

**Pion  
Economics**

**Spatial Productivity  
And Levelling Up:  
An England Perspective**

**Kingfisher Business Centre  
Burnley Road  
Rawtenstall  
Lancashire  
BB4 8EQ**

**Tel: 07774 730570**

**Spatial Productivity and  
Levelling Up: An England  
Perspective**  
**August 2022**

## Introduction

The persistence and extent of spatial productivity across England is well established. Profiling of Gross Value Added per hour (GVAh) shows that the vast majority of the highest productivity local areas are located in London and the South East with substantial clusters to the south east and north east of the capital and west along the M4 corridor. There are few such locations in the North of England with only a handful in any regions outside the South East and London.

The 2022 ‘Levelling Up the United Kingdom’ White Paper is the latest in a series of studies detailing subnational disparities in economic performance and, following convention, profiles area performance relative to a number of spatial indicators<sup>1</sup>. This is a standard approach to area studies in which a series of individual economic indicators are used to show how an area performs relative to a given benchmark, whether it be a regional/UK average or a set of comparator areas. The analysis is then traditionally used to infer area characteristics that will contribute to or hinder development prospects.

Such approaches, however, provide a less than ideal basis for policy development in that the process provides only a ‘partial’ picture of how performance relates to area ‘assets’ and fails to provide any insight as to how the combination of these attributes interact to enhance or constrain the development potential of an area. The objective of this paper is to address this issue and to assist understanding of:

- how the ***mix*** of local attributes/drivers can help to determine the future prospects of an area;
- which of the particular local attributes under review is of ***most*** significance in determining future potential; and
- how the mix of attributes ***varies*** from other benchmark areas or more economically successful parts of the country.

Our performance variable for the analysis is the experimental ONS dataset on GVA per hour worked (GVAh) across local authority districts (LADs). The productivity driver dataset reflects the work programme undertaken for a 2021 BEIS/DLUHC exercise but is updated to 2018 data rather than the original 2017, with all indicators derived from public domain sources<sup>2</sup>.

Addressing issues of collinearity, spatial dependence, endogeneity and distributional form, the analysis provides an interesting perspective as to the nature of spatial productivity patterns across England. We also attempt to value the scale of productivity gains/losses related to local economy attributes across the Levelling-Up Priority Areas, setting these against the level of intervention proposed in the Levelling-Up Fund (LUF)<sup>3</sup>.

---

<sup>1</sup> [Levelling Up the United Kingdom](https://www.publishing.service.gov.uk) ([publishing.service.gov.uk](https://www.publishing.service.gov.uk))

<sup>2</sup> Decomposition of Regional Productivity, (2021), Amion Consulting, (Unpublished)

<sup>3</sup> We are grateful for the advice and assistance of J M Tomkins in the preparation of this document.

## **Geography and Productivity: England**

Sub-regional variation in GVAh is substantive across England. At regional level, the preponderance of above median LADs in the London and South East regions is evident (Figure 1) though the latter also contains a tail of below median performers<sup>4</sup>. Most other regions contain a small number of higher performing LADs often counterbalanced by a larger number of below median performers.

Figure 2 provides a more detailed sub-regional profile illustrating variation across ITL2 areas<sup>5</sup>. Many ITLs display extensive ranges with only a handful (Cheshire, Inner London West, Outer London (East/North East, South and West/North West) having sub-areas that all lie in the positive domain. Likewise, only Cornwall/Isles of Scilly, Devon and South Yorkshire have sub-areas all below the median.

More generally, observation of the spatial profile confirms expectations that the highest performing LADs are primarily urban in nature. Contrasting GVAh with the ONS rural-urban classification shows that over 90% of the top quintile is defined as either a major conurbation or urban area with cities/towns. Some urban areas with significant rural hinterlands, on the other hand, also demonstrate high GVAh values. Close to 40% of the bottom quintile is defined as either largely or mainly rural but a similar proportion is also defined as either a major conurbation or an urban area with a city/town which implies a tail of lower performing urban areas.

## **Data and Methods**

The original BEIS/DLUHC exercise operated in the context of the monitoring framework set out in the BEIS 2019 LEP Outlook Report (July 2020). The underlying datasets delivered a detailed (80+ indicator) spatial overview of areas across England aligned with the UK Industrial Strategy.

Scrutiny of the dataset, on the other hand, showed that a number of indicators took the form of counts, enabling an appreciation of absolute but not relative scale. A number were viewed as outcomes associated with differential productivity performance rather than drivers of that performance and a number overlapped, reporting on different dimensions of the same phenomenon. Inevitably, some indicators were not spatially consistent with the GVA per hour (GVAh) performance variable and a number were residence-based, as opposed to workplace-based, in nature. We also opted to develop/refine some indicators to represent evidence of omitted drivers (e.g. agglomeration, intangibles).

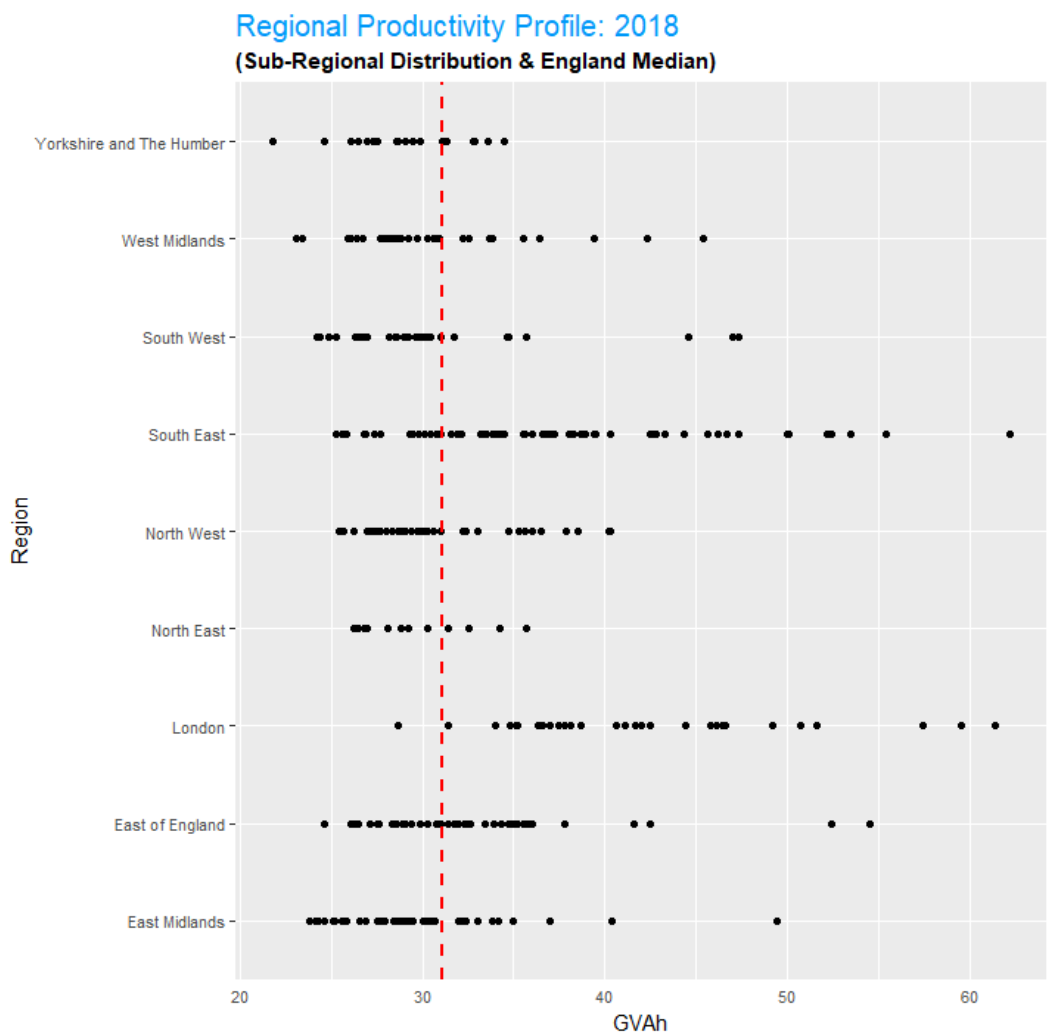
The working dataset used in the original BEIS analysis was pre-processed and screened prior to modelling. This process resulted in a working dataset that is outlined in Table 1, reflecting Industrial Strategy asset groups

