockdown period posed serious challenges to data-gathering and data-building. As such, in order to really understand whether the ongoing trajectory of UK regional productivity growth is one of divergence or convergence, it will be necessary to observe several more years of data as they emerge.

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