



# Place Prospects in the Digital Economy

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THIS PRESENTATION: [BIT.LY/PPDIGECON](https://bit.ly/ppdigecon)

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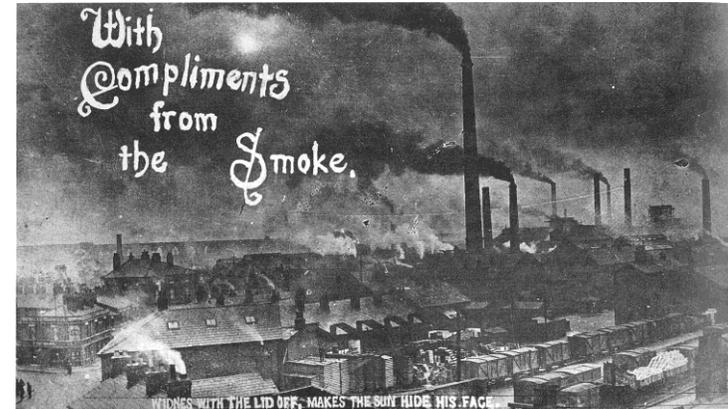
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Incursion of internet-enabled technologies – Automation & Robotisation; Artificial Intelligence; Algorithmic problem solving; seen as existential challenge to existing patterns of production and employment

Prior analysis has focused largely on industrial and occupational impact – spatial impacts less so

But all prior industrial revolutions have affected spatial distribution of employment and hence wellbeing

So this is *important*



**Amalgam of results and thoughts across papers and project report – published and otherwise**

**Featuring Dylan Henderson, Neil Roche, Max Munday, Chen Xu, Laura Norris, Annette Roberts, part funded by EU ERDF**

**Examination of sub-national impacts of internet technologies;**

- Rural v Urban
- City-Regional
- The role and challenge for cities

**A pilot index of vulnerability & opportunity**



**In this presentation**

**Implications of AI, Automation, Industry 4.0 on industries & occupations (e.g. Frey & Osborne 2017; OECD)**

**Some focus on nations (Arntz et al 2017) - at lower spatial scales the analysis gets tougher (Future Advocacy, 2017 for UK parliamentary constituencies) or narrower (e.g. Brookings, 2017 looking at robots in US cities)**

**Typical analyses (e.g. ONS,2019) use occupational, industrial structure to predict vulnerability to technological shocks**

**Rationale: Technology, space and place**

However these analyses ignore critical elements that have been shown or theorised to affect regional prospects (Jones, 2015)

- (location of) Capital ownership,
- Urban/regional hierarchies,
- Urban/rural function/density
- Innovative ecosystems
- Patterns in global value chains
- Consumer/citizen behaviour.
- ...

*All of which will mediate impact of on places*

**Rationale: Technology, space and place**



# Place Prospects in the Digital Economy

## *Rurality*

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# Longstanding concerns over rural business' lack of access to broadband – and hence enabled cloud & other technologies

May be compounded by issues around business size, capacity & sector

## DIGITAL MATURITY IN WELSH SMES, 2018

|                        | RURAL      | URBAN      | TOTAL      |
|------------------------|------------|------------|------------|
| DIGITALLY EMBEDDED     | 16.4%      | 19.5%      | 18.1%      |
| ACTIVE EXPLOITERS      | 31.8%      | 38.6%      | 35.6%      |
| PASSIVE EXPLOITERS     | 34.8%      | 34.2%      | 34.5%      |
| DIGITALLY DISENGAGED   | 16.9%      | 7.7%       | 11.9%      |
| <b>TOTAL RESPONSES</b> | <b>201</b> | <b>246</b> | <b>447</b> |

<https://www.cardiff.ac.uk/superfast-broadband-project/digital-maturity-survey>

# Rural versus Urban



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## *City-Regions*

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Rural-Urban Analysis ignores role of functional economic hierarchies at sub-national scale.

Some indication (e.g. Mack, 2015; Mack & Grubestic 2009) that post-industrial regions plus those next to existing technology-rich urban centres may struggle

An *a priori* assessment of the Cardiff City Region emphasizes this point...



## Broadband-relevant labour market characteristics: Cardiff Capital City-Region.

| Job-related training 2015<br>(% 16–64 years last 13 weeks) | Qualified Population 2015<br>(% pop. NVQ4+/Bachelor degree) | Gross weekly wages<br>2014 (£) (all employees) |             |                       |               |
|--|---|--|-------------|-----------------------|---------------|
| Merthyr Tydfil   | 14.2  | Blaenau Gwent                                  | 19.0        | Merthyr Tydfil        | 404.70        |
| Caerphilly   | 15.3  | Merthyr Tydfil                                 | 25.4        | Blaenau Gwent         | 431.20        |
| Blaenau Gwent  | 16.7  | Torfaen  | 27.4        | Torfaen               | 451.00        |
| The Vale of Glamorgan                                      | 19.9  | Caerphilly                                     | 28.0        | The Vale of Glamorgan | 456.00        |
| Bridgend   | 20.0  | Rhondda, Cynon, Taff                           | 29.6        | Monmouthshire         | 463.90        |
| Cardiff  | 20.2  | Bridgend                                       | 31.0        | Caerphilly            | 466.50        |
| Rhondda, Cynon, Taff                                       | 20.3  | Newport  | 34.0        | Newport               | 471.50        |
| Torfaen  | 23.9  | The Vale of Glamorgan                          | 40.7        | Rhondda, Cynon, Taff  | 477.90        |
| Monmouthshire  | 24.1  | Monmouthshire                                  | 41.7        | Cardiff               | 504.40        |
| Newport  | 24.7  | Cardiff  | 43.5        | Bridgend              | 509.50        |
| <i>Valleys</i>   | <i>18.5</i>   | <i>Valleys</i>                                 | <i>27.9</i> | <i>Valleys</i>        | <i>446.26</i> |
| <i>Coast</i>   | <i>21.3</i>   | <i>Coast</i>                                   | <i>39.4</i> | <i>Coast</i>          | <i>481.06</i> |