---

<sup>4</sup> Harris and Moffat (2021) discuss the nature of the London productivity advantage.

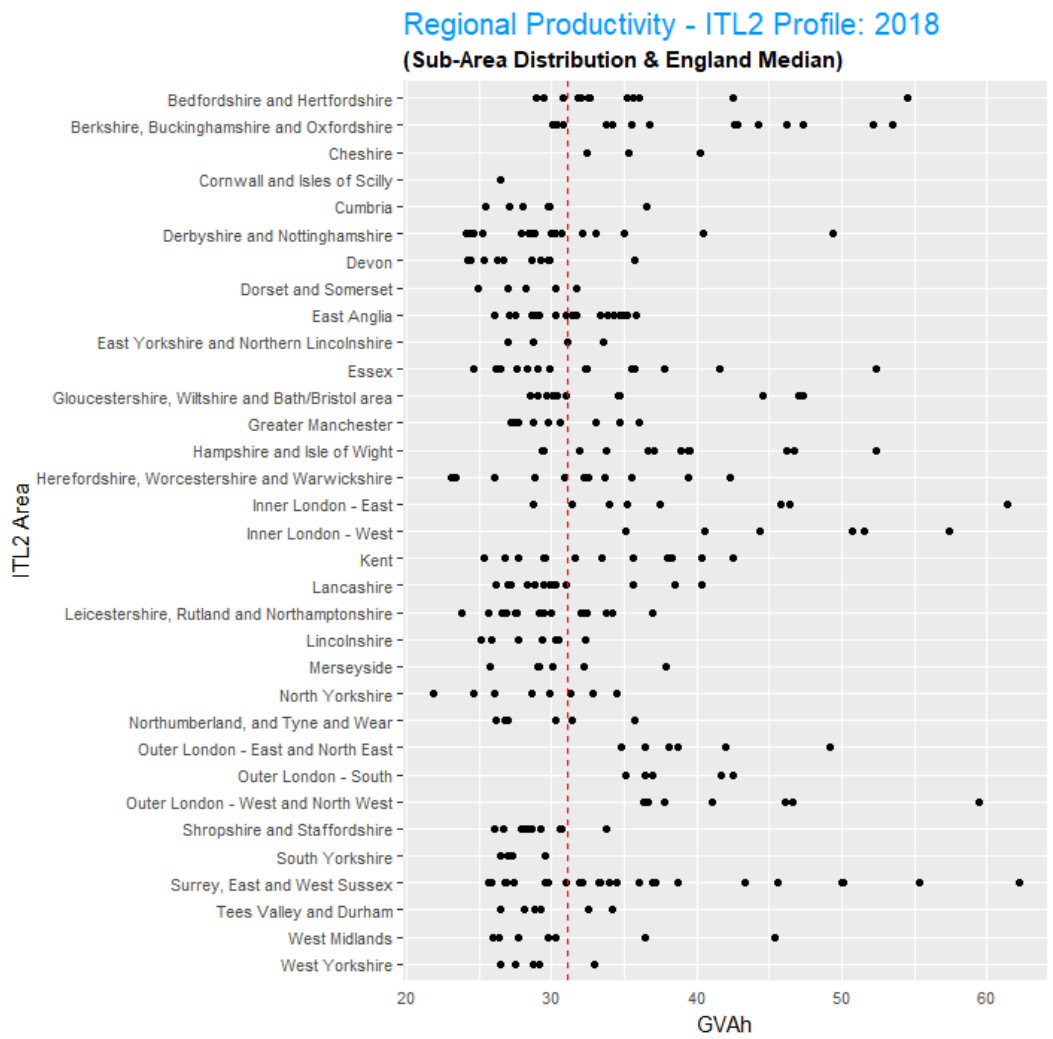
<sup>5</sup> ITL areas have superseded NUTS area classifications but are essentially the same at present.

