New Measures of Demand for Digital Skills: An Analysis across UK Regions

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Overview

- Part of a TPI project using job platform data and administrative data to investigate demand and supply of skills in UK regions
- Measuring demand
- Demands across the regions
- Measuring supply and future work

Related literature

- Productivity slowdown and geographical dispersion
- The Labour market and skill mismatch
- Measuring skills
  - Most common measure is through matching job tasks, education and occupation
  - We are looking at flows of workers – firms desired hires vs potential supplies.

Types of skills: job platform data

- The recent availability of job platform data allows us to delve deeper into the concept of skill, at least on the demand side and hiring end.
- We use Lightcast data on about 9 million job adverts annually from 2014 – 2024.
- Standard variables available for each advert such as geographic location, SIC (various levels), SOC (various levels), plus lists of skill keywords
- and the original text of the advert
- Analysis using Travel To Work Area (TTWA) - local labour markets

Education

- To this we add a graduate/non-graduate/unknown division
- This classification is based on the TPI working paper by Andrieu and Kuczera (2022).
- These authors measured educational qualifications directly from the text of job adverts.
- We revisited and refined using more recent data
  - Increases the share of adverts where educational requirements can be identified to about 40% (from about 20% identified by Lightcast)

Digital Technical skills

- Lightcast identifies about 6,500 keywords (or groups of words) for software skills
- They also identify about 19,000 specialist skills keywords, of which about 1,000 refer to AI, LLM and data analysis.
- We divide these keywords into three groups:
- **Developers** (D) – skills that involve knowledge of programming language, artificial intelligence or data science, which facilitate change and innovation in firms, e.g. Phyton, SQL, Ruby, Machine Learning. Artificial Intelligence.
- **Users (U)** – skills that involve employing standard software packages in business processes, but do not require any knowledge of programming, or advanced statistics/mathematics, e.g. Salesforce, Microsoft Dynamics CRM, SAP Business Connector, Accounting software
- **Basic** (B) – a small group of keywords required for a broad range of tasks, such as Microsoft Excel, Zoom or Google Drive.

Software skills: examples among most popular

	software	count		software	count
D	SQL (Programming Language)	2816885	U	SAP Applications	1255488
D	JavaScript (Programming Language)	2323256	U	Salesforce	521821
D	C# (Programming Language)	1775040	U	Microsoft Dynamics CRM	151073
D	Java (Programming Language)	1613566	U	Sage 50 (Accounting Software)	122199
D	Cascading Style Sheets (CSS)	1417609	U	Google Workspace	94648
D	Python (Programming Language)	1304573	B	Microsoft Excel	4273949
D	C++ (Programming Language)	820473	B	Microsoft Office	3470386
D	AutoCAD	790131	B	Microsoft Word	1013334
D	Ruby (Programming Language)	224494	B	Zoom (Video Conferencing Tool)	107201

Digital Technical skills

- We categorised all software and relevant specialised skills keywords into one of our three groups. The starting point for this was the keywords that appeared in IT, Engineering and Research Occupations, plus manual checking.
- We then divided job adverts into our three groups using a range of methods, based on the number of occurrences of the keywords
  - Many adverts contain all three
- We tried various methods but they were highly correlated across regions (ongoing work).
- Results shown below are preliminary

Digital Technical skills: shares

	Shares of skill types in job adverts			
	Developer	User	Basic	Other
2014	23.6	3.4	3.7	69.3
2015	25.3	3.3	3.7	67.7
2016	23.5	3.4	4.2	68.9
2017	23.3	3.8	4.0	68.9
2018	20.4	3.9	4.0	71.7
2019	20.0	4.3	4.3	71.4
2020	21.4	4.2	4.0	70.5
2021	23.0	4.7	4.6	67.7
2022	24.1	5.0	4.6	66.3
2023	17.4	4.8	5.0	72.8
2024	16.3	5.0	5.0	73.6

Users and basic showing trend increase over time, Developers more variable – increased during the pandemic but fell off after that.

