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Graduate pathways: Identifying patterns of regional retention and attraction

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Executive Summary

Report objectives

There has been an upsurge in policy interest in levelling up UK regions and exploring the mechanisms that influence the interregional mobility behaviour of highly educated people. Graduate retention and attraction play a vital role in a region's economic performance, as the demand for high-level talent is consistently increasing across the UK. However, graduate mobility is complex and depends on many social, spatial and professional factors. This report utilises the most recent available Graduate Outcomes Survey data for the academic year 2018/19 to shed light on retention/migration patterns of recent graduate workers across the UK regions. The primary objectives are to:

- Estimate the graduate retention and attraction rates for the UK regions by age, ethnicity, type of university attended, class of first degree, industry sector, and occupation, and to interpret the differences across subgroups of graduates.
- Explore the location destinations of new workers who graduated from universities in specific regions and analyse the sectoral and occupational distribution of graduates across regions.
- Discuss the policy implications of this analysis and identify key challenges related to skills issues and regional recovery.

Findings

- Whilst most university graduates are employed in their region of study 15 months after graduation (UK average retention rate: 58.1%), there are substantial regional differences in the likelihood of staying regionally or relocating for work. For instance, of the total 2018/19 graduates who moved to another region for work, 32.3% chose London as their employment destination.
- Graduates' geographical mobility is associated with type of university and degree classification. Specifically, the average regional retention rates are lower for the new workers who attended a Russell Group university (49.9%), graduated with a first-class or upper-second class degree (52.9%), and are employed in managerial/professional occupations (57.4%).
- The regional retention rates are remarkably lower for younger graduate workers (aged 29 and under), standing at 55.3% on average compared to 67.0% for those aged over 30 years.
- On average, Bangladeshi (73.5%) and Pakistani (67.6%) graduates exhibit the highest retention rates, whereas Indian (50.6%) and Chinese (51.6%) new workers are the least likely to be employed in their region of study after graduation. Black graduates show an impressive regional variation in the propensity to stay local, as the probability of working in a job in their region of study ranges from 23.4% in the North East to 82.9% in London.
- The attraction/retention rates and the distribution of new graduates vary significantly across industries and occupations. The "public administration, education and health" sectors demonstrate the highest graduate retention rate (64.9%), whereas the attraction rates are more pronounced amongst the graduates working in the "manufacturing" (51.5%) and "transport & communication" (50.7%) sectors.

Policy implications

Policies aiming to create new high-skilled jobs are crucial for attracting and retaining talent to an area. In this context, boosting innovation and R&D investments can benefit the UK regions by increasing the average productivity of an area's workforce and developing agglomeration economies. The UK Government recently announced its target to raise the annual public R&D spending to £22 billion by 2027, thus increasing the total R&D investments (public and private) to 2.4% of the GDP. If R&D expenditure is equitably distributed nationally, it should open up opportunities for the further development of specific sectors and high-level skills (such as STEM-related capabilities) across the UK. However, the shift to remote or hybrid working is likely to decrease geographical impediments to graduates' mobility, hence further intensifying the competition for highly skilled graduates among businesses outside London. Universities could utilise the knowledge gained from their partnerships with local firms to upgrade their degree programmes and equip their students with the required skillsets, thus enhancing graduates' employability.

Introduction

Investigating regional attraction and retention patterns of recent higher education graduates is essential from a human capital perspective. University graduates represent a highly geographically mobile group of the workforce that can fuel productivity and contribute significantly to local economic growth. Graduates have a higher probability of relocating for work after completing their studies than other job seekers, as they can effectively adapt to various occupations and capitalise on labour market opportunities in destination areas (Fratesi, 2014). However, the socio-demographic and skill composition of the workforce plays a critical role in regional convergence, even when the overall net flows of graduates are equal among regions (Ostbye and Westerlund, 2007). For instance, a region may attract less skilled graduates compared to those it loses to other areas, which, in turn, affects its average skills profile. In a closely related vein, there is a heightened policy interest in levelling up the UK regions and exploring the mechanisms that influence the location choices of highly educated people, given that a region's economic performance is strongly associated with the skills of its labour force. Hence, it is important to shed light on how the retention and attraction rates differ by graduates' characteristics and explore heterogeneity in movement patterns across the UK regions.

Moreover, the advent of new technologies in specific sectors, such as automation and artificial intelligence, has increased the demand for related skills. This is also partially connected with existing shortages of Science, Technology, Engineering and Mathematics (STEM) skills and the established skills mismatch issue in the UK labour market (BEIS, 2017), which is estimated to worsen in the near future. Specifically, seven million additional employees are predicted to be under-skilled for particular occupations by 2030 in the UK, especially for digital and core management skills (Industrial Strategy Council, 2019). Given that the distribution of skills shortages is not homogeneous across UK regions, graduate retention appears particularly crucial for regions with a shortage of high skills. It is therefore important to explore the interregional migration behaviour of recent graduates transitioning from higher education to work.