**Figure 1: Regional GVAh Profile (2018)**



Source: ONS/Pion Economics

**Figure 2: ITL2 GVAh Profile (2018)**



<b>Table 1: Study Indicators</b>		
<i>Asset/Driver Group</i>	<i>Indicators</i>	<i>Source</i>
Business and Enterprise	<ul style="list-style-type: none"> <li>(i) micro firms: percentage of business units in an area with less than five employees (shblt5)</li> <li>(ii) business density: number of business units in an area relative to 10,000 population (busdens)</li> <li>(iii) proportion of firms with £50m+ turnover (tn50mpl)</li> <li>(iv) proportion of private sector jobs (prsecjobs)</li> <li>(v) value of services exports relative to GDP (expsgdp)</li> <li>(vi) proportion of office floorspace (offsp)</li> </ul>	<ul style="list-style-type: none"> <li>UK Business Workbook (ONS)</li> <li>UK Business Demography (ONS) &amp; 16/64 Population by LAD (ONS)</li> <li>UK Business Workbook (ONS)</li> <li>Business Register and Employment Survey (ONS)</li> <li>Value of services exports (2017) (ONS)</li> <li>Floorspace Statistics (VOA)</li> </ul>
Industrial Structure and Agglomeration	<ul style="list-style-type: none"> <li>(i) GVA weighted employment as a proportion of total employment (indstr)</li> <li>(ii) location quotient (LQ) of KBI employment within each area (UK base) (kbiq)</li> <li>(iii) a measure of Jacobian spillovers - benefits to firms related to diversity of local economic activity – measured as the proportion all 5 digit SIC codes reported with employment in a 50k radius of each local area (spilj)</li> <li>(iv) a measure of MAR (Marshallian, Arrow, Romer) spillovers - benefits to firms from concentration of similar/related local economic activity – measured as the percentage of total employment within a 50k radius in 2 digit SIC sectors, weighted by the share of sectors in total (England) employment (spilm)</li> </ul>	<ul style="list-style-type: none"> <li>Business Register and Employment Survey (ONS &amp; Pion Economics)</li> <li>Business Register and Employment Survey (ONS &amp; Pion Economics)</li> <li>Business Register and Employment Survey (ONS &amp; Pion Economics)</li> <li>Business Register and Employment Survey (ONS &amp; Pion Economics)</li> </ul>

<b>Table 1: Study Indicators</b>		
<i>Asset/Driver Group</i>	<i>Indicators</i>	<i>Source</i>
Labour Market and Skills	<ul style="list-style-type: none"> <li>(i) proportion of full-time jobs (ftjobs)</li> <li>(ii) net (inward) international migration as % of population (nintmig)</li> <li>(iii) proportion of work-based NVQ4+ employees (wnvq4pl)</li> <li>(iv) share of total HE undergraduate students studying within 50k of area (heug)</li> </ul>	<p>Business Register and Employment Survey (ONS) Local Area Migration Indicators (ONS)</p> <p>Annual Population Survey (APS) &amp; Census(2011) Higher Education Statistics Authority (HESA) &amp; Pion Economics</p>
Infrastructure	<ul style="list-style-type: none"> <li>(i) journey-time to all UK airports with 2m+ scheduled passengers per annum (weighted by passenger numbers) (dairp)</li> <li>(ii) journey-time to all UK ports with 50m+ tonnes freight per annum (weighted by tonnes) (dport)</li> <li>(iii) journey time to nearest national level station (nstat)</li> <li>(iv) remoteness Index (remote)</li> <li>(v) per cent premises with access to ultra-fast broadband (ufbb)</li> <li>(vi) median download speed (meddsp)</li> <li>(vii) per cent premises with inward 4G access in 4+ rooms (prem4gin)</li> </ul>	<p>Pion Economics &amp; Civil Aviation Authority (CAA)</p> <p>Pion Economics &amp; Port Freight Statistics (DfT)</p> <p>Department for Transport (DfT) Journey Time Statistics Area Cost Adjustment (MHCLG)</p> <p>Connected Nations (Ofcom) Connected Nations (Ofcom) Connected Nations (Ofcom)</p>
R&D and Higher Education	<ul style="list-style-type: none"> <li>(i) concentration (LQ) of high R&amp;D sectors (rdbus)</li> <li>(ii) volume of total research funding for HE in 50km radius relative to business base (totgntbus)</li> <li>(iii) number of HE related patents relative to staff numbers in 50km radius (pathe)</li> </ul>	<p>Business Expenditure on R&amp;D Datasets (ONS)</p> <p>Higher Education Statistics Authority (HESA) &amp; Pion Economics</p> <p>Higher Education Statistics Authority (HESA) &amp; Pion Economics</p>



## **Modelling Challenges**

Modelling spatial performance in terms of GVAh faces a range of potential issues that complicate analysis of area-level productivity performance - collinearity, spatial dependence, endogeneity and distributional form. These are discussed in detail within a separate technical paper as is the exGaussian semi-parametric technique used for modelling.

## **Productivity profiling**

The spatial modelling, and the definition of indicator weights within the model outputs, enables us to construct a productivity profile reflecting the distribution of indicator/driver elements across areas within England.

Figure 3 outlines the weights that correspond to the preferred model (scaled against the highest weighted feature for ease of interpretation) and indicates that:

- greatest scoring prominence is attached to knowledge-based (intangible) and office/service space (kbilq and offsp) indicators followed by industry structure (indstr), work-related NVQ4+ employment (wnvq4pl), R&D employment concentration (rdbus), service exports relative to GDP (expsgdp) and large corporate presence (tn50mpl);
- these are followed by share of full-time employment (ftemp), net international in-migration (nintmig) and agglomeration (spilm), along with access to 4G services (prem4gin) within buildings, share of micro businesses (shblt5), access to UF broadband (ufbb), access to higher education students (heug) and HE grant income relative to business (totgntbus); and
- all physical infrastructure features are scored negatively as they are measured in the positive domain – less accessible areas have high index scores which are weighted negatively.

Figure 4 details the performance index associated with these weights across English ITL2 areas<sup>67</sup>:

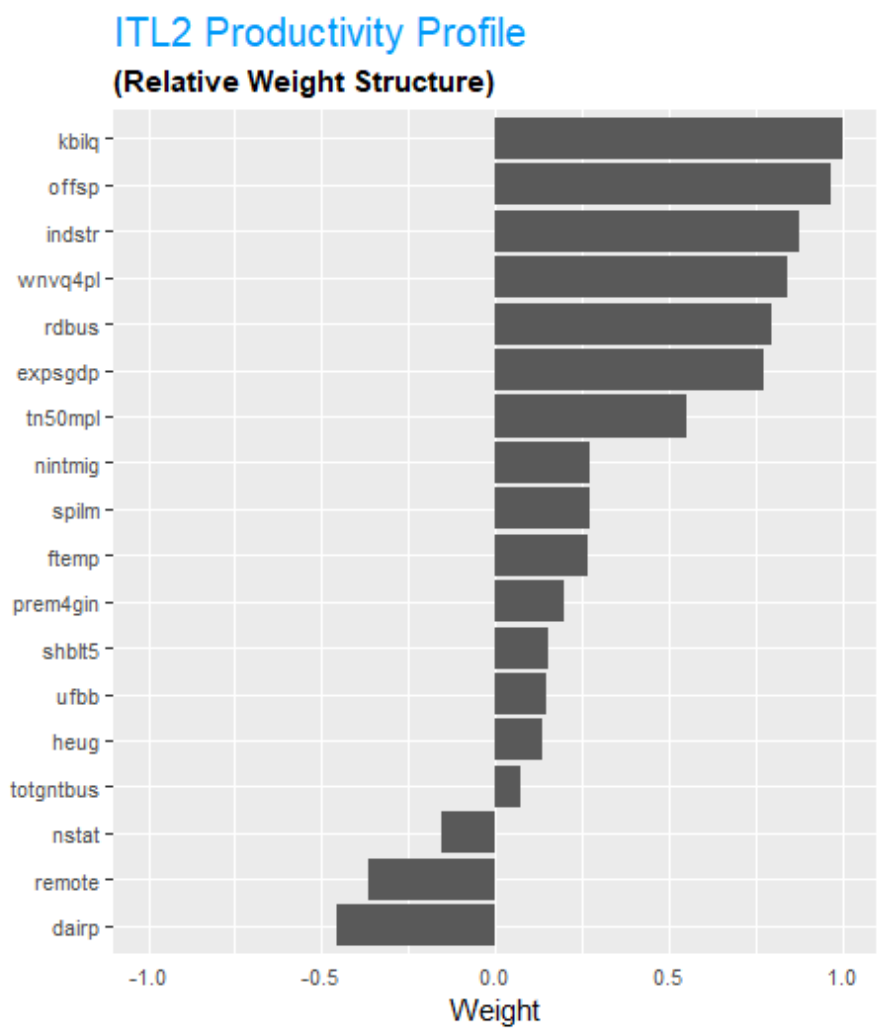
- positive values are dominated by ITLs in London and South East – Inner London (West and East), Berkshire, Buckinghamshire and Oxfordshire, Outer London (W/NW), Surrey East and West Sussex, Bedfordshire and Hertfordshire. Inner London West is confirmed as a significant positive outlier in performance terms;

