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Productivity growth and regional reindustrialisation: UK evidence

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ABSTRACT

The re-emergence of industry – a process known as 'reindustrialisation' – has been widely acknowledged, especially in the United States and Europe. However, there are unanswered questions about the extent of any recent industrial revival in the UK. We present new evidence on reindustrialisation within and across UK regions. Our measures of reindustrialisation reveal that most regions outside London have reindustrialised to some extent. Furthermore, we explore regional reindustrialisation-growth patterns within the context of the UK's longstanding spatial divide in productivity. Our results highlight that manufacturing can still be a dynamic force in the UK economy when supported by appropriate regional policies.

KEYWORDS
productivity; growth; regions; reindustrialisation

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1. INTRODUCTION

Numerous advanced economies have recently witnessed the re-emergence of industry – a process known as 'reindustrialisation' (e.g., Christopherson et al., 2014). This process has been linked to several factors, including the reshoring of previously outsourced production (e.g., Kinkel, 2012, for Germany; Ellram et al., 2013, for the United States; Bailey et al., 2018, for Spain). Corroborating evidence has been reported by Eurofound (2019, fig. 5, p. 17) from a comparative international perspective. We present new evidence on the nature and extent of reindustrialisation in UK regions, and explore whether and how reindustrialisation has impacted on productivity and performance in the context of the UK's longstanding and evolving spatial divide.

Historically, the UK, like other rich countries, has faced a trend towards deindustrialisation. Yet, the pattern of deindustrialisation has differed. It has been linked to a dependency on finance and accelerated by policies that have favoured the City of London over industry (e.g., Martin et al., 2016). It has also been characterised by growing spatial divides in productivity and living standards across the UK's regions (e.g., Fransham et al., 2023; McCann, 2020; Stansbury et al., 2023). The UK's regional productivity problem as a legacy of deindustrialisation remains, with much wider spatial divides than Germany (West versus East) and Italy (North versus South) (e.g., Stansbury et al., 2023, fig. 1, p. 8). In this context, questions arise about whether and to what extent any recent industrial revival has affected UK regions, and whether policy makers can harness it to promote stronger and more inclusive regional growth.

In the paper, we explore three main research questions:

- Has reindustrialisation occurred in UK regions, and if so, to what extent?
- Whether and how, according to different reindustrialisation narratives, have UK regions been affected in terms of productivity and economic performance?
- Can any emergence of reindustrialisation at the regional level be linked to the UK's spatial divide in productivity?

This paper's contributions are threefold. First, though the productivity–reindustrialisation nexus has received some attention empirically in a cross-country setting (e.g., Capello & Cerisola, 2023), it remains understudied at the intra-national level, despite the significant regional economic disparities that exist in countries such as the UK.[1] We produce country-specific evidence for the UK's ITL3 regions, focusing on the period after the global

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financial crisis (GFC) but before the COVID-19 pandemic, from 2012 to 2019.[2] In doing so, we produce new results that link reindustrialisation to regional productivity growth and a region's broader economic performance, in terms of growth in per capita incomes and changes in employment and unemployment. Second, we construct new binary and non-binary reindustrialisation measures, which indicate whether, and to what extent, any re-emergence of industry has occurred within and across UK regions. Third, we explore the spatial implications of our estimations and investigate whether the scale of reindustrialisation can be linked to the UK's evolving regional productivity disparities. This last contribution matters for modern policy debates about place-based industrial strategy, such as European Union (EU) Smart Specialisation Strategies, or the UK's 'levelling-up' agenda, which aims to promote stronger productivity and growth in the UK's lagging regions (e.g., Bailey et al., 2023b).

Our results reveal some evidence of reindustrialisation in many UK regions, but the trend towards reindustrialisation has been quite limited in most cases. In line with arguments about industrial agglomeration and localisation economies, we find regions that built on a pre-existing manufacturing specialisation have experienced relatively robust productivity growth. Regions that expanded across multiple manufacturing subsectors under a more creative pathway have benefitted more from income generation, employment creation and unemployment absorption effects. These outcomes again align with different narratives linking industrial change to innovation and growth. Our results imply small-to-moderate 'catch-up' effects in some of the UK's low-middle productivity regions, and, to a lesser extent, in its weakest lagging regions.

This paper is structured as follows. Section 2 provides some background and context before reviewing the relevant literature. Section 3 introduces our method of measuring reindustrialisation, sets out the empirical approach and testable hypotheses. Section 4 discusses variable selection and describes the data. Section 5 contains the estimation results. Section 6 summarises and concludes.

2. LITERATURE REVIEW

2.1. From deindustrialisation to reindustrialisation

Deindustrialisation has well known causes, including productivity differentials between manufacturing and service sectors and shifting consumption patterns (Rowthorn & Coutts, 2013; Rowthorn & Ramaswamy, 1997; Singh, 1977). The UK's deindustrialisation experience has been relatively severe, with weaker manufacturing output and more rapid declines in employment compared with other G7 countries (e.g., Rowthorn & Coutts, 2013, p. 10). These outcomes have been linked partly to policy decisions, including the shift in support to finance at the expense of industry under Conservative governments in the 1980s (Kitson & Michie, 1996). Deindustrialisation has also been associated with the growing power and influence of transnational corporations within the UK economy (Cowling & Sugden, 1987). The result has been decades of sluggish economic growth and widening inequalities between regions. Many traditional industry regions that are mainly located outside London have faced high levels of unemployment and deprivation (e.g., Rees, 1978, for the Welsh Valleys' coalfields; Lloyd & Reeve, 1982, for textiles and clothing in the Northwest; Imrie, 1991, for Stoke-on-Trent's pottery industry). Their economies have suffered deep and long-lasting economic scars from deindustrialisation.

In recent years, however, there have been signs of an industrial revival in advanced economies. Germany – with an already well-established manufacturing sector – saw value added in manufacturing increase from €545 billion to €680 billion (+25%) between 2011 and 2019; by comparison, it increased from £155 billion to £197 billion (+27%) in the UK, and from US$1864 billion to US $2364 billion (+25%) in the United States (Organisation for Economic Co-operation and Development (OECD), 2024). These figures, while achieved against a smaller relatively sized manufacturing sector, reverse previous trends towards decline in manufacturing output (e.g., Kitson & Michie, 2014, tab. 1, p. 14). The manufacturing share of output has also been more stable in advanced economies since the early 2010s (Mao et al., 2023, fig. 3, p. 4). At least for the UK, recent growth in manufacturing has coincided with growth in the service sector.[3]

The stronger growth of manufacturing in advanced economies is consistent with evidence of increased reshoring of industrial activities (e.g., Kinkel, 2012, for Germany; Ellram et al., 2013, for the United States; Bailey et al., 2018, for Spain). For the UK, the European Reshoring Monitor reported 44 reshoring cases between 2014 and 2018; this compares with 39 cases in Italy, 36 in France and 17 in Germany over the same period (Eurofound, 2019, p. 17). Several factors explain this trend, including shifts in the global competitive environment, supply chain problems and firm-specific drivers (Wiesmann et al., 2017). Other factors include the GFC, which had large and enduring negative effects on capitalist economies and fuelled a debate about the need to rebalance growth away from the financial sector (e.g., Christopherson et al., 2014).

More recently, the UK's exit from the EU, the global health pandemic and rising geopolitical tensions may have pushed the UK further towards reindustrialisation. The dual disruption of COVID-19 and Brexit, in particular, has forced many UK manufacturers to restructure their supply chains by turning back to home-country suppliers, adding to the earlier reshoring trend (*Financial Times*, 2022; WMG, 2017). By contrast, uncertainty around Brexit and trade restrictions with the EU could have weakened the position of UK manufacturing and undermined growth (Bailey & Rajic, 2022; NIESR, 2019). These events have encouraged a debate about whether regional industrial policies are needed to regenerate existing industries in the UK's lagging regions or develop new growth

pathways under a place-based approach (e.g., Martin et al., 2021).

2.2. Reindustrialisation and growth pathways

The idea that reindustrialisation could revive growth in traditional industry regions is not new, though different pathways have been conceptualised, from the older body of work on industrial districts to newer literatures in evolutionary economic geography and transformative systems (e.g., Becattini, 1989; De Propris & Bailey, 2021; Martin & Sunley, 2006).