The extant literature has identified that graduate mobility is a complex phenomenon and depends on a number of social, spatial and professional factors (Faggian and McCann, 2009, Haapanen and Tervo, 2012, Ciriaci, 2014, Abreu et al., 2015, Imeraj et al., 2017, Kitagawa et al., 2021). This report examines regional patterns of retention and attraction according to specific socio-demographic characteristics of new graduate workers (i.e. those in employment 15 months after finishing their studies) and other higher education-related determinants of graduate mobility/retention. It draws on Graduate Outcomes Survey (GOS) data from the Higher Education Statistics Agency (HESA) to explore the early career paths of university students who graduated in the academic year 2018/19. Specifically, the main objectives are to:

- Estimate the graduate retention and attraction rates for the nine regions of England and for Wales, Scotland and Northern Ireland by age group, ethnicity, type of university attended, class of first degree, industry sector, and occupation group.
- Present the location destinations of new workers who graduated from universities in selected regions (North West, Yorkshire & the Humber, West Midlands, East Midlands, South West and South East).
- Analyse the sectoral and occupational distribution of new graduate workers employed in the regions mentioned above.
- Interpret the observed regional differences in retention and attraction rates for different types of graduates and discuss relevant policy implications.

The analysis results unveil that the probability of staying in the same region of study for work 15 months after graduation decreases as we move from lower to higher segments of graduates' skills/class of degree distribution. Specifically, new graduates who attended the selective Russell Group universities and demonstrated a solid academic performance exhibit lower retention rates than others. Similarly, the retention rates are lower for graduates employed in high-paid jobs (managerial and professional occupations), whereas age is positively associated with the likelihood of remaining regionally for work after completing higher education. Moreover, there is a remarkable variation in the attraction and retention rates across different ethnic groups and sectors. The report's findings should improve our

understanding of key determinants and mechanisms that influence graduates' migration/retention behaviour and deliver insights into identifying policy practices that could accelerate regional recovery.

Data and definitions

To address the research objectives, we use Graduate Outcomes Survey (GOS) data from HESA for the academic year 2018/19. GOS is an extensive annual social survey containing detailed information about the post-university activities of higher education graduates, who are surveyed 15 months after completing their course[1]. More specifically, this data includes comprehensive information about graduates' personal characteristics, their activities (e.g., employment status, contract type, location of employment, sector and occupation) and reflections on activities, salaries, and other data obtained from HESA Student record (such as mode and subject of study, level of qualification, name of the institution attended, class of first degree, and so forth). We performed the data analysis presented in this report by accessing the Heidi Plus platform of HESA.

The term "new graduate workers" describes the survey respondents who were in employment 15 months after graduation. Following Carrascal-Incera et al. (2021), we define **graduate retention** as the proportion of new graduate workers employed in the region (r) where they studied over the total number of new graduate workers that studied in that region. **Graduate attraction** represents the number of new graduate workers that come from other UK regions (s) of study relative to the total number of new graduates employed in the destination region (r). Therefore,

$$New\ graduate\ worker\ retention_r = \frac{Number\ of\ New\ graduate\ workers_r^r}{Total\ New\ graduate\ workers_r}$$

$$New\ graduate\ worker\ attraction_r = \frac{Number\ of\ New\ graduate\ workers_s^r}{Total\ New\ graduate\ workers^r}$$

Subscripts (r and s) denote the region of origin (i.e. region of study) and superscripts the region of destination. The preceding quantities need to add up, as follows: $Number\ of\ New\ graduate\ workers_r^r + Number\ of\ New\ graduate\ workers_s^r = Total\ New\ graduate\ workers^r$.

It should be noted that the findings of the present report are purely descriptive. In particular, the estimated likelihood of staying local or moving to another region for work does not account for differences in other graduates' characteristics (such as gender, socio-economic background, social or professional networks, area of subject studied, pre-university educational attainment), and other spatial, social and local economic factors[2] (such as employment levels in the destination region, differentials in cultural and skill-pertinent amenities, and proximity to the home region). By adopting regression-based approaches, future WMREDI work aims to utilise individual-level data from the Graduate Outcomes Survey to effectively control for many of these factors that predict the graduate location decisions.

Results

This section reports the regional retention and attraction rates based on the 2018/19 cohort of graduates. Moreover, it descriptively analyses the relationship between regional retention/attraction and (i) graduates' age, (ii) ethnicity (9 ethnic groups), (iii) class of first degree ("good" degree, other degree class), (iv) type of institution attended (Russell Group universities, other higher education providers), (v) industry sector of employment (9 broad groups), and (vi) major occupation group. This section also explores the distribution of new graduate workers by sector and occupation

[1] The analysis in this report refers to complete responses. The rate of complete responses for the 2018/19 GOS was 48%, while the rate of partially completed responses was 52%. This might lead to a non-response bias if the probability of responding to the survey differs by specific graduates' characteristics (such as gender, age, ethnicity, or location of employment). Nevertheless, HESA did not apply weighting methodologies to the GOS (which aim to make the sample more representative of the population), as weighting seems to make little difference to the estimates associated with employment and study.

[2] See a discussion on some key determinants of graduates' migration behaviour in Imeraj et al. (2017).

in the West Midlands and selected other English regions (North West, Yorkshire & the Humber, East Midlands, South West and South East).

Interregional mobility of university graduates

The results confirm that most higher education graduates are employed in their region of study 15 months after completing their course (see Table 1). For example, of the total 21,995 new workers who graduated from a West Midlands university in 2018/19, 50.8% remained in the same region for work after graduation. However, there are remarkable differences in both retention and attraction rates across English regions and other UK nations. Specifically, the retention rates vary from 40.1% in the East Midlands to 88.3% in Northern Ireland, while the attraction rates range from 8.8% in Scotland to 61.9% in the East of England.