\*Shaded region are denoted as valleys.

Henderson & Jones, 2019

## Broadband-relevant firm characteristics: Cardiff Capital City-Region.

| Percent of private firms in top broadband-benefitting industries 2015 |      | Medium/large firms (50–250 emp) per 10,000 population 2015 |      |
|---|------|--|------|
| Blaenau Gwent   | 10.5 | The Vale of Glamorgan                                      | 5.1  |
| Merthyr Tydfil  | 12.3 | Blaenau Gwent  | 5.7  |
| Rhondda, Cynon, Taff  | 15.5 | Monmouthshire  | 6.0  |
| Caerphilly  | 16.0 | Merthyr Tydfil   | 6.8  |
| Torfaen   | 16.2 | Caerphilly   | 6.9  |
| Bridgend  | 16.7 | Rhondda, Cynon, Taff                                       | 7.2  |
| Newport   | 20.6 | Bridgend   | 7.4  |
| The Vale of Glamorgan   | 21.3 | Torfaen  | 8.7  |
| Monmouthshire   | 21.7 | Newport  | 11.2 |
| Cardiff   | 25.5 | Cardiff  | 13.5 |
| Valleys   | 15.0 | Valleys  | 8.1  |
| Coast   | 22.4 | Coast  | 10.1 |

Henderson & Jones, 2019



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## *Cities*

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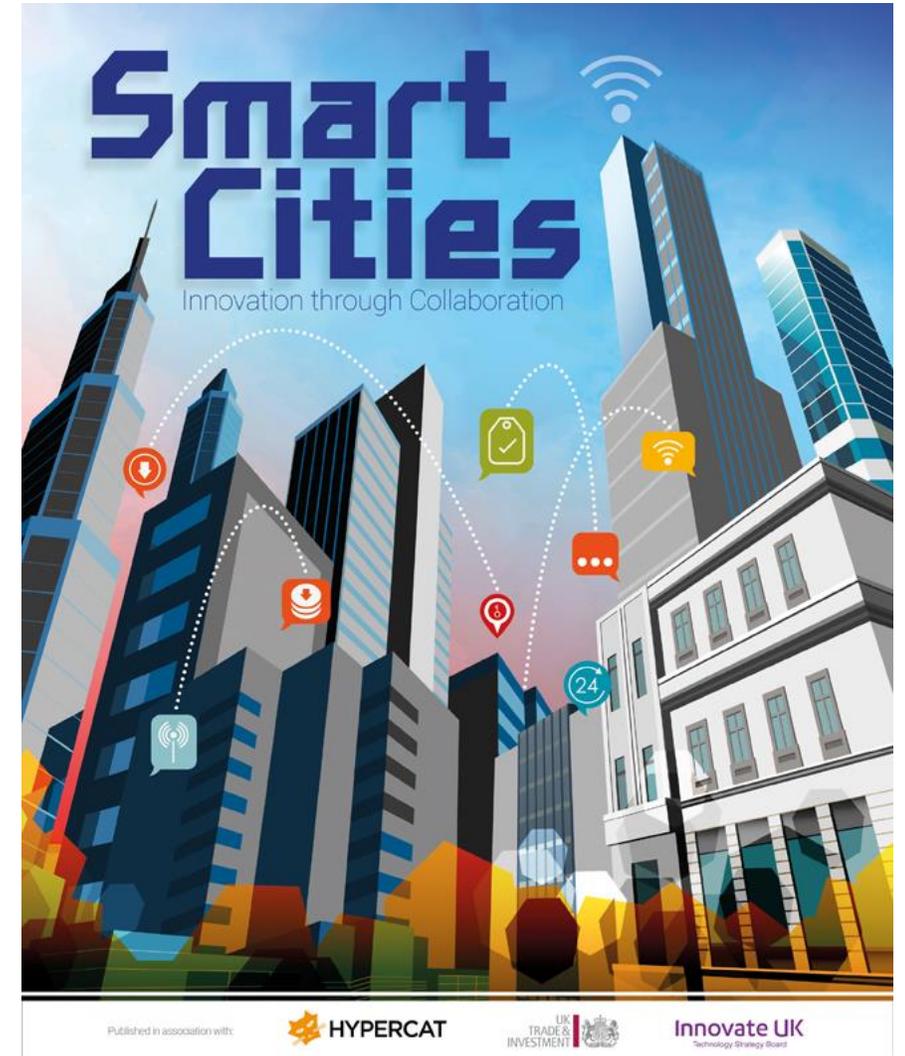
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Analysis so far emphasizes the advantaged position of cities relative to their peri-urban and rural hinterlands