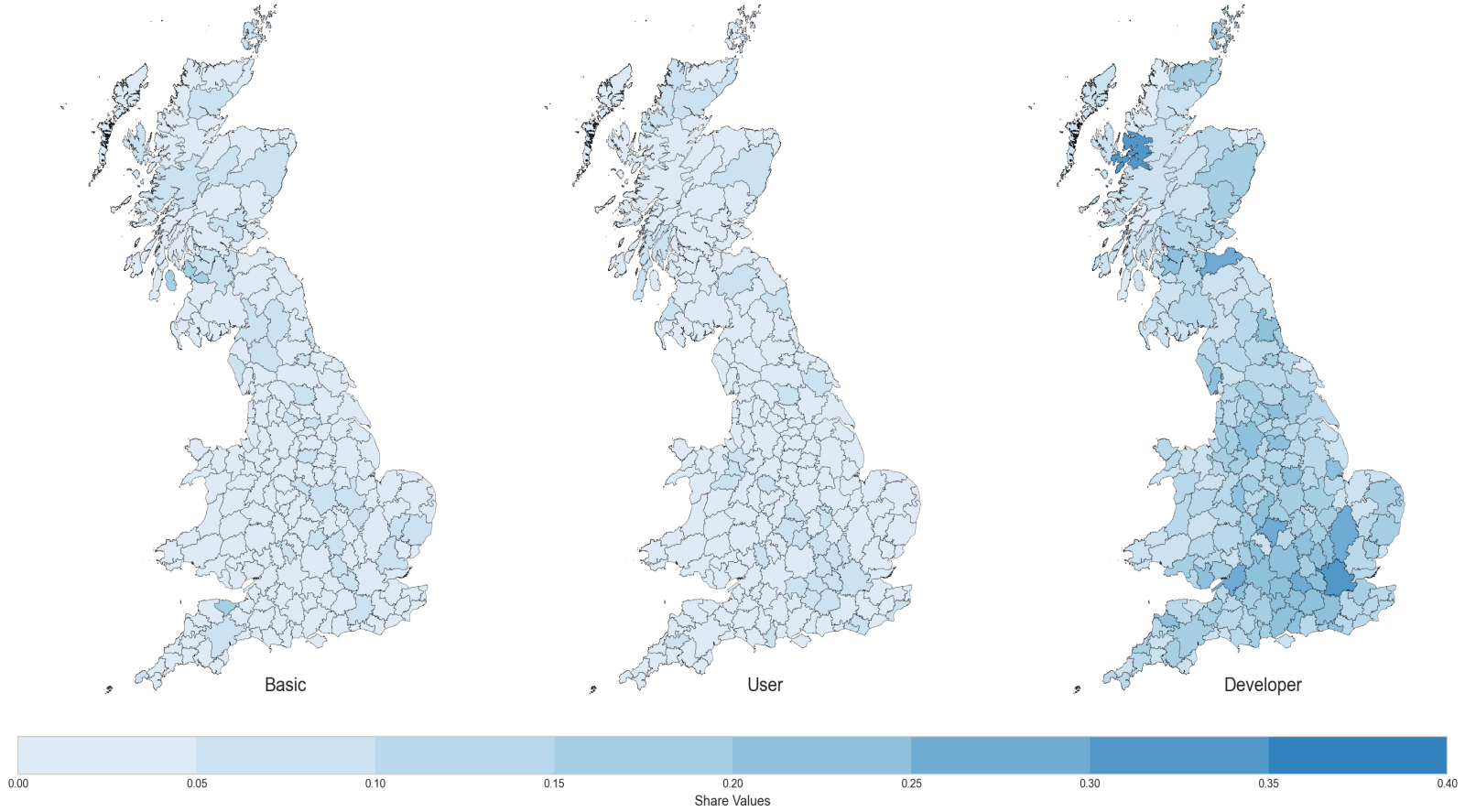
Digital Technical skills: Shares

	Shares of skill types by education.			
Education	Developer (%)	User (%)	Basic (%)	
Graduates	24.6	4.8	3.7	
Non-graduates	14.0	3.8	5.8	
Education unknown	22.2	4.1	4.3	

Graduates more likely to be developers but a significant share also in user and basic

Non graduates less likely to be developers, but still a sizeable share, and more likely to be in the Basic group.