London is the only region in which both the retention (74.4%) and attraction (53.7%) rates are higher than the UK average (58.1% and 41.9%, respectively). Interestingly, of the total 101,830 new graduates across the UK who migrated to another region for work, 32.3% moved to London. Although the living costs in the capital are high, the increased availability of well-paid occupations and opportunities for career progression, the high share of skilled workers, transport links and accessibility, other amenities and culture-related factors seem to maximise graduates' utility and drive their migration/retention behaviour. Similarly, the East of England gains a high proportion of graduates from other UK regions (attraction rate: 61.9%), while it also retains a substantial share of its graduates (47.6%).

As Figure 1 depicts, Scotland and Northern Ireland are the leading areas for retaining graduates in their "region" of study (80.6% and 88.3%, respectively). This picture is likely driven by a considerably high proportion of "home-grown" people who never leave their region for studies or employment. On the contrary, Scotland (8.8%) and Northern Ireland (18.8%) demonstrate the lowest attraction rates in the UK. The latter figures raise questions about the extent to which these two nations can cover the drastically changing demand for high-level qualifications (particularly for STEM-related subjects) in the labour market. The growing demand for STEM-specific skills is widespread across sectors, but the relevant subjects are under-supplied (see, for example, a discussion in the Northern Ireland Skills Barometer, 2019).

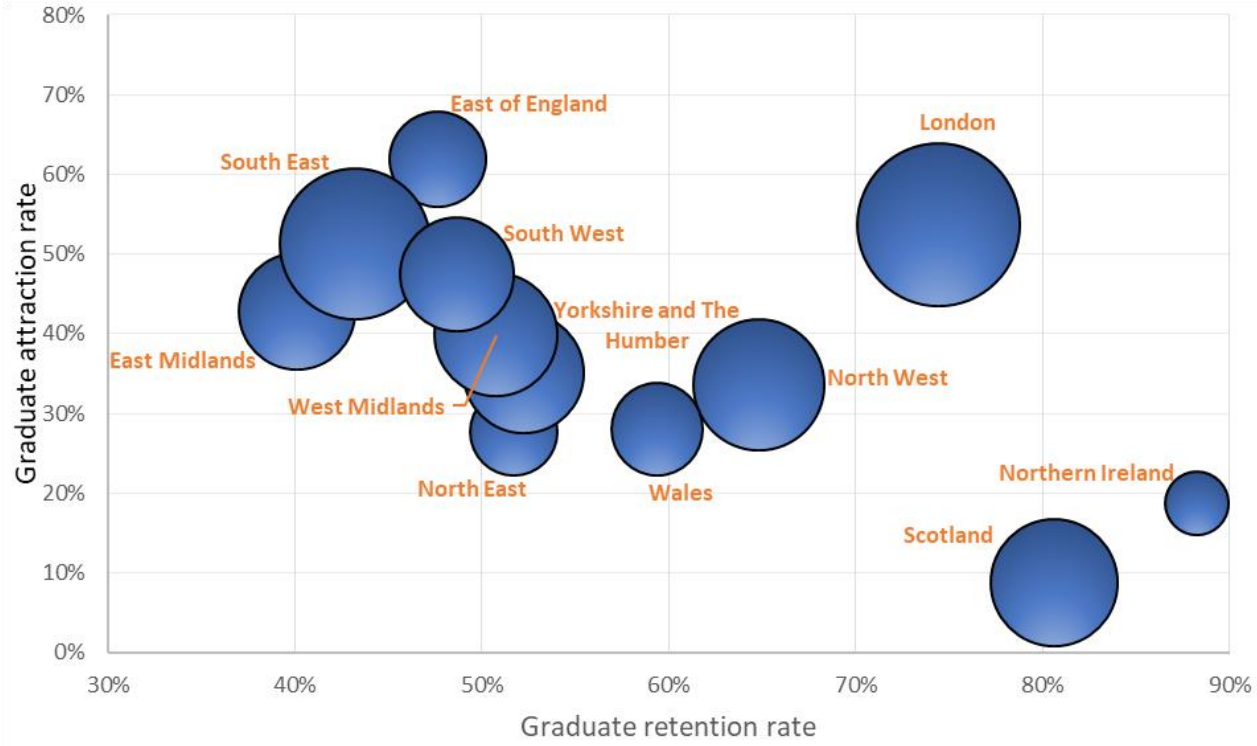
Figure 2 shows the interregional mobility choices of new workers who graduated from selected regions. As discussed, the UK regions see large outflows of their graduates to London and the South East. However, Figure 2 reveals that proximity to destination regions also drives graduates' mobility behaviour. For instance, of the total number of new workers who graduated from a university in Yorkshire and the Humber, 10.3% moved to the North West for work, 7.1% found a job in the East Midlands and 2.6% in the North East. Similarly, 5.7% of the graduates who completed their studies in the West Midlands migrated to the neighbouring East Midlands for work, 5.0% moved to the North West and 5.2% to the South West. The present report focuses on regional analysis and does not distinguish between cities, which could mask intra-regional differences in graduate retention. Nonetheless, previous evidence suggests that the retention rates are notably high in large urban areas, such as Manchester, Birmingham, Newcastle, and Glasgow (Swinney and Williams, 2016, Abreu and Conway, 2021).