---

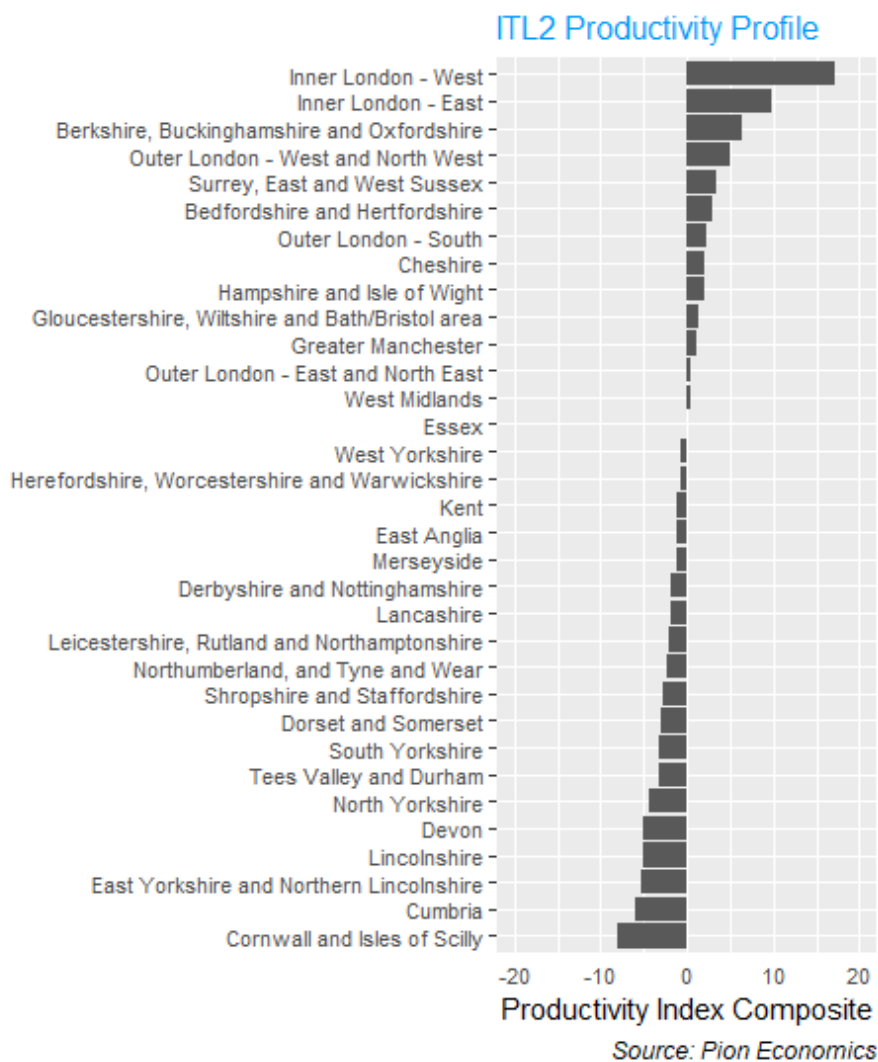
<sup>6</sup> ITL area definitions are consistent with the 2021 ONS classification

<sup>7</sup> The profiles and related observations that follow are specific to the geographies under discussion. Different spatial profiles will be associated with ITL3, LEP and broader geographies.

Figure 3: Indicator/Driver Weight Structure



**Figure 4: ITL2 Productivity Profile**



- Hampshire and the Isle of Wight, Cheshire, Outer London (South), Gloucestershire, Wiltshire and Bath/Bristol, Greater Manchester and West Midlands ITL2 areas constitute the final discernibly positive scores;
- negative values are dominated by primarily peripheral and more rural ITLs– Cornwall and Isles of Scilly, Cumbria, East Yorkshire and Northern Lincolnshire, Lincolnshire, Devon and North Yorkshire, Tees Valley and Durham, South Yorkshire and Dorset and Somerset;
- above these areas lie a mix and of semi-rural and urban ITLs– Shropshire and Staffordshire, Northumberland and Tyne and Wear, Shropshire and Staffordshire, Leicestershire, Rutland and Northamptonshire, Lancashire, Derbyshire and Nottinghamshire ,Merseyside;
- another mix of city and semi-rural areas lie at higher (but still negative) index values – Kent, East Anglia, West Yorkshire, Herefordshire, Worcestershire and Warwickshire with Outer London (E & NE) scoring around the England average.

The highest ranked ITLs (Table 2) typically display positive index scores across most if not all asset groups with the business and enterprise (BE) group making the highest average contribution followed by the industry structure (ISA), labour market/skills (LMS) and infrastructure (IA) groups. R&D and HE (RDHE) is assigned the weakest level of contribution.

<b>Table 2: Average of 5 Highest/Lowest LEP Index Values by Asset Group</b>					
	<b>BE</b>	<b>LMS</b>	<b>IA</b>	<b>ISA</b>	<b>RDHE</b>
<b>Top 5 ITLs</b>	3.26	1.85	1.18	1.96	0.11
<b>Bottom 5 ITLs</b>	-1.14	-0.89	-1.25	-1.30	-0.52

The lowest ranked ITLs display negative index scores across all asset groups but on this occasion it is the infrastructure (IA) and Industry Structure (ISA) grouping that dominate followed by business and enterprise (BE). The RDHE group is defined as making a marginally less negative contribution than LMS.