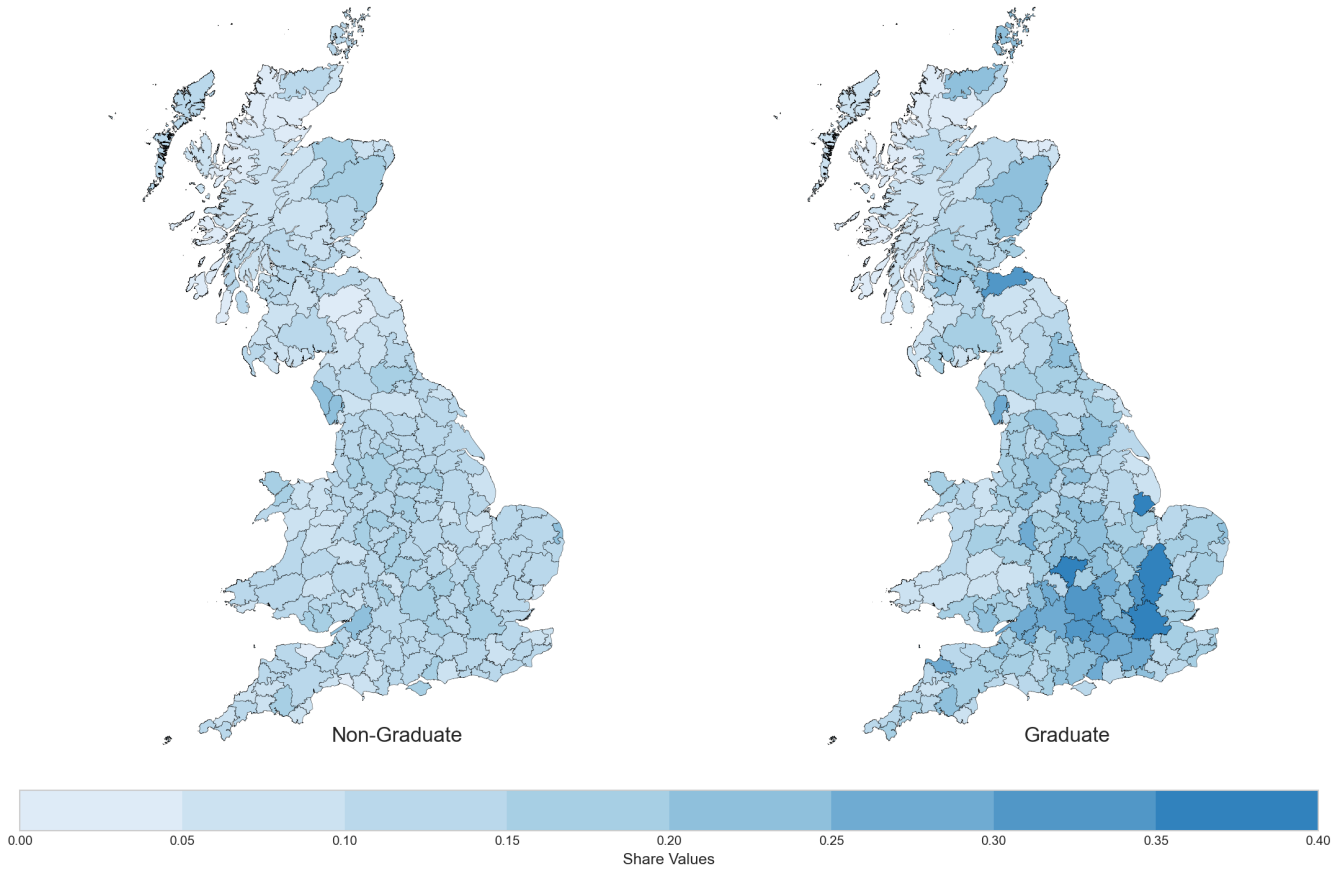
Digital Technical skills by Region Average 2020-22