Table 1 - Regional attraction and retention of new graduate workers – academic year 2018/19

Provider region	Region of employment												UK	Retention rate	Attraction rate
	NE	NW	Y&H	EM	WM	EE	LD	SE	SW	Wales	ST	NI			
North East (NE)	5,695	675	940	255	220	360	1,780	520	220	70	190	85	11,010	51.7%	27.7%
North West (NW)	350	16,065	1,335	600	1,190	550	2,070	825	515	645	250	385	24,780	64.8%	33.6%
Yorkshire & the Humber (Y&H)	545	2,155	10,890	1,475	715	850	2,435	980	425	150	180	50	20,850	52.2%	35.1%
East Midlands (EM)	215	835	1,135	7,890	1,885	1,650	3,410	1,630	645	165	140	55	19,655	40.1%	42.8%
West Midlands (WM)	230	1,110	535	1,255	11,170	970	3,370	1,645	1,135	365	145	65	21,995	50.8%	39.8%
East of England (EE)	75	260	230	420	250	6,385	3,895	1,320	345	90	85	45	13,400	47.6%	61.9%
London (LD)	130	570	350	405	520	2,310	28,360	4,065	830	185	295	90	38,110	74.4%	53.7%
South East (SE)	230	1,035	685	750	1,145	2,265	9,280	14,210	2,545	430	220	90	32,885	43.2%	51.3%
South West (SW)	80	430	220	325	655	745	3,850	2,505	9,125	615	135	55	18,740	48.7%	47.4%
Wales	60	495	155	185	590	295	970	880	1,220	7,280	85	45	12,260	59.4%	28.0%
Scotland (ST)	235	500	265	200	180	325	1,650	535	285	90	18,760	250	23,275	80.6%	8.8%
Northern Ireland (NI)	35	65	30	35	45	50	190	80	65	25	80	5,260	5,960	88.3%	18.8%
UK	7,880	24,195	16,770	13,795	18,565	16,755	61,260	29,195	17,355	10,110	20,565	6,475	242,920	58.1%	41.9%

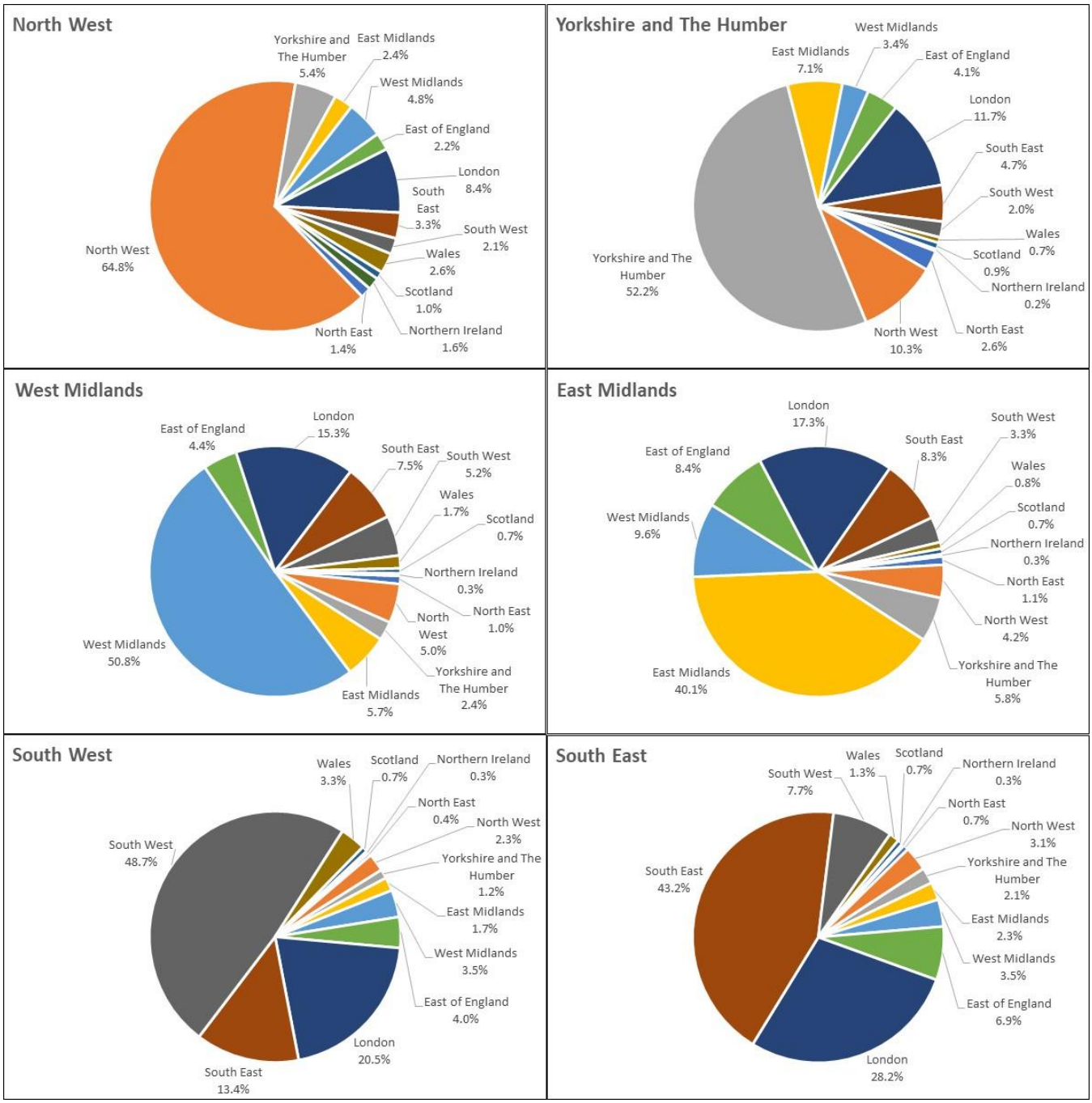
Note: The table covers the 2018/19 cohort of higher education graduates in employment who were interviewed 15 months after completing their studies. It excludes graduates whose employment location is outside the UK or unknown. The number of graduates in each cell is rounded to the nearest multiple of 5, in line with HESA's disclosure control. The provider region refers to the location of higher education institutions based on their main administration building.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Figure 1 – Graduate attraction and retention rates by region