But this ignores deep changes to the nature of value creation, and the location of value realization which will impact the role of cities in the 'smart' and connected world

tl;dr – cities face significant pressure and likely consequent restructuring



**“These two complementary areas experience an unequal level of exchange. The periphery, rich in resources, provides goods to the densely populated central area. The centre provides a return in the form of ideologies and cultural influence.”**

Liverani, 2013 p21 writing on the urban revolution, c. 3000BCE.  
Quoted in Jones (2015)



# The Role of Cities

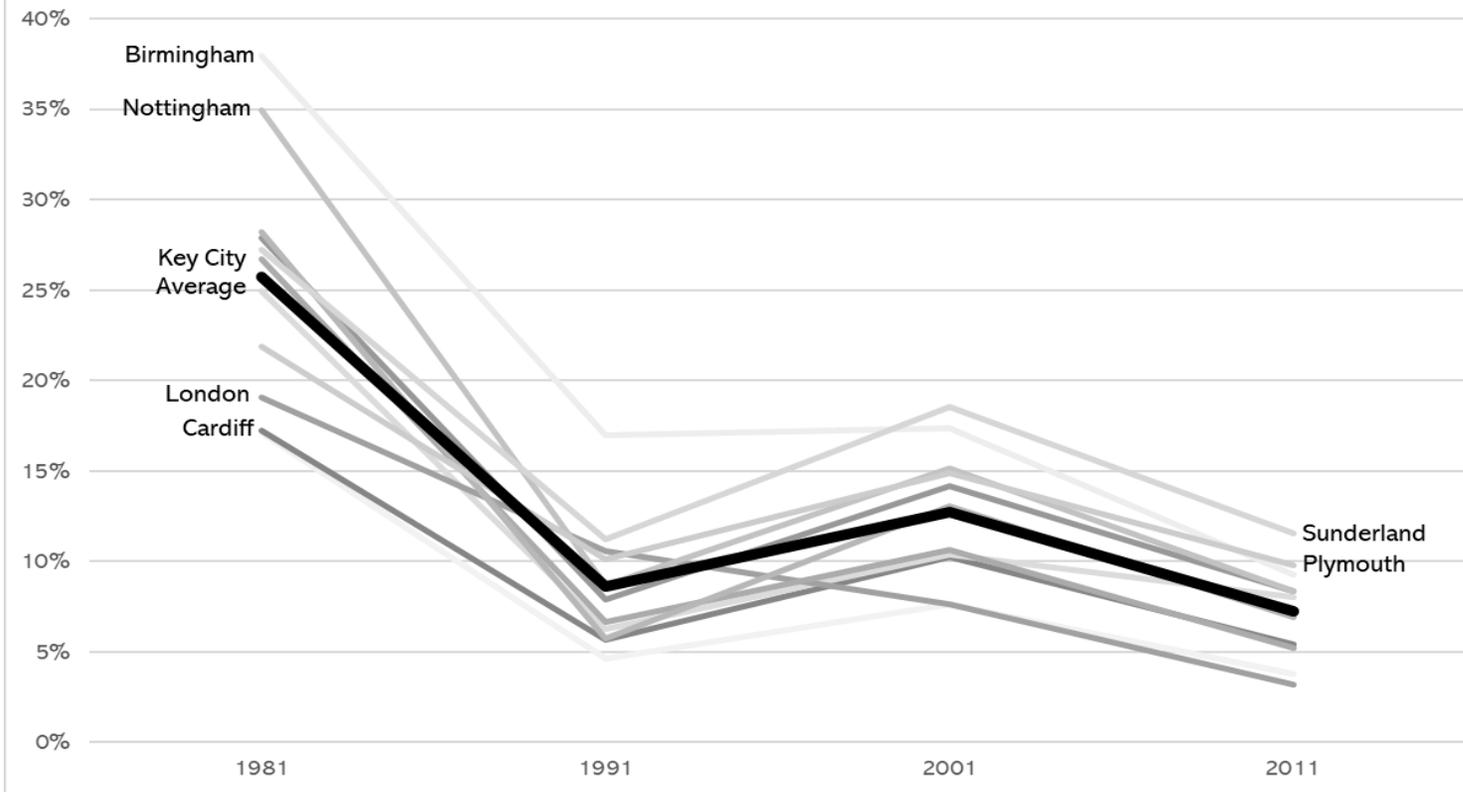
**The rising sun managed to peek around the vast column of smoke that forever rose from Ankh-Morpork, City of Cities, illustrating almost up to the edge of space that smoke means progress or, at least, people setting fire to things.”**

Terry Pratchett, *Unseen Academicals*



# The Role of Cities

Figure 1 Manufacturing Employment Share in Key UK Cities 1981-2011



“The entire supply chain is in China now,” said another former high-ranking Apple executive. “You need a thousand rubber gaskets? That’s the factory next door. You need a million screws? That factory is a block away. You need that screw made a little bit different? It will take three hours.”.