A well-established growth pathway involves reinforcement of a region's pre-existing industrial specialisation. Traditional industrial regions can undertake critical upgrading of an old industrial structure, thereby benefitting from internal economies of scale, positive agglomeration externalities and cost savings (e.g., Marshall, 1890; Maskell & Malmberg, 2007). Upgrading can also facilitate the production of niche products and spin-offs in pre-existing industries, since existing capabilities and knowledge can be combined in new ways to produce new specialisations in the same industry (Grillitsch et al., 2018). Alternatively, regions can adapt existing skills and knowledge or combine local capabilities to branch out from an old industrial specialisation towards related industries. Diversification enables industrial regions to harness pre-existing accumulated local knowledge, networks and skill-sets to produce new goods in closely related industries (Boschma & Weterings, 2005; Grillitsch et al., 2018; Neffke et al., 2011).

A more radical variant is the creation pathway, whereby regions move towards producing in entirely new industries. This involves more fundamental change in regional industrial structure, creating growth discontinuities, as discussed within and beyond the evolutionary economic geography literature (e.g., Isaksen et al., 2018; Martin & Sunley, 2006; Tödtling & Trippl, 2013; also De Propris & Bailey, 2021). This pathway is associated with significant destruction of old industries; but it can also offer stronger 'de-locking' possibilities for lagging regions, which must adopt new capabilities to operate effectively in new industries (Martin & Sunley, 2006). Industrially diversified regions are exposed to additional sources of disruptive technological change and transformative growth (De Propris & Bailey, 2021). Further, when unrelated knowledge is combined in novel ways, it can lead to strong growth based on radical product innovation and new market creation (Frenken et al., 2007).

Though regional productivity growth is likely to be shaped by a variety of other factors and involve complex interactions amongst multiple actors, industries and spaces, the above pathways generate, to differing degrees, various possibilities for traditional industry regions to realise productivity gains and 'catch-up' growth.

2.3. Empirical evidence for UK regions

Different strands of literature explore the scope for reindustrialisation to foster growth in the UK. A long-established body of work provides evidence on the resilience of particular industries to industrial decline (e.g., Cooke, 1995). For example, amid the global steel crisis in the early 1990s, Morris and Plake (1995) highlight how traditional steel industries in South Wales were able to survive, at least initially, due to their adoption of new technologies and shift towards new product specialisations. Newer research explores the relatively recent resurgence of manufacturing in some UK regions. Amison and Bailey (2014) consider the British Midlands' established advantage in certain areas of manufacturing, which has allowed for continued specialisation in automotive design and engineering. Sunley et al. (2023) analyse trends in advanced manufacturing in UK regions and districts between 1971 and 2015. They find regions that expanded in older, more established industries have done better than regions moving into newer, more science-based industries. Contrarily, regions that engaged in newer areas of advanced manufacturing have done relatively well, which may reflect spatial inequalities in investment and human capital (Sunley et al., 2023).

To our knowledge, only Capello and Cerisola (2023) have constructed a measure of regional reindustrialisation and explored its linkages to productivity growth using formal econometric methods. They constructed a binary variable to identify EU NUTS2 regions that have realised positive changes in the manufacturing share of value added over the period 2000–17. Their cross-sectional estimations reveal that reindustrialising regions experienced stronger productivity growth than non-reindustrialising regions between 2013 and 2017. However, productivity growth was mainly confined to the manufacturing sector – as a result, spillovers to other economic sectors were much weaker. One limitation of the aforementioned paper, though, is that the extent of reindustrialisation is likely to differ across regions, hence the varying scale of reindustrialisation needs establishing beyond a simple binary approach.

3. CONCEPTS AND METHODS

3.1. Measuring reindustrialisation: binary and non-binary approaches

Reindustrialisation has typically been measured using either the industry share of value added or employment. In this paper, we focus on changes in the share of industry in total gross value added (GVA). We note that this measure is often applied in the UK productivity literature (e.g., Mao et al., 2023). Industry's share of GVA is also emphasised in the European policy debate about 'Industry 4.0' and Smart Specialisation Strategies (e.g., European Commission, 2018). However, changes in employment are potentially relevant too – hence, we provide some comparison of our results by considering how our value-added-based reindustrialisation measure associates with regional economic performance more generally, including changes in the employment share and the unemployment rate.

This paper constructs regional reindustrialisation indicators as follows. Our basic proposition is that a region is reindustrialising if it has experienced a favourable temporal

shift in manufacturing GVA relative to other economic sectors. First, we divide manufacturing GVA by total GVA (both in current prices). Importantly, this embeds both quantity and quality elements of manufacturing production, while controlling for overall price changes in the economy (Capello & Cerisola, 2023).[4] Specifically, we use the current price GVA in manufacturing based on the 2007 UK Standard Industry Classification (SIC) codes 10–33, which we divide by the current price total GVA for each ITL3 region using Office for National Statistics (ONS) data. Second, we compute the change in manufacturing's share during the pre-GFC subperiod, 2002–07, and compare it with the change in the post-GFC subperiod, 2012–19.[5] Third, we construct a binary reindustrialisation variable based on the difference in these two changes, which takes a value of unity if the difference is positive, or zero otherwise. Consequently, if a region's growth in the manufacturing share of GVA has increased in the later subperiod relative to the earlier subperiod, this is suggestive of a movement towards reindustrialisation. We refer to this measure of reindustrialisation as the binary 'changes' indicator because it involves changes in the share of a region's manufacturing GVA in two subperiods. This indicator, specifically, is identical to the binary measure used by Capello and Cerisola (2023) in their study of the EU's NUTS2 regions. However, our measurement approach is different from this earlier work in two respects.

First, we note that the binary 'changes' indicator used by Capello and Cerisola (2023) is influenced by only the first and last observations in each subsample, hence measurement may be distorted by one or two extreme/outlier observations. This problem is more likely to arise around major crises, such as the GFC. Therefore, we construct an alternative binary 'trend' indicator, which takes a value of unity if the time trend of the manufacturing share of GVA shifts positively across the two subperiods, and zero otherwise. Differently, our 'trend' indicator depends on all years from 2002 to 2007 and from 2012 to 2019. In this case, it should capture a more generalised shift towards reindustrialisation, if one exists. We find that the correlation between the binary 'changes' and 'trend' indicators is 0.88; hence both measures tend to identify the same regions as reindustrialising, though arguably the 'trend' measure is relatively robust to points of extreme difference.

Second, we produce non-binary counterpart measures. As explained above, under the 'changes' approach, for each region we compute the change in manufacturing's share during the pre-crisis subperiod, 2002–07, and compare this with the change in the post-crisis subperiod, 2012–19. We then multiply this difference by our binary 'changes' indicator. To construct a non-binary 'trend' indicator, we calculate for each region the difference in the time trends in the manufacturing share of GVA across the two subperiods and multiply this by the binary 'trend' indicator. Both the non-binary 'changes' and 'trend' indicators range from zero for non-reindustrialising regions to more positive values, depending on the extent of reindustrialisation. The correlation between the non-binary 'changes' and 'trend' measures is lower at 0.44. We argue that both binary and non-binary indicators are useful. On the one hand, the binary indicators have the advantage of simplicity. On the other hand, our non-binary indicators account for different degrees of reindustrialisation between and within UK regions.

Figure 1 maps the extent of reindustrialisation in UK ITL3 regions using our non-binary 'changes' and 'trend' indicators, respectively, revealing quite similar patterns. To provide some context, the average value of the 'changes' indicator is 0.034 when computed across all reindustrialising regions. This implies that the change in the manufacturing share of GVA in the later subperiod (2012–19) exceeded the change in the earlier subperiod (2002–07) by 3.4 percentage points on average. This difference seems quite small relative to the sample average manufacturing share of 12.6 percent for reindustrialising regions. However, there is substantial variation in the extent of reindustrialisation across UK regions. For example, in the region of North and North East Lincolnshire, the manufacturing share increased by 1.5 percentage points during the subperiod, 2002–07, before increasing further by 6.3 percentage points during the later subperiod, 2012–19. This implies a value for the non-binary reindustrialisation 'changes' indicator of 0.048 (= 0.063 – 0.015), which is above the sample average of 0.034 for reindustrialising regions. Interestingly, many regions outside London, including parts of Northern Ireland and the Midlands, have experienced stronger movements towards reindustrialisation.