Note: The graduate retention and attraction rates shown in the graph are derived from Table 1. The bubble's size for each region represents the total number of new workers who graduated from universities located in that region (based on the academic year 2018/19).
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Figure 2 – Location destinations of new graduate workers who completed their studies in selected regions



Note: The region at the top left side of each graph is the location of higher education institutions attended by the new graduate workers. For each of these locations, the figures show the distribution of new graduate workers across regions of employment. In each graph, the percentages sum up to 100%.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

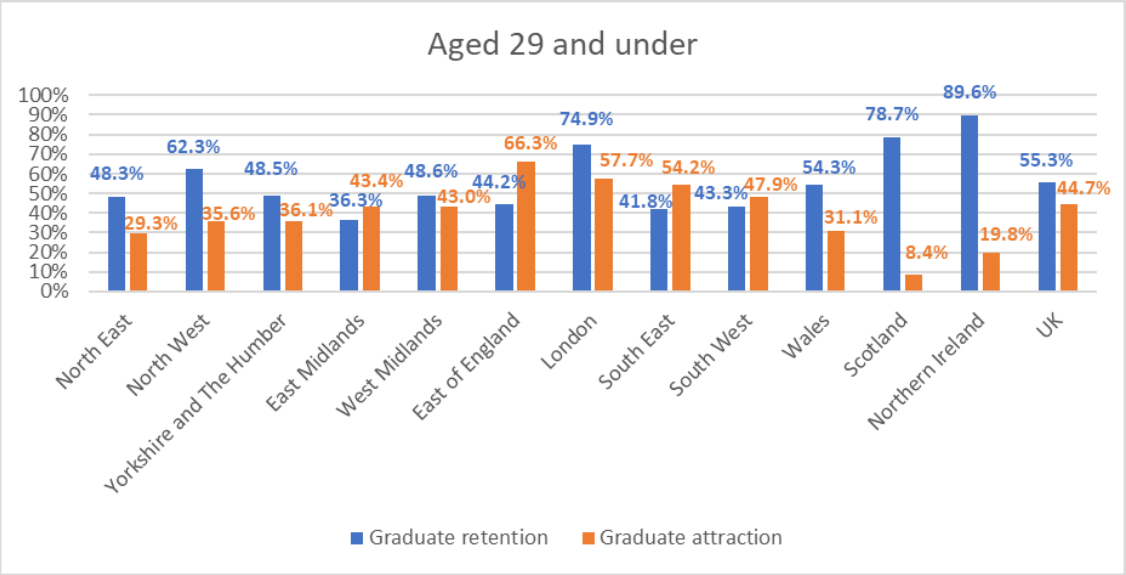
Analysis of retention and attraction rates by subgroups of graduates