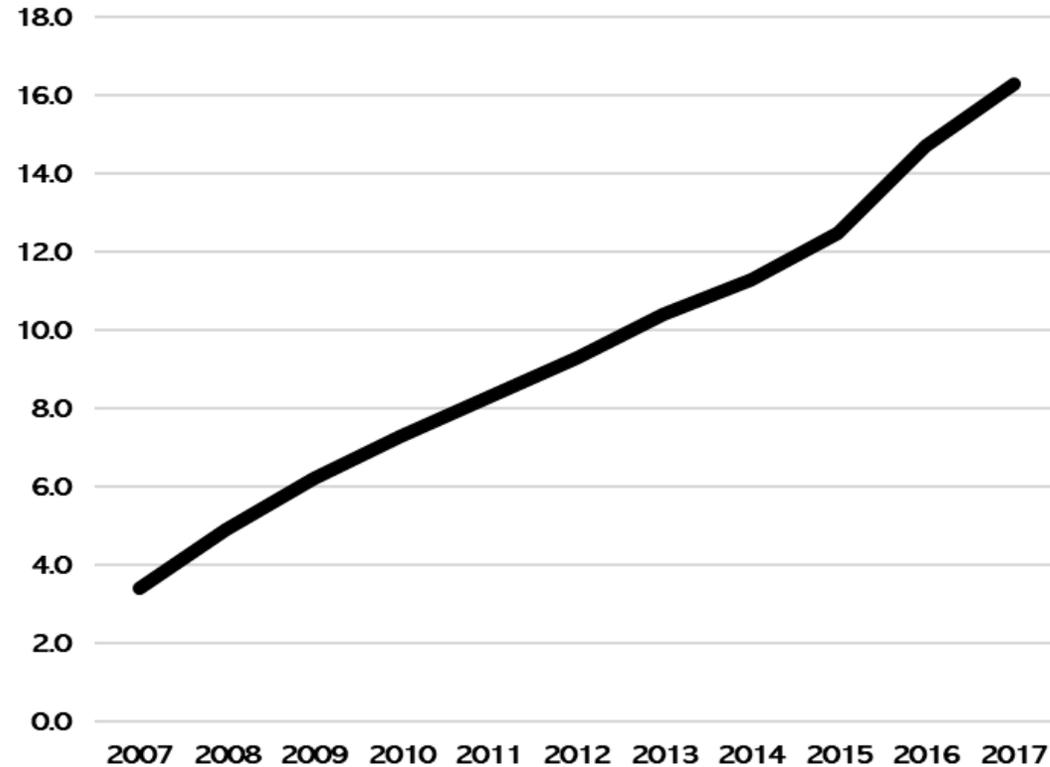
New York Times, (2012) How the U.S. Lost Out on iPhone Work



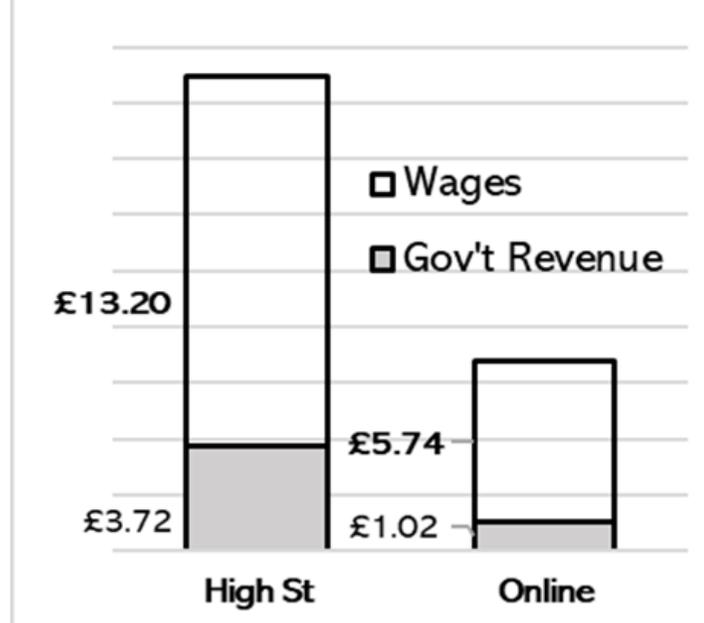
# The Role of Cities

% of retail sales

Figure 2 - The Growth and Impact of UK Internet sales



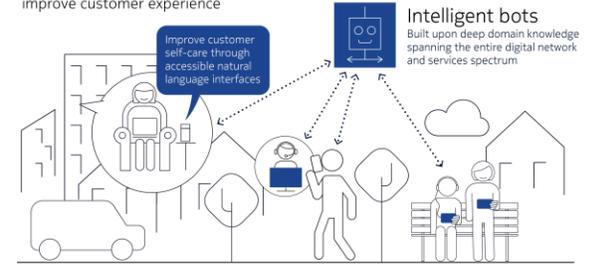
Tax and Labour Returns per £100 Spent



Nokia Autonomous Customer Care

The evolution to zero-touch customer care

Reduce customer effort and improve customer experience



Enhanced omni-channel customer care

Humanoid interface decreases human agent workload and makes subscribers more self-sufficient

Augmented customer care

The best of human and machine intelligence together improve customer care speed and accuracy, reduce costs and improve operational efficiencies