These results present an initial reference as to the underlying features that combine to explain patterns of productivity performance at the ‘tails’ of the distribution. Strong performers tend to contain robust business and economic environments and be associated with better than average labour market/skill attributes alongside positive HE, infrastructure and R&D underpinnings.

In contrast, the lowest ranked areas tend to display deficits in all measured dimensions and particularly so in terms of infrastructure provision and industry structure. Such areas have relatively weak business and economic environments, below average labour market/skills attributes and little in the way of R&D or HE mass.

## **Productivity Gains and Loss**

While the productivity index provides a basis for understanding spatial variations in performance, it is one step removed from the valuation of productivity gains/losses at local area level. Combining model outputs/projections with ONS estimates of hours worked and GVA across ITL3 areas<sup>8</sup> allows us to balance projected/actual GVA and place a value against productivity gains/losses<sup>9</sup>.

Figure 5 provides an initial perspective with gain/loss profiled across GVAh deciles (decile 1 – low GVAh) and confirms the concentration of gains within better performing deciles - the highest ranked decile of GVAh LADs accounts for a third of top decile GVA, substantially higher than any other decile. Losses increase moving down the decile hierarchy with losses in the bottom decile placed at some 20% of decile GVA.

Figure 6 profiles monetary gain/loss pattern as a percentage of ITL2 area GVA with areas ranked by total GVA<sup>10</sup>. Consistent with previous patterns, high GVA areas typically display net positive gains and low GVA areas the reverse.

The modelling projects that the Inner London (West) productivity gain from asset/driver profiles is equivalent to 39% of its GVA or some £79bn. In contrast, Cornwall and the Isles of Scilly is projected to have an annual net productivity loss equivalent to 35% of its GVA or just under £4bn.

Given the nature of the exercise, it is also possible to estimate individual asset group contribution to GVA. Figure 7 decomposes the patterns of Figure 6 into underlying asset/driver groups. As anticipated, the highest GVA areas display positive contributions across all groups and lowest GVA areas the reverse.

At the tails of the distribution, Business and Enterprise (BE) is defined as the primary driver of productivity gain to Inner London West with a contribution equivalent to 18%/£36bn of GVA. Consistent with the productivity index, Infrastructure and Accessibility (IA) is largest net negative contributor to Cornwall and Isles of Scilly and equivalent to broadly 11% of GVA (a loss of some £1.2bn per annum). Beyond the tails, it is evident that net gain/loss is more mixed in the middle of the distribution.

The Figure reinforces comments made at the outset that local area performance reflects a complex combination of features. Contrasting performance against individual indicators may help understanding at the tails of the performance spectrum, but does little to understand performance in the middle of the latter

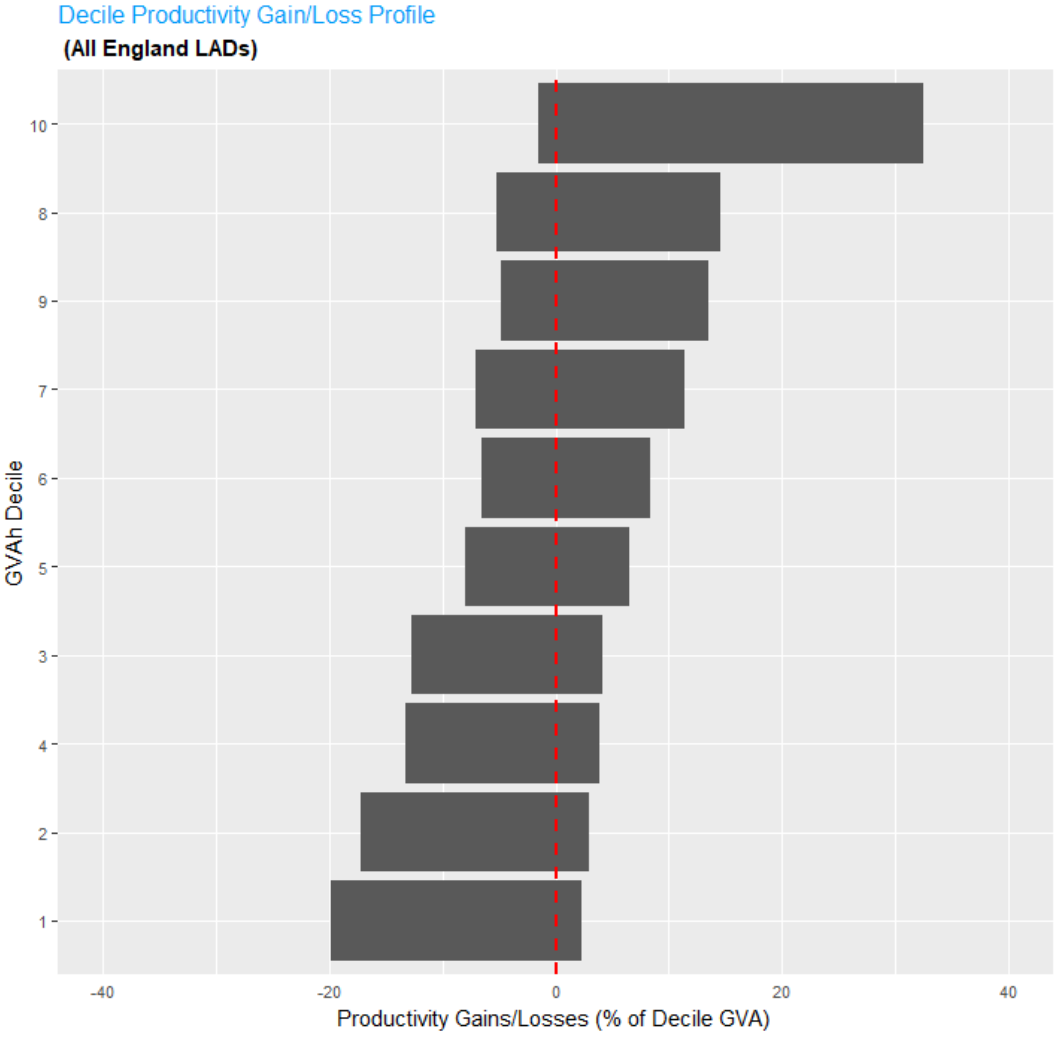
---

<sup>8</sup> Hours worked are defined at ITL3 but not ITL2 level.

<sup>9</sup> Gains/losses represent variation in projected GVAh around mean GVAh (adjusted by hours worked and balanced to ITL3 GVA totals) when assets are set to zero.

<sup>10</sup> The order of ITLs differs from earlier Figures primarily due to differences in working hours.