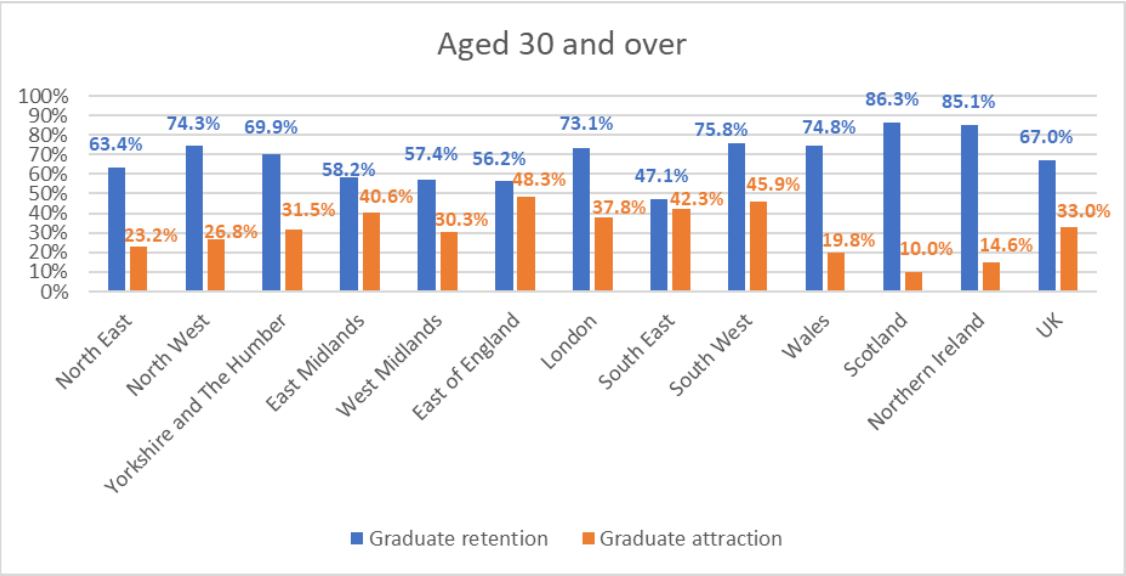
Age

Unsurprisingly, the regional retention rates are substantially lower for younger graduate workers (aged 29 years and under), standing at 55.3% on average compared to 67.0% for those over 30 years (Figure 3). The difference in the retention rates between these broad age groups is striking in the South West (standing at 32.5 percentage points) and remains at a very high level in the East Midlands, Yorkshire and the Humber, and Wales (21.9, 21.4, and 20.5 percentage points, respectively). On the contrary, London is the only English region where the retention rate is slightly higher for younger new graduate workers (74.9%) than those over 30 (73.1%). Although the capital retains a high proportion of its graduates across both age groups, it loses a not negligible share of older degree holders to other areas, particularly to peripheral regions to London. Specifically, of the 2,835 older graduates who studied in London and migrated to other UK regions for work, 76% moved to the South East, the East of England, and the South West.

Conversely, the regional attraction rates are more pronounced among the younger graduate workers in England, ranging from 29.3% in the North East to 66.3% in the East of England. The labour-motivated movements of young graduates should be linked to their willingness to pursue transregional opportunities and find their job match at the beginning of their careers. Moreover, older graduates are more likely to have family commitments, which may affect their migration decisions (Smith and Sage, 2014). Another possible explanation for the above figures is that older graduates are more likely to have completed a postgraduate course, considering that the probability of staying local is higher for new workers with a postgraduate qualification than those holding only a bachelor's degree (Carrascal-Incera et al., 2021). This implies that older graduates' choices regarding the region of study are strongly correlated with their later residential and employment decisions.

Figure 3 – Graduate attraction and retention rates by region and age group





Note: Of the 242,890 GOS respondents of the 2018/19 academic year with a known location of employment within the UK, 76.5% were aged 29 and under at the end of the academic year, and 23.5% were over 30.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Ethnicity

There are considerable ethnic differences in the mobility patterns among new graduate workers (Table 2). Non-White graduates cover 20.8% of the total GOS respondents in employment. On average, Bangladeshi (73.5%) and Pakistani (67.6%) graduates see the highest retention rates in the UK regions, whereas Indian (50.6%) and Chinese (51.6%) new workers are the least likely to be employed in their region of study after graduation. The Black community demonstrates impressive regional variation in the propensity to stay local. Specifically, for Black graduates, the probability of finding a job in their region of study ranges from 23.4% in the North East to 82.9% in London.

Particularly noteworthy is that the White group witnesses the lowest retention rate among all ethnic groups in London (67.1%). Moreover, it appears that the distance of movement from London to other regions differs significantly between White graduates and ethnic minorities, as the latter tend to relocate less far than their White counterparts. For instance, of the total 5,740 White new workers who graduated from a London university and then migrated to other locations for work, 11.1% moved to northern English regions. The corresponding share for Black and Indian graduates (i.e., those who completed their course in London and then found a job in the North) is lower, standing at 6.4% and 8.7%, respectively.

The average UK attraction rates vary from 26.5% for Bangladeshi graduates to 49.4% for the Indian group. In the West Midlands, the highest attraction rate is observed among the White people (43.1%), followed by Chinese (42.1%) and graduates from other Asian backgrounds (42.6%). Most White graduates that relocated to the West Midlands for work previously studied in the East Midlands (covering 23.9% of the total inflows of this group to the region), followed by the North West (17.0%) and the South East (16.1%). More than one-third of non-White new graduates who moved to the West Midlands for work had attended a university in the East Midlands (34.4%), followed by the South East (13.7%), London (13.4%) and the North West (13.1%).

The different patterns in the interregional migration behaviour of ethnic groups described above may be due to various factors. These include ethnic differences in academic performance and demographic profiles, the occupational segregation of specific ethnic minorities (Elliott and Lindley, 2008), their high concentration to some regions such as London and the Midlands (Craig, 2012), their lower average socio-economic background (Zuccotti, 2015), differences in household formation and sensitivity to long-distance moves (Christie, 2007).