Zero-touch customer care

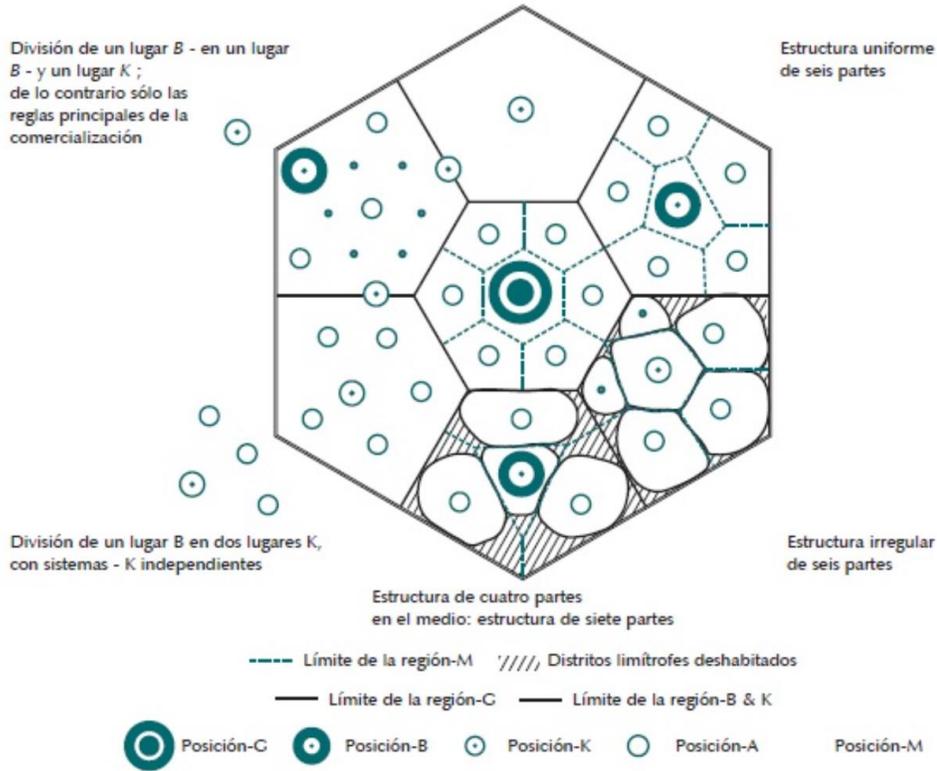
Unprecedented levels of intelligence and automation preempt a substantial volume of incoming customer communications remediation



JONES (2019) *Not so Smart? The City in the Digital Economy* ERSA LYON

# The Implications for Cities

Un sistema de lugares centrales de acuerdo con el principio administrativo



# Place Prospects in the Digital Economy

## Regions

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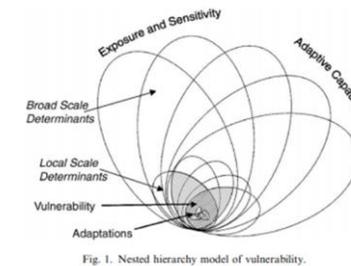
- **Previous rounds of automation had implications for workers and places**
  - **Skill biased nature of automation effects - routine-based tasks and jobs** (Berman et al 2006)
- **Power of AI to learn and adapt to more complex tasks opens up the potential to replace higher level skills such as management (Autor, 2015).**
- **Potential implications for regions emerging:**
  - **New business models that rely on ownership of IP, algorithms & delivery platforms**
  - **R&D/Innovation/Complexity has a tendency to concentrate in particular places** (McAfee & Brynjolfsson 2017; Balland et al 2020)
  - **‘Left behind’ places, and consequent effects...(Rodriguez-Pose, 2018)**



# The Challenge for Regions: Literature

- **Evolutionary economic theorists have explored vulnerability within a wider framework of resilience and the potential for regions to respond and adapt to shocks**
  - Resilience literature Equilibrium focused models – degree of bounceback (e.g. disaster studies)
  - Resilience as a historical, evolutionary process (Boschma and Franken, 2012 etc.)
  - Comprising vulnerability, resistance, robustness, recoverability (Martin and Sunley, 2015)
- **But how applicable are shocks to understanding vulnerability to automation?**
  - Studies have principally focused on sudden shocks such as recessions
  - Not all shocks e.g. recessions are sudden or negative
  - Slow burn models.... (Pendell et al 2010; Boschma and Frenken ) ‘Slow burn’ models.... (Pendell et al 2010; Boschma and Frenken )

- The concept of vulnerability is linked to the risk that places face from a stressor and consequent likelihood of impact (Brooks et al., 2005)
- Vulnerability as a dynamic process rather than a static state or snapshot in time (Smit & Wandel, 2006)
- Ecological literature defines vulnerability in relation to (Smit and Wandel, 2006)
  - Exposure – defined in relation to a hazard and its experience by a particular group, or multiple groups (O'Brien & Leichenko, 2000).
  - Opportunity – defined as presence of factors that may enable a particular group to adapt to a hazard
- At the regional level vulnerability is likely to be a product of a complex range of social and economic factors, with automation impacting on jobs, businesses and sectors. Smit and Wandel 2006
- Vulnerability of what?
- Firms (Nelson and Winter, 1982), regions, jobs, tasks (OECD, 2018)....