**Figure 5 : Decile Productivity Gain/Loss**



Source: Pion Economics

**Figure 6: Asset/Driver Contribution to ITL2 GVA**

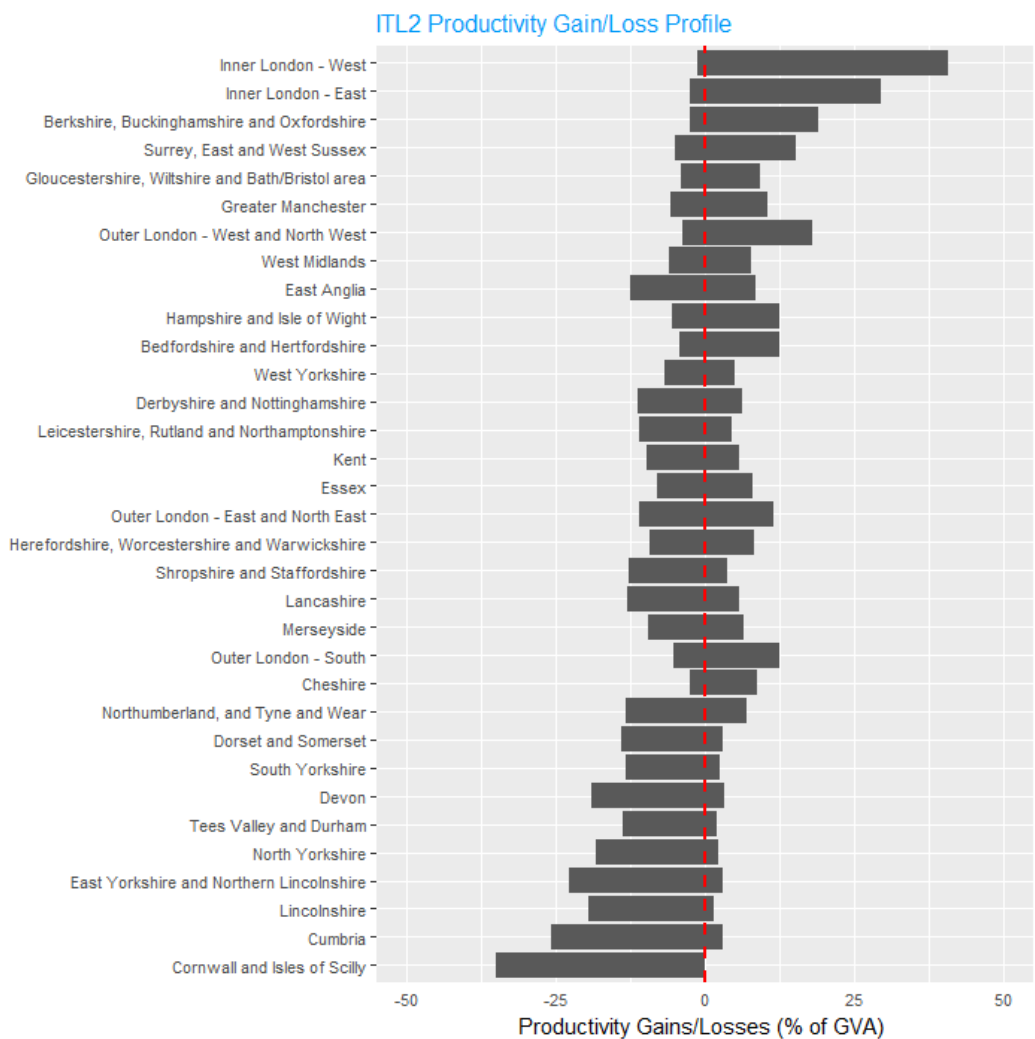
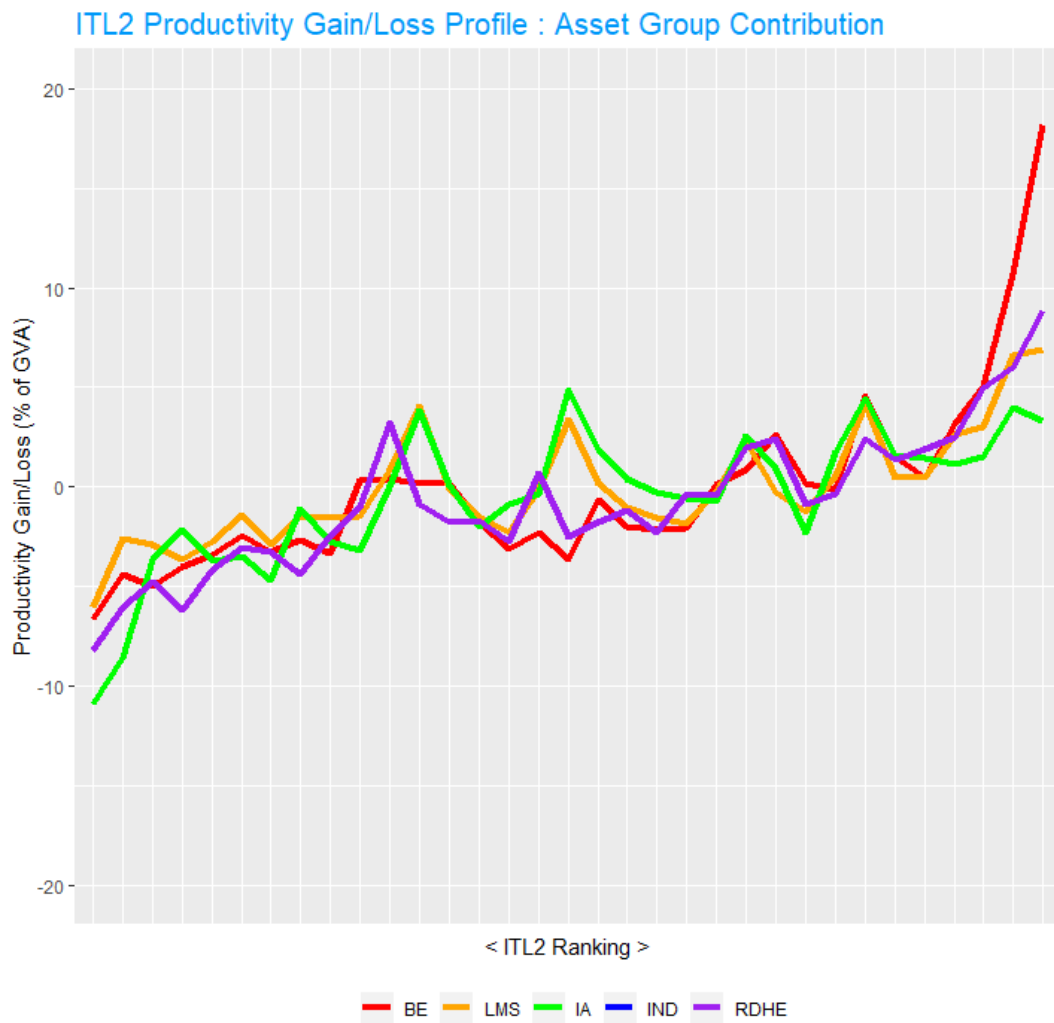


Figure 7: Asset Group Contribution to ITL2 GVA



Source: Pion Economics



## **Productivity and Levelling Up**

In this final section we turn to the issue of levelling up. In an attempt to support the ambition detailed in the Levelling Up White Paper, the GB Levelling Up Fund (LUF) identifies priority LAD areas on the basis of an index which allocates LADs into three categories reflecting an identified level of need, with category 1 representing places ‘deemed in most need of investment’.