Basic and Users spread out across the country

Developers more concentrated around London

Digital Technical skills by Region Average 2020-22

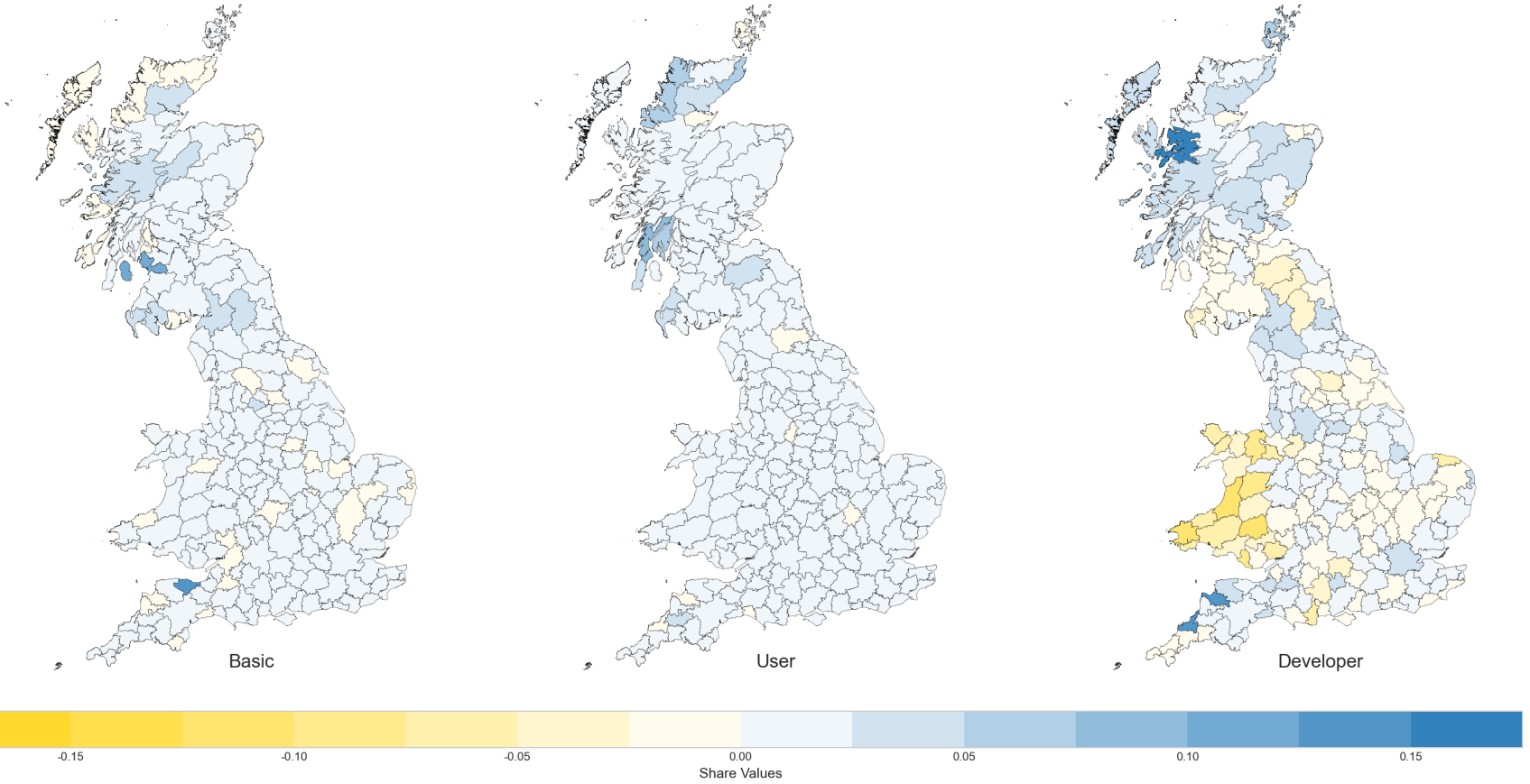


Developers: Concentration around London mainly for graduates.