Other regions, in London and the South East, and also regions in the North East of England and Scotland, have experienced more limited reindustrialisation according to Figure 1. For example, in London's Lewisham and Southwark, the changes in manufacturing's share in the earlier and later subperiods are −0.8 and 0.2 percentage points, respectively, implying a value of 0.01 (0.002 − −0.008) for the non-binary 'changes' indicator. This is quite close to the sample average of 0.017 for reindustrialising regions in London, but it is below the average of 0.034 for all UK reindustrialising regions. Overall, both the 'changes' and 'trend' indicators reveal that reindustrialisation has been quite variable across UK regions, supporting our use of non-binary measures.

3.2. Reindustrialisation regimes

The existing literature acknowledges that industrialisation can take different forms, which may not be equal in their impact on productivity and growth (e.g., Capello & Cerisola, 2023; De Propris & Bailey, 2021; Martin & Sunley, 2006). Therefore, we further investigate the productivity–reindustrialisation nexus according to the particular patterns in industrial activities observed in each of the UK's reindustrialising regions. We consider four basic patterns, which indicate whether a region has started out from a pre-existing manufacturing specialisation; and, if so, whether this specialisation has been

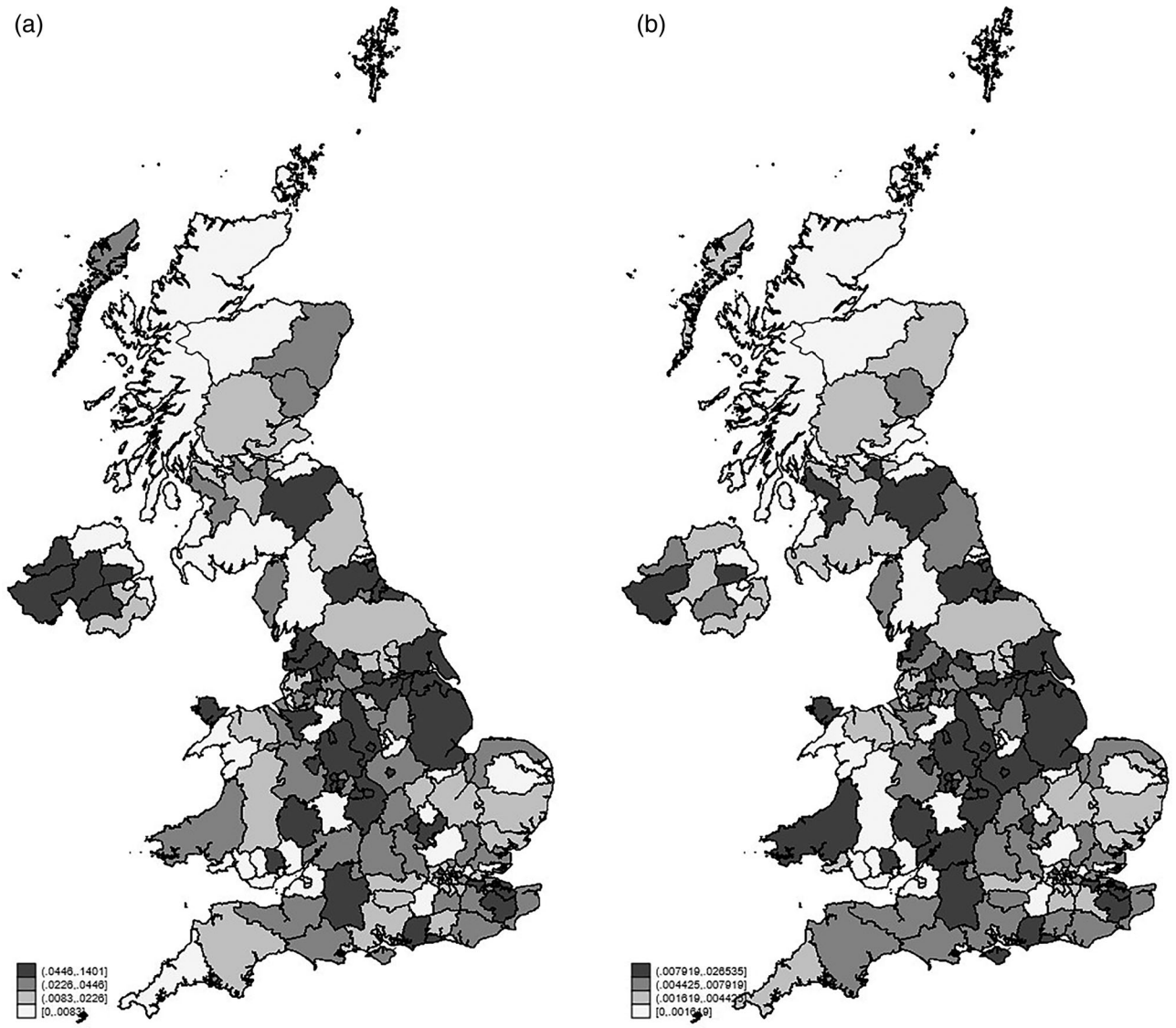

Figure 1. Overview of regional reindustrialisation – 'changes' and 'trend' indicators: (a) non-binary 'changes' indicator of reindustrialisation; and (b) non-binary 'trend' indicator.
Source: Authors' own computations.

reinforced over time or reconfigured, with a region moving instead into a wider range of activities in different manufacturing subsectors. Alternatively, we account for the possibility that a region has started out with a relatively diversified manufacturing structure, which has either been reinforced or refined over time.

A region's initial specialisation in manufacturing is inferred from the location quotient (LQ), which measures the relative specialisation of a region's production in a particular sector or subsector. Specifically, we compute the LQ for each manufacturing subsector by dividing a region's GVA in manufacturing subsector j by its GVA across all subsectors in that region, where $J = 8$. The full list of subsectors is provided in Table A1 in Appendix A in the supplemental data online. We then multiply this by the ratio of total GVA in manufacturing aggregated across all i regions to total GVA in subsector j aggregated across all i regions. For each region, we compute the average of LQ across subsectors to obtain an overall indication of a region's relative specialisation in manufacturing activities:

$$LQ_i = \frac{1}{J}\sum_{j=1}^{J}\frac{GVA_i^{INDUSTRY\ SUBSECTOR\ j}}{GVA_i^{TOTAL\ INDUSTRY}} \times \frac{\sum_{i=1}^{I} GVA_i^{TOTAL\ INDUSTRY}}{\sum_{i=1}^{I} GVA_i^{INDUSTRY\ SUBSECTOR\ j}} \quad (1)$$

To infer the pattern of reindustrialisation occurring in each region, we first determine if a region is relatively specialised or diversified in manufacturing activities at the start of our sample in 2002. If the LQ index exceeds unity, this implies that a region is relatively specialised in a particular manufacturing subsector at the start of our sample; if, by contrast, the LQ is less than unity, it is instead relatively diversified. Second, we compare the LQ between the first and last years of the sample, 2002 and 2019, respectively, to determine whether

manufacturing activities in each region have become more specialised in, or more diversified across, different manufacturing subsectors. The four possibilities are summarised in equations (2) to (5):

$$LQ_i^{2019} > LQ_i^{2002} > 1 \tag{2}$$

$$LQ_i^{2002} > 1 \text{ and } LQ_i^{2002} > LQ_i^{2019} \tag{3}$$

$$LQ_i^{2002} < 1 \text{ and } LQ_i^{2002} < LQ_i^{2019} \tag{4}$$

$$LQ_i^{2019} < LQ_i^{2002} < 1 \tag{5}$$

We relate equations (2) to (5) to particular reindustrialisation 'regimes' as follows. Equation (2) represents the 'extension' regime, whereby a region's pre-existing manufacturing specialisation is reinforced over time. Equation (3) represents the 'diversification' regime, whereby a region moves away from a pre-existing manufacturing specialisation, expanding its manufacturing activities across additional subsectors. Equation (4) represents the 'reorientation' regime, whereby an initially diversified region becomes less diversified, refocusing its manufacturing activities in fewer subsectors. Equation (5) represents the 'creation' regime, whereby an initially diversified region becomes even more diversified in its manufacturing activities by expanding across additional subsectors.