# Timing and impacts

- **Resilience / vulnerability factors identified by economic geographers**
  - Variety (Boschma, 2015)
  - Entrepreneurship (Williams and Vorley, 2014)
  - Innovation (Bristow and Healey, 2014)
  - Exports (Laphu, 2018)
- **Timescale of the impact**
  - Slow-burn but innovation diffusion models point to stages or waves of impact

# Vulnerability-Opportunity: Identifying Regional Drivers

|                    | Metric   | Rationale  | Literature                               |
|--------------------|--|--|--|
| <b>Exposure</b>    | <b>Industries at High Risk</b>                 | Uneven impacts of transformation in productive systems   | Birtchnell & Urry; Berger & Frey; OECD   |
|                    | <b>Routine Occupations</b>                     | Evidence suggests routine process occupations at higher risk   | Hawksworth et al; Arntz et al.           |
|                    | <b>Compensation of Employees as a % of GVA</b> | Potential for automation labour to further shift the capital/labour share                                  | Prettner, 2017; Autor & Salomons, 2018   |
|                    | <b>Concentration (Herfindahl) Index</b>        | Variety as an indicator of economic resilience   | Sunley, Martin, Boschma...               |
| <b>Opportunity</b> | <b>Percent with post-16 Qualifications</b>     | Higher Qualifications / skills benefit from labour-augmenting technological incursion & more widely useful | Berger & Frey; Hassink; Faggian & McCann |
|                    | <b>R&amp;D Spend per inhabitant</b>            | Proxy for innovation, IP ownership   | Saxenian; cooke; Asheim...               |
|                    | <b>GFCF as % of GVA</b>                        | Proxy for (recent) capital investment & infrastructure   | Amin & Goddard; Leigh & Craft            |
|                    | <b>Businesses per 1000FTEs</b>                 | Proxy for entrepreneurship & enterprise; readiness to enter new markets                                    | Mitra; Basco; Malecki                    |

## Method (1)

# Vulnerability-Opportunity: Building a Composite Index

|             | Metric                                  | Source                               | Year               | Range         |
|-------------|---|--------------------------------------|--------------------|---------------|
| Exposure    | Industries at High Risk                 | OECD / PWC & ONS BRES                | 2016               | 28.8% - 33.5% |
|             | Routine Occupations                     | ONS Labour Force Survey              | Average 2006/11/17 | 23.7% - 32.3% |
|             | Compensation of Employees as a % of GVA | ONS Regional Accounts                | 2016               | 48.2% - 62.5% |
|             | Concentration (Herfindahl) Index        | ONS BRES                             | 2016               | 0.062 - 0.114 |
|             | Percent with post-16 Qualifications     | ONS Labour Force Survey              | 2017               | 51.2% - 73.6% |
| Opportunity | R&D Spend per inhabitant                | EUROSTAT                             | Average 2012-15    | €67 - €1,988  |
|             | GFCF as % of GVA                        | ONS Regional Accounts (experimental) | Average 2014-16    | 12.9% - 56.4% |
|             | Businesses per 1000FTEs                 | ONS Business Demography              | 2016               | 60.5 - 173.4  |
|             |   |                                      |                    |               |

## Method (2)

# Constructing the Index

Identification of eight proxy indicators (so far)

Four exposure & four opportunity measures

Transform each to standard distribution – setting min=0, max=1 & retaining relative distribution of regional scores

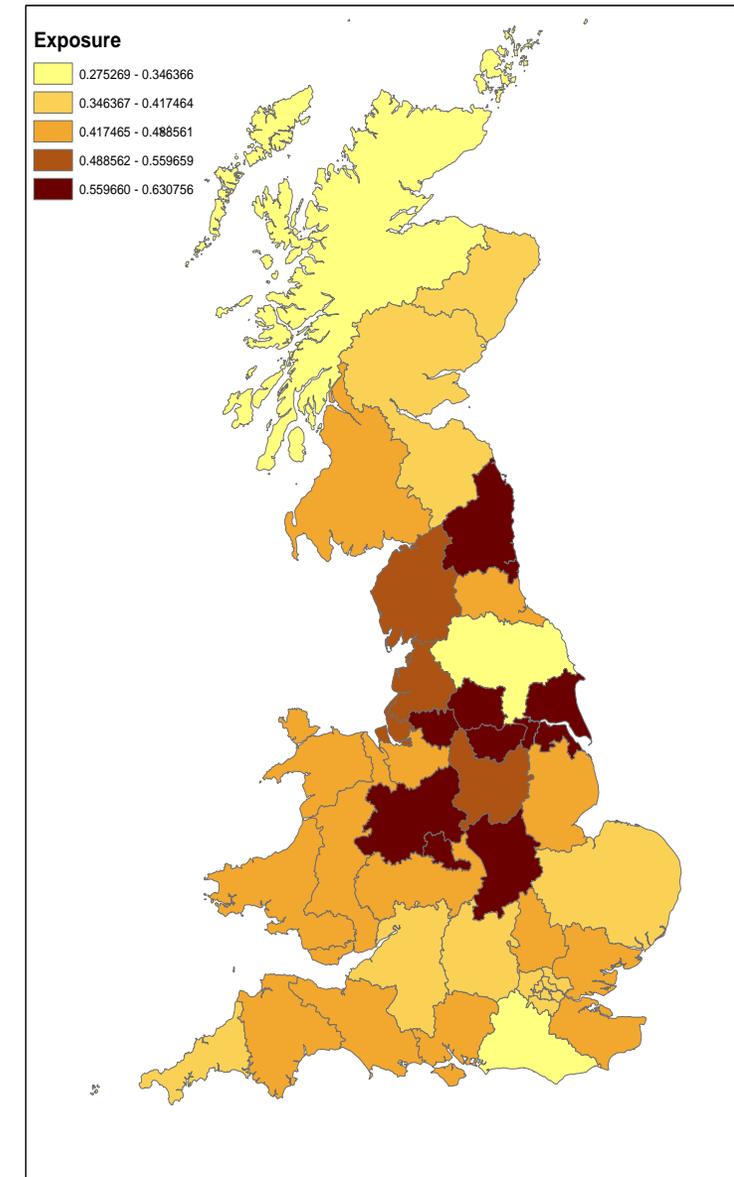
Hence allocate equal weighting to each variable