Non-graduates more spread out

Digital Technical skills by Region

Change in digital technical skills: average 2020-22 minus average 2017-19

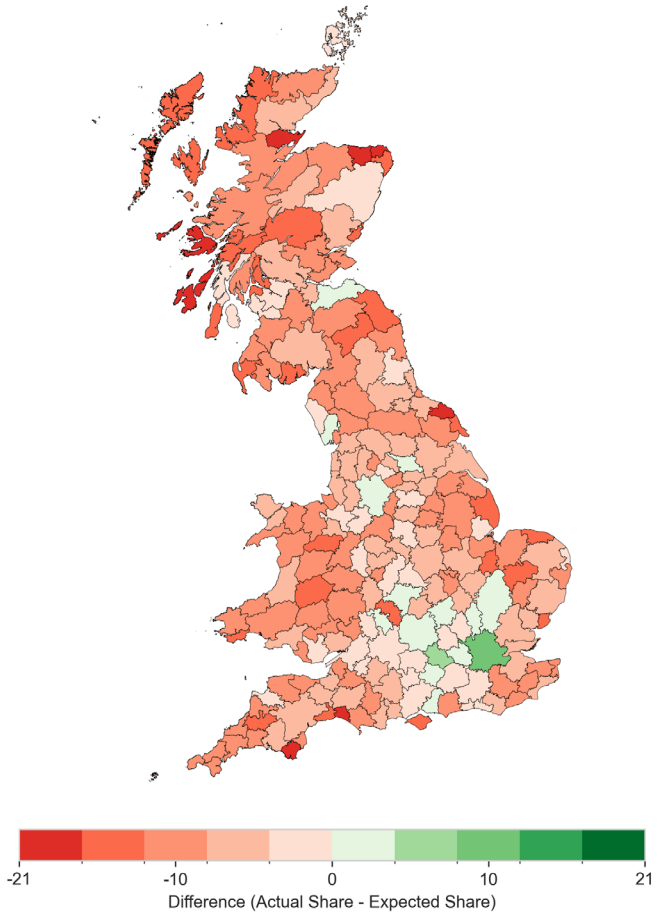


User and basic growing everywhere. Developers more mixed but growing in London

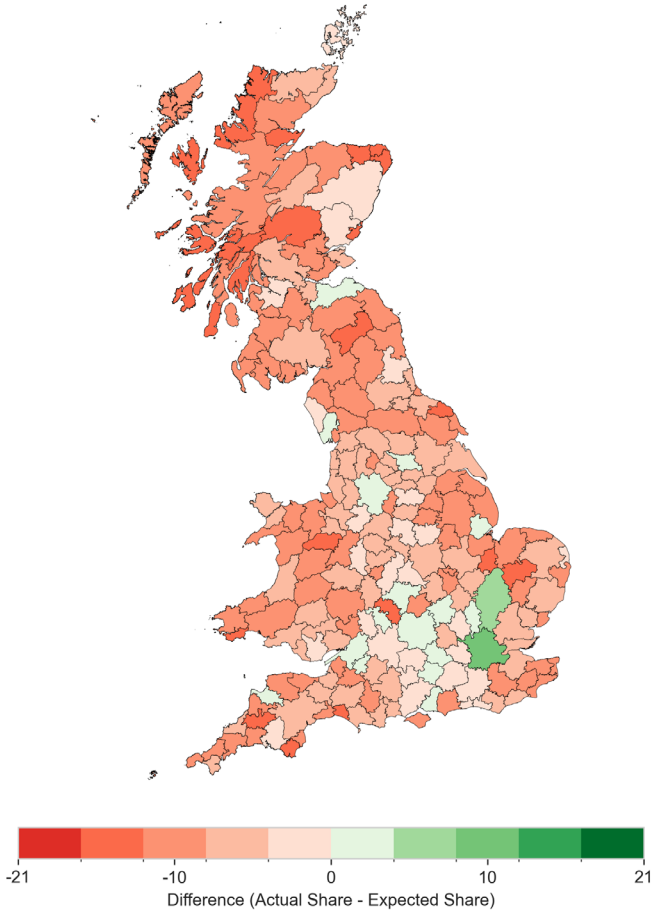
Allowing for industry composition

- The distribution across regions will be affected by the composition of industries in the region
  - Software sector concentrated in London and SE
- We used the Lightcast data by industry (SIC1)
  - but caveat industry N
- we calculated aggregate UK industry shares of D, U and B.
- And applied these to the industry advert share in each TTWA to give an expected share of D, U and B
- We then took the difference between the actual and expected shares.

Developer and Total Technical skills: Ratio actual to expected. (2020-22)