Table 2 - Graduate attraction and retention rates by region and ethnic group

Region	Ethnic group								
	White	Black	Pakistani	Bangladeshi	Indian	Chinese	Other Asian	Mixed	Other
	Graduate retention rate								
North East (NE)	54.4%	23.4%	61.5%	63.2%	27.6%	46.2%	47.4%	40.0%	57.1%
North West (NW)	65.5%	61.2%	76.6%	72.9%	59.4%	58.1%	55.0%	57.7%	70.5%
Yorkshire & the Humber (Y&H)	52.1%	54.7%	74.9%	76.2%	44.1%	30.4%	45.2%	43.0%	59.3%
East Midlands (EM)	41.7%	30.3%	41.7%	44.0%	40.2%	29.2%	33.9%	35.4%	36.0%
West Midlands (WM)	50.1%	48.1%	75.9%	74.6%	51.8%	35.5%	38.6%	49.7%	56.8%
East of England (EE)	53.6%	33.6%	47.8%	51.6%	29.3%	35.3%	27.8%	42.6%	29.7%
London (LD)	67.1%	82.9%	71.7%	86.6%	73.2%	76.0%	75.0%	77.1%	83.7%
South East (SE)	46.0%	27.4%	39.5%	44.4%	33.9%	34.0%	39.2%	34.9%	39.4%
South West (SW)	50.6%	39.6%	36.8%	54.5%	26.7%	30.4%	41.7%	38.8%	47.6%
Wales	61.8%	35.6%	41.2%	50.0%	25.0%	44.4%	45.8%	48.0%	60.0%
Scotland (ST)	83.9%	63.4%	79.3%	50.0%	61.1%	71.4%	63.0%	71.8%	86.4%
Northern Ireland (NI)	90.0%	*	*	*	80.0%	*	*	75.0%	*
UK	58.5%	53.7%	67.6%	73.5%	50.6%	51.6%	53.4%	52.3%	64.8%
	Graduate attraction rate								
North East (NE)	26.8%	28.6%	23.8%	14.3%	42.9%	25.0%	18.2%	33.3%	20.0%
North West (NW)	33.7%	35.0%	26.4%	20.5%	31.3%	47.1%	37.1%	37.9%	26.2%
Yorkshire & the Humber (Y&H)	35.6%	32.8%	21.0%	23.8%	43.8%	50.0%	46.2%	36.8%	20.0%
East Midlands (EM)	42.8%	36.9%	44.4%	35.3%	43.6%	50.0%	40.6%	41.4%	50.0%
West Midlands (WM)	43.1%	29.0%	20.2%	21.7%	36.5%	42.1%	42.6%	39.7%	22.2%
East of England (EE)	61.8%	57.8%	62.1%	59.0%	71.9%	75.0%	72.7%	61.3%	63.3%
London (LD)	62.8%	48.5%	34.8%	19.9%	53.0%	49.0%	42.9%	53.5%	34.4%
South East (SE)	48.6%	64.9%	68.1%	57.9%	65.5%	61.0%	60.2%	56.1%	48.0%
South West (SW)	46.4%	50.0%	61.1%	45.5%	63.6%	56.3%	55.9%	50.5%	50.0%
Wales	27.1%	33.3%	22.2%	15.4%	43.8%	33.3%	31.3%	36.8%	35.7%
Scotland (ST)	8.0%	13.5%	8.0%	*	15.4%	9.1%	5.6%	13.6%	0.0%
Northern Ireland (NI)	17.7%	*	*	*	*	*	*	14.3%	*
UK	41.5%	46.3%	32.4%	26.5%	49.4%	48.4%	46.6%	47.7%	35.2%
Total number of new graduate workers by ethnic group (UK)	174,690	14,165	5,455	2,720	7,715	1,725	3,785	7,860	2,525
Distribution (%) of new graduate workers by ethnic group (UK)	79.2%	6.4%	2.5%	1.2%	3.5%	0.8%	1.7%	3.6%	1.1%

Note: The table excludes graduates with unknown ethnicity and those whose employment location is outside the UK or unknown. In line with HESA's disclosure control, the asterisk (*) denotes suppressed percentages that correspond to totals with fewer than 23 graduates (i.e., the denominator of the fraction is less than 23). Similarly, the underlying numbers of graduates used to calculate the rates in each cell are rounded to the nearest multiple of 5.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Type of university