Calculate average exposure, opportunity & composite score

# Results: Exposure

|   | Exposure (0-1) |
|---|----------------|
| 1 UKG3 West Midlands                                | 0.63           |
| 2 UKD3 Greater Manchester                           | 0.61           |
| 3 UKE3 South Yorkshire                              | 0.61           |
| 4 UKE1 East Yorkshire and Northern Lincolnshire     | 0.59           |
| 5 UKF2 Leicestershire, Rutland and Northamptonshire | 0.59           |
| ...   |                |
| 31 UKI1 Inner London                                | 0.38           |
| 32 UKK3 Cornwall and Isles of Scilly                | 0.38           |
| 33 UKM5 North Eastern Scotland                      | 0.35           |
| 34 UKE2 North Yorkshire                             | 0.34           |
| 35 UKM6 Highlands and Islands                       | 0.30           |
| 36 UKJ2 Surrey, East and West Sussex                | 0.28           |

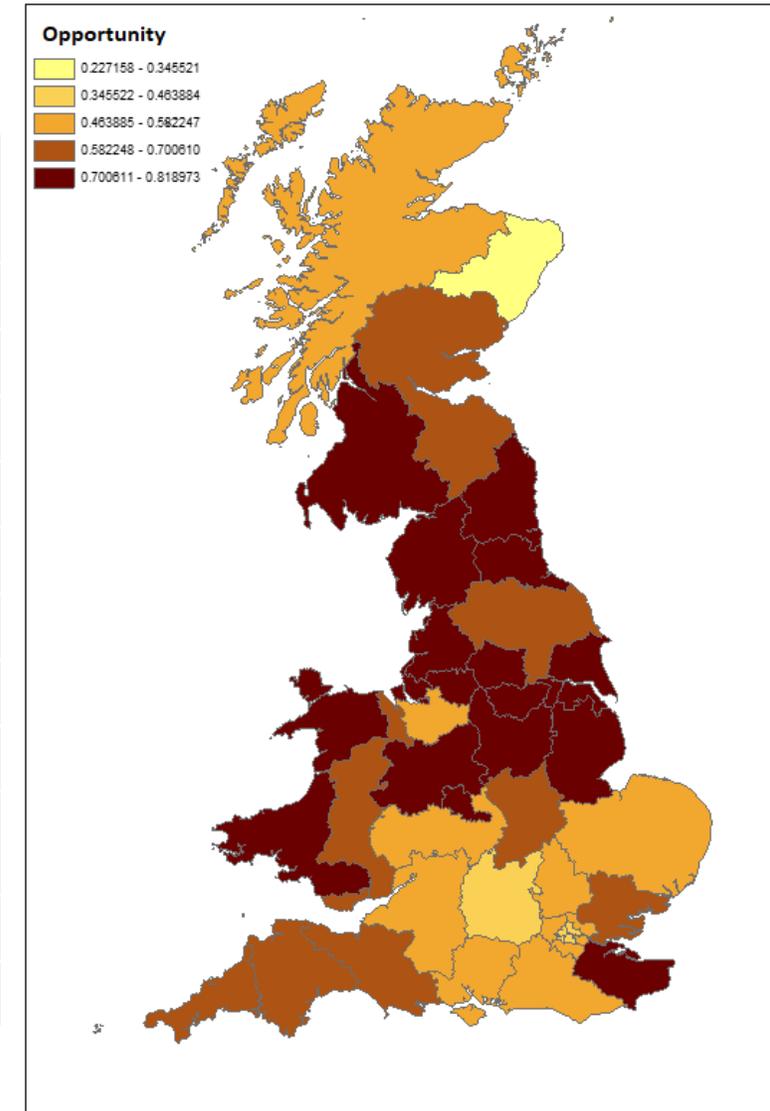
*NB – Higher score is always worse*



# Results: Opportunity

|   | Opportunity (0-1) |
|---|-------------------|
| 1 UKE3 South Yorkshire                                | 0.82              |
| 2 UKG3 West Midlands                                  | 0.81              |
| 3 UKE1 East Yorkshire and Northern Lincolnshire       | 0.81              |
| 4 UKF3 Lincolnshire                                   | 0.81              |
| 5 UKE4 West Yorkshire                                 | 0.8               |
| ...   |                   |
| 32 UKH2 Bedfordshire and Hertfordshire                | 0.51              |
| 33 UKD6 Cheshire                                      | 0.49              |
| UKJ1 Berkshire, Buckinghamshire and<br>34 Oxfordshire | 0.41              |
| 35 UKI1 Inner London                                  | 0.39              |
| 36 UKM5 North Eastern Scotland                        | 0.23              |