The initial index was constructed in two stages. Stage 1 reflected indicators relating to GVAh, the 16+ unemployment rate and the proportion of the 16-64 population without any NVQ or equivalent qualification with metrics assigned equal weight. Stage 2 introduced additional metrics to measure need for improved transport connectivity (average journey times to employment centres by car, public transport and bicycle in England) and need for regeneration (commercial and domestic vacancy rates in England)<sup>11</sup>. Once ranked, the three area categories were defined via a simple ‘thirds’ principle<sup>12</sup>.

The index has been modified for Round 2 of the LUF to reflect changes in local authority structures, introduction of two year data averages and a restriction to prevent potential Covid effects on data profiles leading LADs to fall to lower priority categories<sup>13</sup>.

While it is not the purpose of this study to examine the nature and construction of the LUF index or the interpretation of ‘levelling-up’, it is interesting to use the analysis within to provide some context for the priority areas.

In terms of GVAh alone - the focus here - there exists substantive overlap in GVA performance across priority areas (Figure 8). While 79% of Priority 1 (P1) areas have a GVAh below the England median, the figure is 54% and 23% for Priority 2 (P2) and 3 (P3) areas respectively.

In terms of direct overlap, 21% of P2 areas have a GVAh below the P1 area median and 20% of P3 areas have a GVAh below the P2 median. Likewise, 22% of P1 areas have a GVAh above the P2 area median and 20% with a similar number of P2 areas displaying GVAh above the P3 area median.

Our analysis enables us to construct GVA gain/loss profiles of each priority area group for comparative purposes. Figures 9 to 11 replicate the earlier gain/loss analysis by priority area deciles:

- Priority 1 (P1): There are no P1 areas in the top GVAh decile and hence no decile 10 values. All bandings have gains/losses though losses are more dominant in lower deciles;
- Priority 2 (P2): stronger general performance in higher deciles is evident though the tail of lower GVAh performers in P2 areas is also represented in lower decile losses;

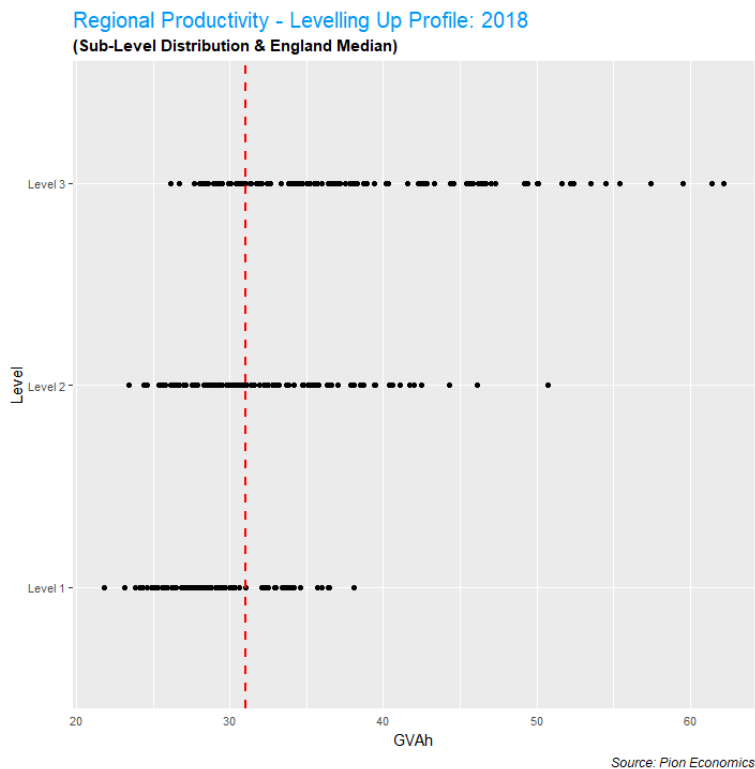
---

<sup>11</sup> Other metrics were employed for Wales and Scotland.

<sup>12</sup> [Levelling Up Fund: Prioritisation of places methodology note - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/90442/levelling-up-fund-prioritisation-of-places-methodology-note.pdf)

<sup>13</sup> [Levelling Up Fund Round 2: index update note - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/90442/levelling-up-fund-round-2-index-update-note.pdf)