Because of industrial agglomeration externalities and intra-industry productivity spillovers, which are emphasised in the older industrial districts literature and newer literatures on evolutionary economic geography and transformative systems (e.g., Becattini, 1989; De Propris & Bailey, 2021; Martin & Sunley, 2006), we expect reindustrialising regions in the 'extension' regime to benefit from stronger productivity growth. By comparison, regions in the 'reorientation' regime would start out from a lower level of specialisation and smaller productive base, hence productivity gains are expected to be more limited initially. Under 'diversification' and 'creation' regimes, which involve transition into different subsectors, regions may benefit from transformative growth due to radical product innovation and new market creation effects. However, regions moving away from a specialised industrial subsector would face fewer intra-industry productivity spillovers, while they may face additional barriers to innovation, with more limited opportunities for knowledge transfers and interactive learning amongst firms operating in different subsectors (Grillitsch et al., 2018). Productivity improvements may also be more limited if growth occurs primarily due to product innovation and market creation effects rather than through process innovation (Frenken et al., 2007). Further, any productivity improvements arising under more creative pathways may take longer to emerge due to the level of disruption involved under such industrial change and the time required to accumulate significant new knowledge in different subsectors. Therefore, we expect the largest productivity gains to occur under the 'extension' regime, whereas the 'creation' regime is expected to generate weaker productivity growth at least in the initial phases of reindustrialisation.

This paper's identification approach produces a set of four binary variables indicating whether a region is reindustrialising under a particular regime (see Figures A1–A4 in Appendix A in the supplemental data online). Furthermore, in an effort to capture the extent of regional reindustrialisation under specific regimes, each regime dummy indicator is in turn multiplied by either the non-binary 'changes' or 'trend' measure of reindustrialisation to produce a set of four corresponding interaction terms, which we implement under a regression model framework, as described below.

3.3. Empirical implementation

Our empirical approach is summarised in equations (6) and (7). These provide a cross-sectional regression framework, wherein we link changes in regional reindustrialisation (R_i) to labour productivity growth (ΔY_i) in region i between 2012 and 2019:

$$\Delta Y_i = \alpha + \varphi Y_i + \beta R_i + \gamma X_i + \delta G_i + \varepsilon_i \tag{6}$$

$$\Delta Y_i = \alpha + \varphi Y_i + \beta^k R_i I_i^k + \gamma X_i + \delta G_i + \varepsilon_i \tag{7}$$

for $k = 1, 2, 3, 4$ and where $\varepsilon_i \sim N(0, \sigma^2)$.

Equation (6) includes a measure of regional reindustrialisation, R_i, the initial level of labour productivity, Y_i, and a set of control variables, X_i, which reflect the stock of technology and human capital, amongst other factors, as well as various geographical factors, G_i, to absorb unobservable influences in different UK regions. Equation (7) accounts for different patterns of regional reindustrialisation via a set of k interaction terms. The latter are formed by the product of the non-binary reindustrialisation indicator variable, R_i, and the regime dummy indicator, I_i^k, where $k = 1, \ldots, 4$, which correspond to equations (2) to (5). We estimate equations (6) and (7) using ordinary least squares (OLS) and correct the standard errors for heteroskedasticity and arbitrary spatial autocorrelation following the approach of Conley (1999) since productivity growth in one region is often correlated with growth in nearby regions.[6]

Importantly, equations (6) and (7) have testable implications. First, equation (6) allows us to test whether, and to what extent, regional reindustrialisation associates with labour productivity growth. Second, estimation of equation (7) allows us to test whether the observed effects depend on the type of reindustrialisation in each region. Third, to provide some further exploration of the implications of our estimations, we exploit the variation in regional reindustrialisation to extrapolate the associated productivity growth effects, which we link to the UK's regional productivity divide.

4. VARIABLE SELECTION AND DATA DESCRIPTION

4.1. Regional productivity and performance

We use the OECD's Regions and Cities Database and extract data on GVA per worker (2015 constant prices), including all economic sectors, which we henceforth

refer to as our 'aggregate' measure of productivity growth. Additionally, we use GVA per worker (2015 constant prices) in manufacturing (International Standard Industrial Classification (ISIC) rev. 4, sector C) and industry (ISIC rev. 4, sectors B–E) as alternative, 'disaggregate' measures because it is unclear whether reindustrialisation has affected productivity only in manufacturing. To provide some comparison for regional performance more broadly, we utilise data on per capita incomes (gross domestic product – GDP), as well as changes in the ratio of employed workers to a region's total population and the unemployment rate, which are computed over the subperiod 2012–19 on an annualised basis. GDP per capita (2015 constant prices), employment and unemployment data are sourced from the OECD's Regions and Cities Database.[7]

4.2. Control variables

We draw on the relevant empirical literature to control for possible confounding factors (e.g., Rocchetta et al., 2022, *passim*). The 2012 value for regional productivity (or alternatively, performance) is included to control for a region's initial level of productivity (or performance). Population (100,000s) in 2012 is added to control for regional size heterogeneity using ONS data. The unemployment rate in 2012 is included to control for labour market slack, with data sourced from the OECD's Regions and Cities Database and UK Labour Force Surveys. We construct a dummy variable, which takes a value of unity for regions located in one of the UK's major conurbations – based on the ONS's methodology for classifying built-up areas – and zero for all other regions. This includes the Greater London, Greater Manchester, West Midlands and West Yorkshire built-up areas, which are characterised by significant urban agglomeration, high population densities and well-established physical infrastructures.

To control for a region's initial stock of technology, we include the number of patents granted in 2012, sourcing data from the UK government's IPSUM Database, and normalise by residential population (100,000s) based on ONS estimates. To proxy for a region's initial stock of human capital, we include the share of residents (aged at least 16) attaining levels 1 and 2 educational qualifications from the UK's 2011 census. We employ these measures due to their strong associations with the more practical and vocational skills that support industry, for example, City and Guilds Craft, National Vocational Qualifications (NVQs) and Scottish Vocational Qualifications (SVCs), and we also include apprenticeship qualifications where indicated.

To control for regional exposure to Brexit, we construct a dummy variable that takes a value of unity for regions with above-average exposure, and zero otherwise.[8] The underlying Brexit exposure indices are based on the proportions of regional labour income and GDP tied to EU trade as produced by Chen et al. (2018) for the manufacturing sector and for all economic sectors.[9] Our expectation is that any Brexit effect will be negative because more exposed regions will have faced greater business disruption and stronger productivity headwinds in the build-up to Brexit (e.g., Chen et al., 2018; Dhingra & Sampson, 2022; NIESR, 2019).

To control for unobservable heterogeneity, three sets of dummy variables are included. The first set distinguishes between different UK nations of England, Scotland, Wales and Northern Ireland. The second indicates whether a region is located in London, the South East or East England, thereby acknowledging at a basic level the regional dimension of the UK 'productivity puzzle'. The third set indicates if a region is in a given ITL2 region. Overall, whilst acknowledging the trade-off between model control and efficiency, we have endeavoured to control for relevant confounding influences.

4.3. Summary statistics

Descriptive statistics for each variable are summarised in Table A2 in Appendix A in the supplemental data online. Evidently, UK ITL3 regions have realised annualised productivity growth rates in manufacturing, industry and overall (across all economic sectors) of −0.5%, −0.1% and 0.6%, respectively, over the subperiod 2012–19 (see Table A2, panel A, online). Regional economic conditions have also been rather stagnant, with GDP per capita growth of 1.1%, while the employment share has increased by 0.6% and the unemployment rate has decreased by 0.5% on average across all regions over the subperiod 2012–19 (all in annualised terms).

Despite the fairly weak overall economic picture, many UK regions have experienced a movement away from deindustrialisation towards reindustrialisation, either due to a slower contraction in manufacturing in the post-crisis years, or, more positively, due to an increase in the manufacturing share of GVA (see Table A2, panels B and C, online). The value of 0.866 in Table A2, panel B, online indicates that 86.6% of regions (155 out of 179) experienced some form of reindustrialisation as defined using our 'changes' measure. This is very similar to the 86% identified using the 'trend' measure in Table A2, panel C, online. By contrast, in only 10% of regions (18 out of 179), we find evidence of deindustrialisation using the 'changes' indicator, whereby a contraction in the manufacturing share of GVA in the pre-crisis subperiod was followed by a larger contraction during 2012–19.