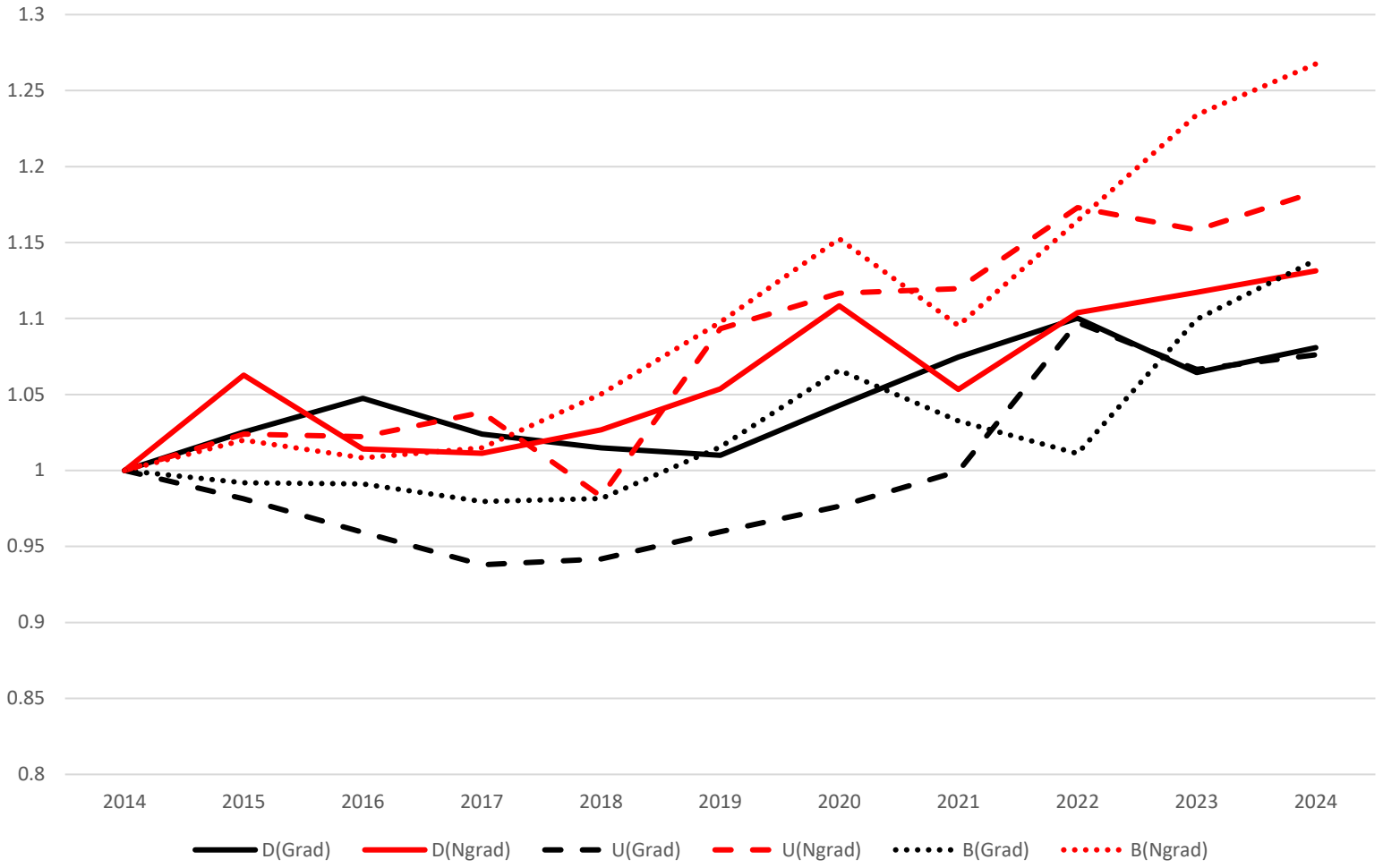
Total



Developer

Ratios > 1 mostly in golden triangle.

Earnings
(about 20% of job adverts)



Graduates developers earn about 35% more than non-graduate developers but the premium is falling over time.

Large rises for non-graduate user and basic.

Demand: Summary

- High demand for all three types of digital technical skills across regions
- but Developer skills more concentrated while those required for 'business as usual' are important everywhere
- Areas outside the golden triangle, appear also to be more willing to hire non-graduates to fill their needs.
- The concentration of developer skills in the golden triangle is not just due to industry composition
- Earnings of non-graduates appear to be gaining on graduates over time, although the graduate premium remains high
- Next step is to match with supplies of people leaving education with STEM skills

Additional slides

Supply

- Use the Longitudinal Educational Outcomes data (LEO)
- follows individuals as they progress through compulsory education into the labour market or remain in education.
- For any one year we will calculate the proportion of those leaving education with STEM or digital skills
- We plan to do this for each level of education - schooling, further education and university education
- We will also use LEO to calculate movements across regions
- Currently LEO is only available for England – 154 TTWA

Supply: LEO data

- We classify subjects into four key groups that contribute to digital skills:
- **Maths and Logical Skills**: essential for programming, data analysis, and logical thinking in digital fields.
- **Computing and Programming Skills**: directly relevant to coding, software development, and digital problem-solving.
- **Science and Engineering**: provides problem-solving and logical reasoning skills useful indigital industries.
- **Applied Digital Skills**: for automation and digital control systems.
- So far we have done this for KS4 and KS5.