**Figure 8: Distribution of – Priority Areas**



**Figure 9: Decile Productivity Gain/Loss – Priority 1 Areas**

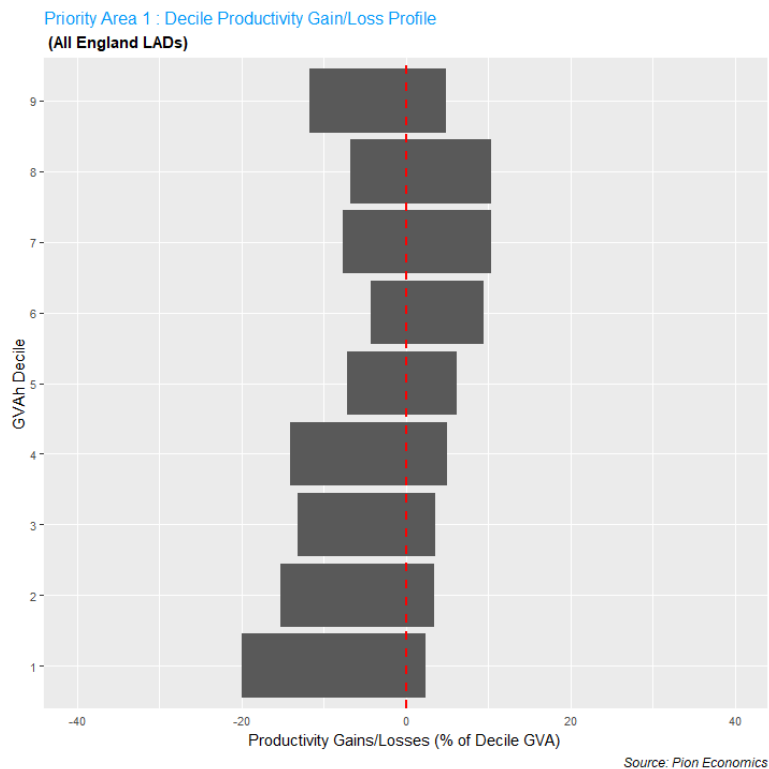


Figure 10: Decile Productivity Gain/Loss – Priority 2 Areas

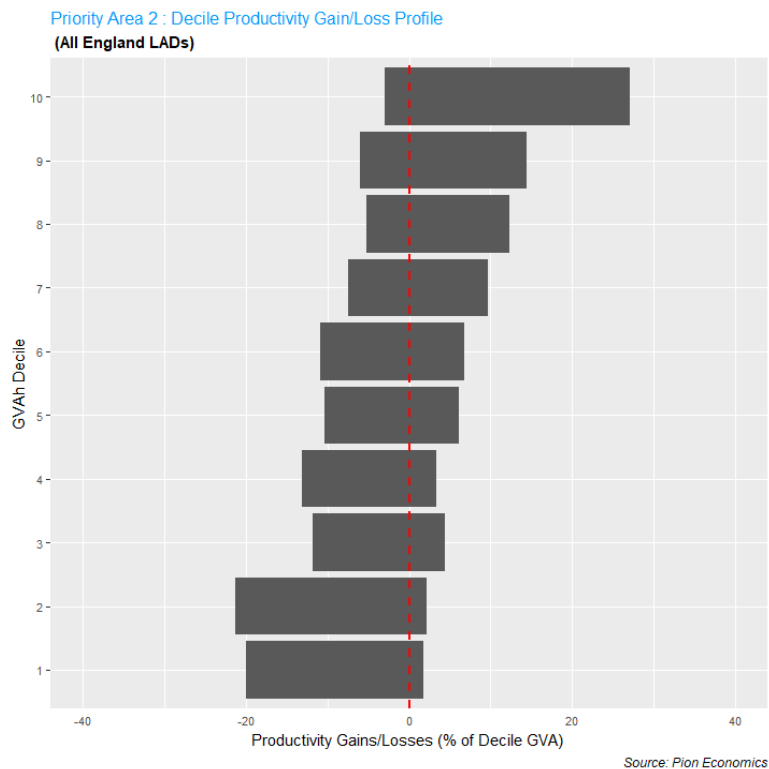
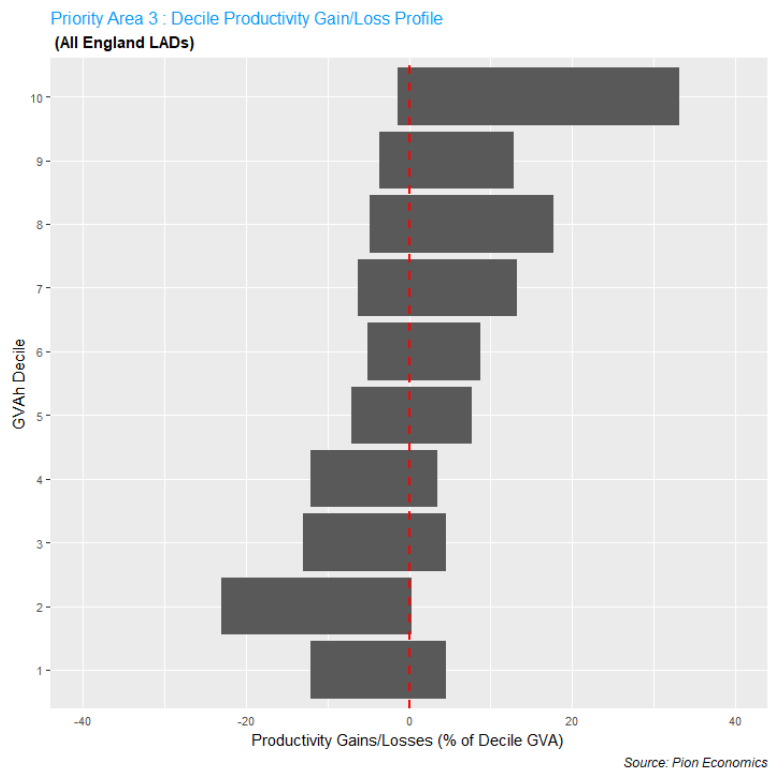


Figure 11: Decile Productivity Gain/Loss – Priority 3 Areas



- Priority 3 (P3): gains/loss performance is similar to that for P2 areas but the more extensive gain profile in higher deciles is notable and reflects the introduction of the highest performing LADs. The presence of below median GVAh performers in P3 is also reflected in the loss profile of lower deciles.

In terms of projected productivity loss, one of the rationales for intervention, the analysis places absolute P1 loss at some £46bn per annum broadly 10 times larger than the LUF Fund. P2 loss is placed at £45bn per annum – interestingly broadly the same as for P1 - and P3 loss at £30bn per annum.

Annual P1 area gains are projected at £24bn defining an annual net position of £22bn - four to five times larger than the LUF Fund suggesting that one-off LUF interventions are unlikely to drive significant reductions in spatial performance. P2 gains are placed at £46bn broadly in line with losses while P3 gains are estimated at £165bn, substantially higher than losses.

## **Overview**

In practice, two broad strands of research have developed to define and review productivity drivers within the UK. Area-level studies started in a somewhat ad-hoc manner with suppositions (often filtering down from country-level research) regarding the range of area attributes that might help explain differential productivity performance. Over time, area approaches have become more technical in nature though such approaches have always struggled to address the complexity of multiple, interrelated drivers in a single framework. While the advent of plant-level datasets has facilitated the emergence of complex econometric specifications that dominate modern productivity analysis, these studies have also struggled to incorporate broader spatial/location elements within their frameworks.

As ever, there are positives and negatives in both approaches. The current study is intended to make headway in the context of these competing approaches but essentially adopts an area-level approach. It attempts to provide insight into the range of spatial features that combine to explain variations in spatial performance, constructing a framework within which to assess the relative standing of areas in terms of such drivers. Although not pursued here, the framework also permits assessment of the nature/extent of driver deficit/surplus relative to potential comparators.

The approach offers a 'broad' perspective on performance relative to drivers, hence our preference to focus on the grouping of drivers (Business and Enterprise, Labour Market & Skills and so on) rather than individual drivers themselves. It is not devoid of challenges but it does point to a conclusion that the LUF is unlikely, in and of itself, to radically alter the hierarchy of spatial productivity across England.