Further decomposition reveals that in 50% of reindustrialisation cases, as identified by our 'changes' indicator, regions have moved from a pre-crisis contraction in the manufacturing share of GVA to a post-crisis expansion. In 47% of reindustrialisation cases, regions appeared to be at an earlier stage of the process, and have moved from a larger contraction in the manufacturing share in the pre-crisis subperiod to a smaller contraction in the period 2012–19. Only in 3% of reindustrialising cases have regions built on an initial increase in the manufacturing share in the pre-crisis subperiod with a further expansion during the period 2012–19. Figure A5 in Appendix A in the supplemental data online illustrates the heterogeneity of changes in the manufacturing share of GVA from 2012 to 2019 for reindustrialising regions, as indicated using the 'trend' measure. This includes regions that

experienced sustained increases in the manufacturing share of GVA, such as West Sussex (Southwest), South and West Derbyshire, Warwickshire, South West Wales, and Fermanagh and Omagh, as well as regions that realised smaller contractions in the manufacturing share.[10]

To provide some exploration of possible changes in the build-up to Brexit, we examined the changes in the manufacturing sector's GVA share in regions most exposed to Brexit, according to the proportions of regional GDP and labour earnings tied to EU manufacturing trade. Using data from Chen et al. (2018), we focused on the top five ITL2 regions: Inner and Outer London, Kent, Hampshire and Isle of Wight, Lancashire, and East Riding and North Lincolnshire. Our analysis yields mixed results (see Figure A6 in Appendix A in the supplemental data online). The most exposed reindustrialising regions experienced small but less favourable changes in the manufacturing share compared with less exposed regions. However, starting from 2016, the most exposed regions began to catch up by realising more favourable changes in the manufacturing share. This trend aligns with the pre-Brexit surge in trade (evidenced by stockpiling) due to anticipated trade barriers with the EU (e.g., Freeman et al., 2022, fig. 1, p. 14). Therefore, overall, our findings point to a small negative Brexit effect on reindustrialisation up to 2019, but we acknowledge that these results likely tell only part of the story.

Regarding reindustrialisation regimes, for the binary 'changes' indicator, 24% of all 179 ITL3 regions were classified in regime 1 ('extension'), whereas only 13% of regions were classified in regime 4 ('creation') (see Table A2, panel B, in the supplemental data online). Similar outcomes emerge for the 'trend' indicator; 25% of all regions were classified in regime 1 ('extension') compared with 13% in regime 4 ('creation'). Therefore, reindustrialising regions have tended to expand within pre-existing manufacturing subsectors, whereas a creation pathway is less common, perhaps because entry into new subsectors involves more fundamental and disruptive change. The non-binary 'changes' measure of reindustrialisation ranges from 0 to 0.14, whereas the 'trend' measure ranges from 0 to 0.027 (see Table A2, panel C, online), which is indicative of varying movements towards reindustrialisation across our sample. What remains unclear is whether reindustrialisation has (or potentially could have) contributed to revitalising regional prospects, with productivity in London and surrounding regions seen to be higher than in most other regions (Figure 2).

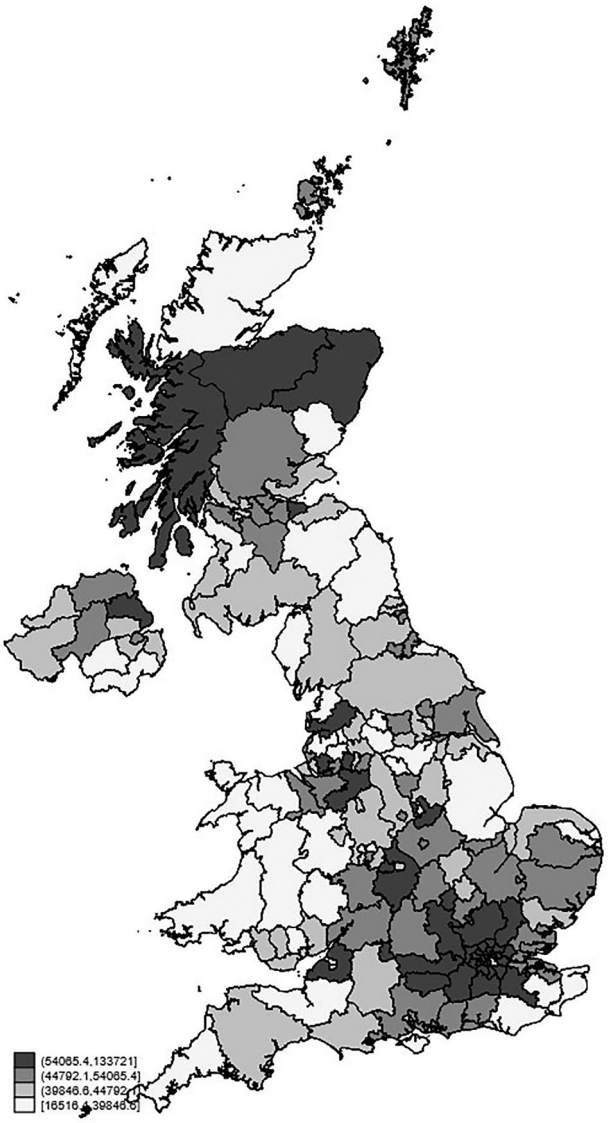

Figure 2. UK regional aggregate productivity, gross value added (GVA) per worker, average 2002–19, based on 2015 constant prices.
Source: Authors' own computations using the OECD's Regions and Cities Database.

5. RESULTS

5.1. Main results

The estimation results for labour productivity growth between 2012 and 2019 in manufacturing (columns 1–4), industry (columns 5–8) and across all economic sectors (columns 9–12) are summarised in Table 1 using the binary and non-binary 'trend' indicators of reindustrialisation, which we prefer somewhat over the 'changes' indicators because they help mitigate any effect of extreme observations/outliers around the GFC. However, we present the results using the 'changes' indicators in Table A3 in Appendix A in the supplemental data online, which are broadly similar in terms of sign, economic size and statistical significance.

The binary 'trend' reindustrialisation indicator in column (1) of Table 1 is positively and significantly associated with productivity growth in manufacturing (i.e., sector C). Our estimations imply that reindustrialising regions have experienced about 2.6% more annualised productivity growth than non-reindustrialising regions in the post-crisis years. Significant associations also emerge using the non-binary reindustrialisation indicator in columns (2–3). The relevant estimates are highly significant (at the 1% level), and robust after the inclusion of additional controls. Economically, a 1 SD (standard deviation) increase in reindustrialisation associates with an increase in

Table 1. Estimation results for productivity growth (2012–19) using the 'trend' measures of reindustrialisation.

	Manufacturing				Industry				All sectors			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Initial productivity level	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
	(3.267)	(3.168)	(3.297)	(3.423)	(4.851)	(4.892)	(5.065)	(6.045)	(3.632)	(3.202)	(2.911)	(2.809)
Reindustrialisation (binary)	0.026***	–	–	–	0.023***	–	–	–	0.003*	–	–	–
	(4.138)				(4.188)				(1.709)			
Reindustrialisation (non-binary)	–	5.290***	4.869***	–	–	1.688***	1.568***	–	–	0.609***	0.517***	–
		(9.504)	(12.721)			(3.530)	(2.746)			(8.834)	(6.358)	
Regime 1: Extension	–	–	–	6.623***	–	–	–	1.979***	–	–	–	1.124***
				(8.658)				(2.895)				(7.414)
Regime 2: Diversification	–	–	–	5.984***	–	–	–	4.131***	–	–	–	0.173
				(7.362)				(10.847)				(1.105)
Regime 3: Reorientation	–	–	–	4.271***	–	–	–	0.744	–	–	–	0.650***
				(8.429)				(0.859)				(6.884)
Regime 4: Creation	–	–	–	4.545***	–	–	–	1.450***	–	–	–	0.548***
				(12.101)				(2.957)				(7.105)
Population	–	–	0.004***	0.003***	–	–	0.004***	0.004***	–	–	0.000	0.000**
			(4.612)	(4.056)			(4.654)	(4.104)			(1.428)	(2.252)
Major conurbation	–	–	0.014**	0.018***	–	–	0.006	0.010**	–	–	−0.002	−0.002
			(2.477)	(3.131)			(0.990)	(2.067)			(0.912)	(0.993)
Labour market slack	–	–	0.021	−0.001	–	–	−0.063	−0.064	–	–	−0.011	−0.018
			(0.266)	(0.007)			(1.256)	(1.185)			(0.776)	(1.396)
Patents	–	–	0.002***	0.002***	–	–	0.001	0.001	–	–	0.000	0.000
			(2.829)	(2.870)			(1.582)	(1.640)			(0.448)	(0.771)
Education	–	–	0.201	0.203	–	–	0.184	0.151	–	–	0.090**	0.099**
			(1.277)	(1.370)			(1.148)	(0.995)			(1.986)	(2.193)
Brexit exposure	–	–	−0.034***	−0.031***	–	–	–	–	–	–	−0.003	−0.004
			(4.644)	(4.069)							(1.109)	(1.207)
Additional controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.283	0.381	0.429	0.436	0.294	0.288	0.320	0.348	0.211	0.235	0.256	0.278