Supply and Demand Combined

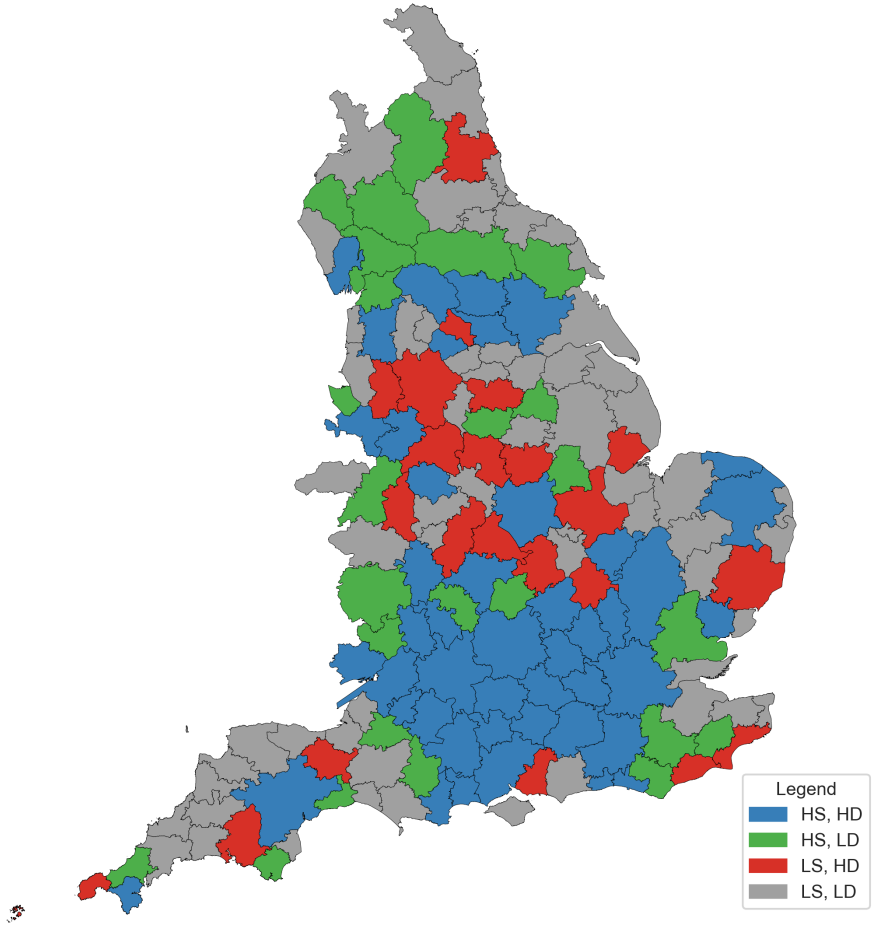
- We divide TTWAs into four quadrants, based on taking the average of proportions across TTWAs, and averaging across 2016-2019.

(HS, HD), (HS, LD), (LS, HD), (LS, LD) :

	All	Developer	User	Basic
HS,HD	46	46	44	44
HS,LD	25	25	27	27
LS, HD	25	23	32	35
LS,LD	58	60	51	48
	154	154	154	154

Basic

Supply and Demand Quadrants: Developer



Supply and Demand Quadrants

- HS,HD mainly London and South East, including Oxford and Cambridge, but includes some 2nd tier cities such as York and Southampton
- HS,LD primarily rural areas – Likely to reduce in number when we take account of FE and HE due to mobility
- LS, HD – Areas where skill constraints bite – e.g. many 2nd tier cities such as Coventry, Newcastle, Nottingham, Portsmouth and Sheffield
  - Includes Manchester but that will change when we include FE and HE
- LS, LD – 'left behind areas' in North and North East, Kent etc. Low skills just one of many issues
- Areas that move from LS,LD to LS,HD for user and basic also worth noting – includes Durham, Canterbury, Telford