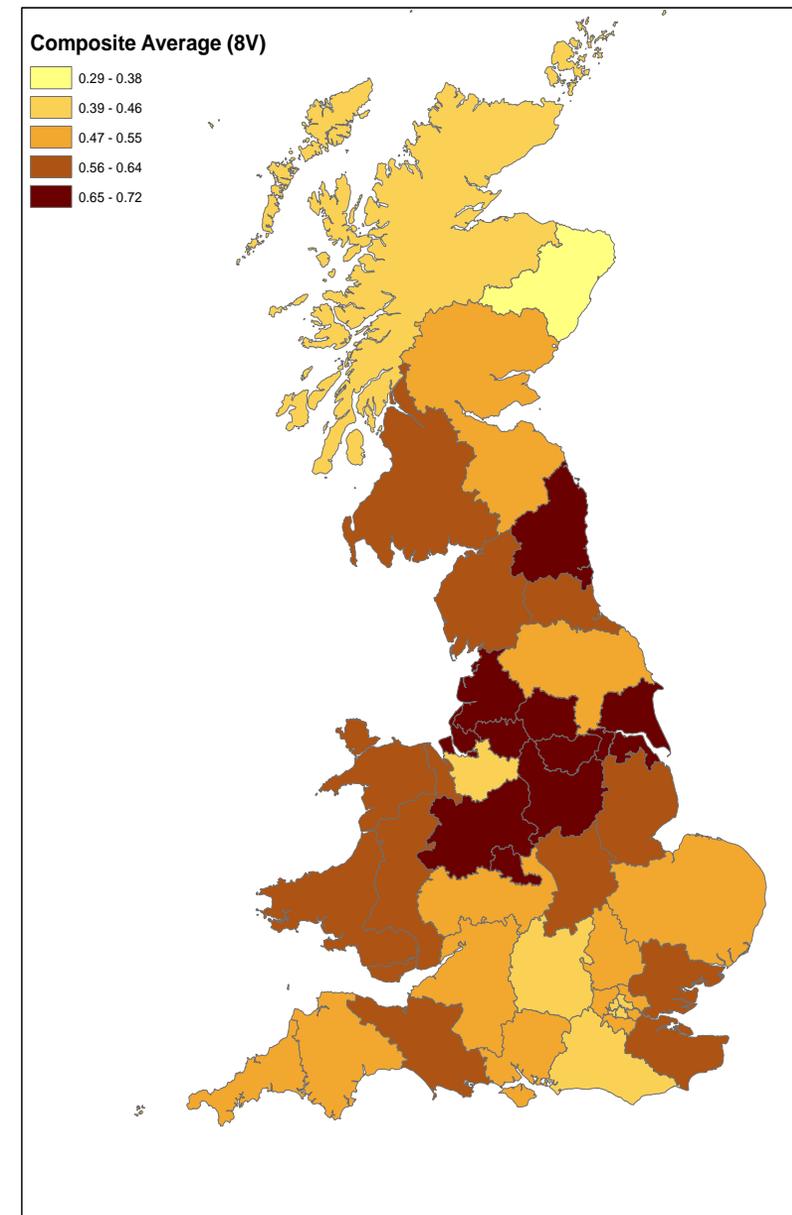
*NB – Higher score is always worse*



# Results: Composite

|  | Composite<br>(0-1) |
|--|--------------------|
| 1 UKG3 West Midlands                               | 0.72               |
| 2 UKE3 South Yorkshire                             | 0.71               |
| 3 UKE1 East Yorkshire and Northern Lincolnshire    | 0.7                |
| 4 UKE4 West Yorkshire                              | 0.69               |
| 5 UKD3 Greater Manchester                          | 0.68               |
| ...  |                    |
| 32 UKM6 Highlands and Islands                      | 0.43               |
| 33 UKJ2 Surrey, East and West Sussex               | 0.41               |
| 34 UKJ1 Berkshire, Buckinghamshire and Oxfordshire | 0.41               |
| 35 UKI1 Inner London                               | 0.38               |
| 36 UKM5 North Eastern Scotland                     | 0.29               |

*NB – Higher score is always worse*





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## *Conclusions*

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**Tech-driven industrial upheaval is politically and socially mediated as well as depending on ‘the economics’. Technology is *not* fate.**

**However, prior rounds of tech incursion suggest a range of factors within and *between* places will influence the extent and impact of new technology**

**Reading across the literature and examining current place characteristics, the (rolling) impact of technology would seem to favour already-successful places relative to those less economically successful (post-industrial, rural, Northern)**

**The world remains resolutely *unflat* and *weightful***

**Examination of relative success in places like the UK ignores a more radical and existential change being wrought on places by the platform economy.**

**A sui generis ‘region’ characterised by a handful of megafirms is abstracting value from production, intermediation & consumption across most other global regions. More and more value is captured (effectively) a-spatially**

**So far, few places or nations seem to have grasped this challenge**

**Takeaways**



# Place Prospects in the Digital Economy

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