Model significance	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Observations	179	179	179	179	179	179	179	179	179	179	179	179	179

Note: The constant term, additional controls and subregional (ITL2) fixed effects are included as indicated, but are not reported for brevity. Additional controls include nation-specific dummy variables for Scotland, England and Northern Ireland, as well as the Southeast dummy variable. R^2 is the R^2 statistic for model fit. Model significance is the p-value for overall model significance. Absolute t-statistics (in parentheses) are based on Conley's (1999) robust standard errors. Significance: *10%, **5%, ***1%.
Source: Authors' own computations.

productivity growth in the region of 2.4% (= 4.869 × 0.005 × 100) to 2.6% (= 5.29 × 0.005 × 100). Therefore, the implications of reindustrialisation are positive and significant for manufacturing productivity, both statistically and economically.

For industry (i.e., sectors B–E), the results using both binary and non-binary reindustrialisation measures in columns (5–7) of Table 1 are statistically significant at the 1% level. The productivity effect is somewhat smaller economically, with column (5) implying that reindustrialising regions have experienced around 2.3% more annualised productivity growth in industry than non-reindustrialising regions. This is comparable but somewhat larger than the 1.5% productivity growth realised for the EU's NUTS2 regions in the same industry sectors (B–E) reported by Capello and Cerisola (2023, tab. 5, p. 9). Therefore, our findings suggest that reindustrialisation has played a stronger role in supporting productivity growth in industry and manufacturing.

The binary reindustrialisation indicator in column (9) of Table 1 produces economically smaller and less significant effects for aggregate productivity growth (i.e., across all sectors). However, using our non-binary reindustrialisation measure, we obtain results in columns (10) and (11) that are much more significant statistically (at the 1% level). A 1 SD increase in reindustrialisation associates with an increase in aggregate productivity growth of about 0.26% (= 0.517 × 0.005 × 100) to 0.30% (= 0.609 × 0.005 × 100). The small economic effect is consistent with the small weight of the manufacturing sector in the UK economy and weak interlinkage between manufacturing and service sectors.

In Table 1 (column 4), all reindustrialisation regimes positively and significantly associate with manufacturing productivity growth, regardless of the nature of reindustrialisation. The coefficient estimates for regimes 1–4 are all relatively large in the manufacturing sector, ranging from 4.271 to 6.623, and are significant at the 1% level (column 4). For industry, again each regime associates positively with productivity growth, and significantly so in three regimes, with estimates ranging from 0.744 to 4.131 (column 8). At the aggregate level, all four regimes associate positively with productivity growth, and usually significantly so, with estimates ranging from 0.173 to 1.124 (column 12). Qualitatively similar outcomes are obtained when using the 'changes' measure in Table A3 in Appendix A in the supplemental data online.

Table 1 indicates reindustrialising regions that extended a pre-existing manufacturing specialisation have generally realised more robust productivity growth than other regions. Our results are quite consistent with Sunley et al.'s (2023) finding that the UK's best performing traditional industry regions have tended to expand in existing industries. Overall, we find that 'diversification' and 'creation' regimes do not associate as robustly with productivity growth. Therefore, the gains from intra-industry specialisation – often termed 'Marshallian externalities' – appear to exceed any productivity-enhancing spillovers due to local firms interacting in less closely related or

different sectors (Jacobs, 1969; Marshall, 1890). The relatively strong outcomes for the 'extension' regime might also reflect a shift toward producing closely related varieties, niche products and new specialisations within the same area, such as West Midlands' transition away from mass production in the automotive sector towards luxury vehicle manufacture in the premium sector. In this respect, our results are not necessarily inconsistent with the view in evolutionary economic geography that relatedness matters (Boschma & Weterings, 2005). In contrast, the results for the other regimes are generally less robust and somewhat weaker empirically, especially for the 'creation' regime. Our results point to stronger barriers to interactive learning, innovation and productivity growth when regions transition to entirely new subsectors involving the production of different goods. Moreover, the finding of weaker productivity gains under the 'creation' regime seems quite plausible within the context of an early UK reindustrialisation process.

Regarding controls, regional population associates positively with productivity growth, and always significantly in manufacturing and industry (Table 1). Estimates for the major conurbation indicator are also positive and significant for manufacturing, which points to productivity-enhancing urban agglomeration economies in large built-up areas. However, labour market slack is insignificant in our estimations. A region's stock of patents positively associates positively with growth, and significantly for manufacturing. Furthermore, regional human capital affects growth, with positive and larger point estimates for manufacturing and industry, although education plays a statistically more significant role outside of industry. We also find some evidence of regional convergence, in that initially less productive regions (with otherwise similar characteristics) have experienced stronger growth in the post-GFC years.

Table 1 indicates that Brexit has weakened productivity growth prior to EU exit, and significantly so in the case of manufacturing. Our estimations imply that regions with above-average exposure to Brexit have suffered about 3% less manufacturing productivity growth than other, less exposed regions. Therefore, Brexit's direct effect on productivity growth seems much larger than any indirect effect it has had by slowing the initial momentum towards regional reindustrialisation.[11] The strong direct effect can be explained in part because Brexit placed some limits on trade, particularly the trade in goods, which has disrupted productivity in the manufacturing sector. Exposed regions may also have faced significant productivity headwinds due to rising economic uncertainty and falling investment in the build-up to Brexit (e.g., NIESR, 2019).[12]

5.2. Additional estimations

Industrial policies are often framed around their potential to impact on the standard of living and inclusivity of growth. Furthermore, some theoretical arguments and empirical work suggest that different forms of industrial change – such as whether regional specialisation is reinforced or if production instead becomes more diversified – can affect variables such as labour productivity and employment differently (e.g., Frenken et al., 2007, p. 687). Table 2 uses real GDP per capita growth (columns 3–4), the change in the share of employed workers to total population (columns 5–6), and change in the unemployment rate (columns 7–8) over the subperiod 2012–19 as alternative dependent variables. Each variable is computed at the aggregate level (i.e., across all economic sectors). For comparison, the outcomes for aggregate labour productivity growth are presented in columns (1–2). Table 2 uses the non-binary 'trend' measure of reindustrialisation, though similar results are obtained using the 'changes' measure (see Table A4 in Appendix A in the supplemental data online). Evidently, reindustrialisation associates positively and significantly with growth in real GDP per capita (column 3) and changes in the employment share (column 5), whereas it is linked negatively to changes in the unemployment rate (column 7). These findings suggest that reindustrialisation can have broadly positive effects on regional productivity and performance.

In Table 2 the association between reindustrialisation and GDP per capita growth is positive in all four regimes, and significant in three cases (column 4). Our findings for the 'extension' regime are more robust for labour productivity growth and GDP per capita growth, with weaker effects on employment. This is consistent with arguments about industrial agglomeration externalities and localisation economies, whereby economic growth occurs mainly due to improvements in efficiency, process innovation and increased labour productivity without necessarily affecting employment (Frenken et al., 2007). However, for the 'creation' regime we find more robust effects on GDP per capita growth (column 4), changes in the share of employment (column 6) and the unemployment rate (column 8). This may reflect radical product innovation and the creation of new markets and employment which are associated with more creative pathways (Frenken et al., 2007). Further, when local firms expand production into new areas, this can alleviate structural unemployment by absorbing displaced workers (Pasinetti, 1993). The latter can arise naturally over time due to adverse economic shocks and general improvements in productive efficiency.

5.3. Implications for the UK's regional productivity divide

Our non-binary measures reveal the varying scale of reindustrialisation across UK regions. Exploiting this heterogeneity, for each ITL3 region we compute the aggregate productivity growth effects associated with regional movements towards reindustrialisation. Regions undergoing larger movements towards reindustrialisation stand to benefit from larger productivity growth effects compared with regions undergoing smaller movements, whereas non-reindustrialising regions extract no growth gains from this process. Focusing on the reindustrialisation-growth effects, we do not impose changes on any other variables in the estimations.

Table 2. Additional estimations using alternative performance indicators.

	Labour productivity growth		GDP per capita growth		Employed/population change		Unemployment rate change	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reindustrialisation	0.517***	–	0.544***	–	0.084***	–	−0.038***	–
	(6.358)		(8.622)		(2.864)		(4.089)	
Regime 1: Extension	–	1.124***	–	0.555***	–	−0.097	–	−0.026
		(7.414)		(7.022)		(1.135)		(1.234)
Regime 2: Diversification	–	0.173	–	0.200	–	0.025	–	−0.063***
		(1.105)		(1.376)		(0.378)		(3.084)
Regime 3: Reorientation	–	0.650***	–	0.671***	–	0.125***	–	−0.004
		(6.884)		(6.732)		(2.834)		(0.279)
Regime 4: Creation	–	0.548***	–	0.646***	–	0.084***	–	−0.057***
		(7.105)		(6.498)		(2.762)		(3.735)
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.256	0.278	0.301	0.319	0.422	0.434	0.823	0.826
Observations	179	179	179	179	179	179	179	179

Note: Reindustrialisation corresponds to the non-binary 'trend' reindustrialisation variable. All estimations include the full set of controls. See also the notes to Table 1.
GDP, gross domestic product.
Source: Authors' own computations.

To proceed, we utilise the full range of estimation results obtained using the non-binary 'changes' and 'trend' reindustrialisation measures as presented in columns (1–2) of Table 2 (and see Table A4 in Appendix A in the supplemental data online).[13] For example, using the 'trend' measure, we compute a productivity growth effect for Barnsley, Doncaster and Rotherham of approximately 0.525% by multiplying the relevant estimate of 0.517 in column (1) of Table 2 by the increase in the trend of the manufacturing share across the two subperiods, 0.010151, and scaling in percentage points. We take the smallest and largest outcomes obtained from 'changes' and 'trend' reindustrialisation results as the lower and upper bounds for the growth effects, and also average these outcomes. Similarly, we compute the regime-specific growth effects for each reindustrialising region using the relevant estimates in column (2) of Table 2 (and see Table A4 online). We provide a summary of results in Table A5 online for brevity but discuss the key findings below.

We find that, overall, regions outside London have benefitted from stronger productivity growth effects than London regions. In this paper, we link these differences to the varying scale of reindustrialisation across UK regions, with regions outside London generally experiencing larger movements towards reindustrialisation, resulting in larger productivity growth effects, as indicated in Table A5 (panel B) in Appendix A in the supplemental data online. Consistent with these findings, London regions have also realised somewhat weaker actual productivity growth in the post-GFC years than other regions (e.g., Rodrigues & Bridgett, 2023). However, the extent to which reindustrialisation has contributed to productivity growth effects has varied widely across UK regions.

Figure 3 plots reindustrialising regions' initial productivity in 2012 against their regime-specific growth effects. In regions with a pre-existing manufacturing specialisation, which was reinforced under the 'extension' regime, or where an initial diversification was followed by increased specialisation under the 'reorientation' regime, reindustrialisation has generated stronger productivity growth effects (Figure 3a, c). This has benefitted numerous lower-to-middle productivity regions. For instance, Antrim and Newtownabbey, which is a

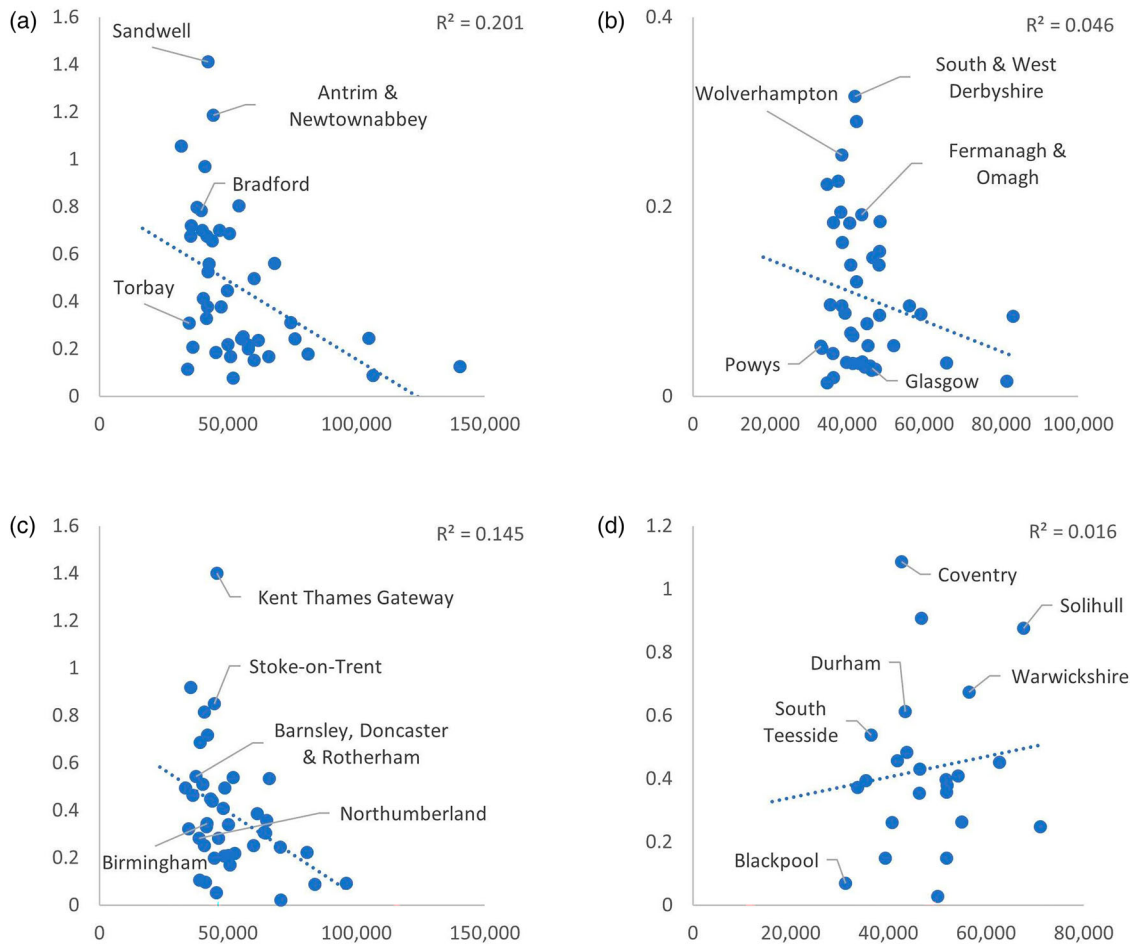

Figure 3. Reindustrialisation-growth effects and initial productivity by regime.
Note: Reindustrialisation-implied productivity growth effect, in percentage points (vertical axis)/initial productivity (horizontal axis): regime 1: 'extension' in (a); regime 2: 'diversification' in (b); regime 3: 'reorientation' in (c); and regime 4: 'creation' in (d). The dotted line corresponds to the trendline.
Source: Authors' own computations.

significant manufacturing hub in Northern Ireland, has benefitted from a productivity growth effect of approximately 1.2% in Figure 3a. Similarly, Sandwell in the West Midlands, with its increased specialisation in premium automotives, has benefitted from a productivity growth effect of about 1.4%. Elsewhere, Kent Thames Gateway has transitioned from older industries to newer manufacturing specialisations, and stands out with a productivity growth effect in the region of 1.4% in Figure 3c. Lower productivity regions under the 'creation' regime have experienced somewhat weaker growth effects in Figure 3d, as have regions under the 'diversification' regime in Figure 3b. For example, South and West Derbyshire, which diversified away from an initial specialisation in advanced manufacturing, has only realised a productivity growth effect of about 0.3% in Figure 3b. Overall, our results point to stronger 'catch-up' growth effects under the 'extension' regime, wherein numerous regions have benefitted from significant industrial agglomeration externalities and localisation economies. Contrarily, many lower productivity regions in the other regimes have not done as well from reindustrialisation.

Though reindustrialisation has been widespread across the UK, large productivity gaps still exist between London and the rest of the UK. The movement towards reindustrialisation that most regions have experienced has been limited, hence most lower-to-middle productivity regions have realised only small reindustrialisation-growth effects. Further, despite the expectation of some positive reindustrialisation-growth effects, many lower-to-middle productivity regions have experienced only weak or negative productivity growth in the post-crisis years (e.g., Birmingham, Dudley, Wolverhampton, Stoke-on-Trent, Durham, South Teesside and Northumberland). This highlights the importance of other constraints on productivity growth. Increased trade disruption, rising economic uncertainty and falling investment would have affected many UK regions in the build-up to Brexit, particularly the more industrial regions in the North of England and Midlands (e.g., Bailey et al., 2023a; Chen et al., 2018). Other constraints include lack of expenditure on regional infrastructure and local skills shortages (e.g., Fransham et al., 2023; Martin et al., 2021; Stansbury et al., 2023). Overall, our results support recent calls for more local or place-based policy interventions that aim at addressing the specific needs of UK regions (e.g., Bailey et al., 2023b, *passim*).

6. CONCLUSIONS

This paper has explored the reputed re-emergence of industry with a particular focus on UK manufacturing. We have contributed by constructing new binary and non-binary reindustrialisation measures, which reflect changes in the level and trend of manufacturing activities in the regional economy. We have used these to map reindustrialisation within and across the UK's 179 ITL3 regions. Our analysis has generated new empirical results relating to UK regional productivity and performance.

As our results confirm, there are signs of a manufacturing revival in the UK, aligning with the growing body of research on reshoring. Reindustrialisation has been quite extensive across the UK, though rather variable in terms of the size of changes in the manufacturing share experienced by reindustrialising regions. Most regions have experienced a combination of larger initial contractions in the manufacturing share of value added in the pre-crisis subperiod, followed by smaller contractions or small-to-moderate increases in this share in the post-crisis years. Consistent with an early reindustrialisation process, few regions have experienced moderate-to-large increases in the manufacturing share between 2012 and 2019.

Empirically, we found that reindustrialising regions have experienced from 2.3% to 2.6% more annualised productivity growth in industry and manufacturing than non-reindustrialising regions in the post-GFC years. Our findings for UK regions are somewhat stronger than Capello and Cerisola's (2023) findings for EU regions, though we also find that reindustrialisation has played a stronger role in boosting productivity growth in manufacturing, whereas its pass-through to the wider economy has been more limited. These results can be attributed to the smaller size of industry in the UK economy and the weak interlinkage between the manufacturing and service sectors. Our estimations have revealed that regions expanding on pre-existing manufacturing specialisations have benefitted from relatively robust productivity growth, pointing to significant industrial agglomeration effects. In contrast, reindustrialising regions on more creative pathways have benefitted more from income generation, employment creation and unemployment absorption effects. These differing outcomes can be linked to arguments about process versus product innovation under different growth pathways.

Because movements towards reindustrialisation have typically been quite limited, the associated productivity growth effects have been small-to-moderate for most regions. Of concern, some of the weakest and least productive regions have not experienced much, if any, actual productivity growth in the post-GFC years, implying deeper lying barriers to economic progress. Therefore, our results suggest that manufacturing can still be a dynamic force in the UK economy, but they also highlight the limitation of reindustrialisation as a mechanism to reverse lagging productivity growth. As our results also show, UK productivity problems have not been helped by Brexit. We have found that Brexit has reduced manufacturing productivity growth significantly prior to EU exit, whilst slowing down somewhat the early momentum towards reindustrialisation. However, we share the view that Brexit is likely to be a 'slow burn' process (e.g., Bailey et al., 2023a) and its full effects on UK regions cannot yet be fully assessed.

In conclusion, our results indicate the continued need for targeted policies aimed at upgrading and scaling-up manufacturing in regions with established capabilities. The revival of manufacturing cannot be sustained without the support of active policies that enable its development. Our findings underline the need for a broader industrial

strategy, involving increased expenditure on regional infrastructure and skills, which have well established productivity linkages. One potential barrier to progress, which is confirmed by our findings, relates to the weaker productivity growth in parts of London. This raises the possibility of resources being diverted to support the UK's political and financial capital at the expense of other regions and industries (Martin & Sunley, 2023). In our view, this would be a step in the wrong direction given the large regional productivity disparities that persist, and the opportunities that any momentum towards reindustrialisation might afford the UK to rebalance its growth model in a more broad-based way.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

NOTES

1. To our knowledge, only Capello and Cerisola (2023) have estimated the productivity–reindustrialisation nexus, with a focus on EU NUTS2 regions.
2. The first-level UK territories consist of 12 ITL1 regions, which include Scotland, Wales, Northern Ireland and nine statistical regions of England. The second-level territories consist of 41 ITL2 regions, which include English counties/county groups; Scottish council area combinations; Welsh unitary authority groups; and Northern Ireland. The third-level territories consist of 179 ITL3 regions, which include English counties, local authority districts and unitary authorities; Scottish council area combinations; Welsh unitary authority groups; and Northern Irish local government districts.
3. For example, UK non-manufacturing sectors grew at an annualised rate of 3.9% over the period 2011–19 versus an annualised rate of 3.7% over the period 2002–07 (OECD, 2024).
4. A constant prices GVA measure of reindustrialisation might provide a better indication about production volumes. However, price is an important component of the quality of production. Therefore, following the approach of Capello and Cerisola (2023), we take the ratio of value added in current prices.
5. These subperiods are selected partly to avoid the instability associated with the GFC; also because the reindustrialisation debate and push for policy initiatives was strengthened subsequently (e.g., Christopherson et al., 2014; Bailey et al., 2015). As a sensitivity check, we moved the subperiods up to two years further away from the crisis, using instead the periods 2002–05/06 and 2013/14–19. Alternatively, we moved the subperiods one year closer to the crisis, using the periods 2002–08 and 2011–19 instead. However, these different choices had little effect on whether we classified regions as reindustrialising or the extent of any reindustrialisation.
6. When employing Conley's (1999) robust standard errors, we use the Bartlett kernel such that spatial autocorrelation decays linearly with distance, up to a prespecified cut-off point of 1000 km, which roughly accords with the upper end of the maximum pairwise distance amongst UK ITL3 regions. Similar results are obtained if we used alternative cut-off distances of 250, 500 or 750 km or allowed for spatial autocorrelation within but not across UK nations to account for nationwide institutional influences on growth.
7. Data for (un)employment are available for 168 ITL3 regions (all regions in England, Wales and Scotland), but are unavailable for Northern Ireland regions. For the latter, we utilise data from the UK Labour Force Survey for Northern Ireland to fill in these gaps.
8. The underlying indices correspond to Brexit exposure in NUTS2 (equivalent to ITL2) regions, hence we assign values to ITL3 regions based on their ITL2 counterparts. Specifically, we average Chen et al.'s (2018) index values for regional labour income and GDP exposure to create an 'overall' exposure index, before identifying regions with above-average values.
9. We exclude the control for regional Brexit exposure in the industry sector due to lack of data.
10. Both trajectories are consistent with a movement towards reindustrialisation because the time trend in manufacturing's share of GVA was found to be more positive over the later subperiod, 2012–19, than over the earlier subperiod, 2002–07.
11. For example, the average value for the non-binary 'trend' reindustrialisation variable was 0.0051 for regions with an above-average Brexit exposure, whereas it was 0.0055 for regions with a below-average exposure to Brexit. If we multiply this difference by the relevant coefficient estimate of 4.869 (Table 1, column 3), multiplying also by 100 to scale in percentage points, it implies that reindustrialising regions with above-average Brexit exposure have realised about 0.2% (= 4.869 × [0.0055 – 0.0051] × 100) less manufacturing productivity growth due their weaker movement towards reindustrialisation than regions with below-average exposure to Brexit. This is much less than the direct effect of about 3.4%.
12. We acknowledge that other Brexit effects, including those referred to in the main text, may not be fully captured in our estimations given the simplicity of our approach and focus on EU trade linkages.
13. We compute the productivity growth effects only for regions that are identified as reindustrialising using both 'changes' and 'trend' measures.

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