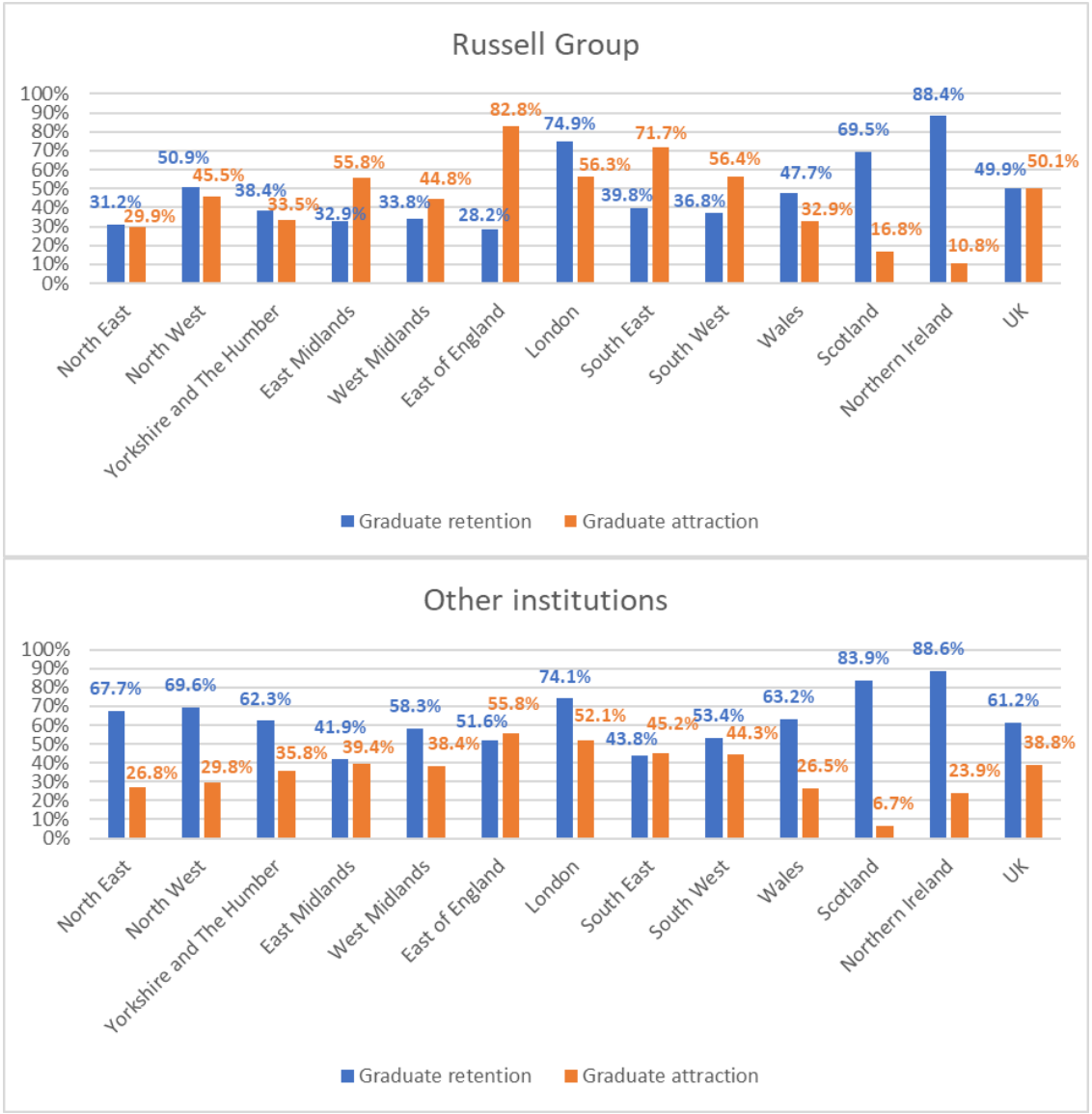
The academic literature has established that the employment and earnings prospects of students attending selective and high-quality universities are generally more favourable than those who graduate from other institutions (Dale and Krueger, 2014, Walker and Zhu, 2018). It is well-documented that Russell Group (RG) universities are highly selective, in the sense that they attract (on average) students with strong educational performance. Figure 4 shows that new workers who graduated from the prestigious RG universities are remarkably less likely to be employed in their region of study fifteen months after completing their course compared to those who obtained a degree from other institutions. Specifically, the UK average retention rate of RG university graduates is 11.3 percentage points lower than that of other institutions' graduates[3] (49.9% versus 61.2%). The difference in the retention rates between these types of institutions is more salient in the North East, the West Midlands, the Yorkshire & the Humber, and the East of England (standing at 36.5, 24.5, 23.9 and 23.4 percentage points, respectively).

On the contrary, the attraction rates are higher among the RG university graduates relative to their counterparts who earned a degree from other higher education providers (UK average: 50.1% versus 38.8%). The East of England demonstrates an outstanding attraction rate of 82.8% among the new graduate workers who attended a RG university, followed by the South East (71.7%), the South West (56.4%), London (56.3%), and the East Midlands (55.8%).

[3] We replicated the analysis by applying a different grouping of universities (pre-1992 versus post-1992 institutions), but the patterns of retention and attraction rates were similar.

The above findings suggest that students attending elite universities may receive more offers for work from across the UK regions. Selective institutions may have strategies in place that improve their students' productivity through collaborations with partner businesses. Moreover, employers likely perceive a degree from a well-regarded institution as a signalling[4] tool of graduates' quality and skills, particularly at the beginning of their career. Another explanation for the vast discrepancies in the retention and attraction rates between these broad types of institutions is that less selective universities admit a higher proportion of "mature" (older) students than others (Walker and Zhu, 2018). As discussed earlier, age is positively correlated with the probability of staying locally for work after graduation. Furthermore, some groups of students (such as ethnic minorities and people from low socio-economic backgrounds) are more likely than others to be "loyals" (i.e., to study and work in the same region where they grew up) and could be deterred by relocation costs. As a corollary, they may have fewer opportunities to enrol at a RG university in their area. For example, there are only two RG universities (Birmingham and Warwick) in the West Midlands, where the proportion of ethnic minority residents is significantly higher than in other UK regions.

Figure 4 – Graduate attraction and retention rates by region and type of university attended



Note: The Russell Group includes 24 universities (Birmingham, Bristol, Cambridge, Cardiff, Durham, Edinburgh, Exeter, Glasgow, Imperial College London, King's College London, Leeds, Liverpool, London School of Economics and Political Science, Manchester, Newcastle, Nottingham, Oxford, Queen Mary, Queen's Belfast, Sheffield, Southampton, University College London, Warwick, and York). Of the 242,975 GOS respondents of the 2018/19 academic year with a known location of employment within the UK, 27.7% graduated from a Russell Group university and 72.3% from other institutions.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

[4] From a theoretical viewpoint, the economic literature has seen a debate between the "human capital theory" (Becker, 1962) and the signalling/filtering functions of education (Arrow, 1973).

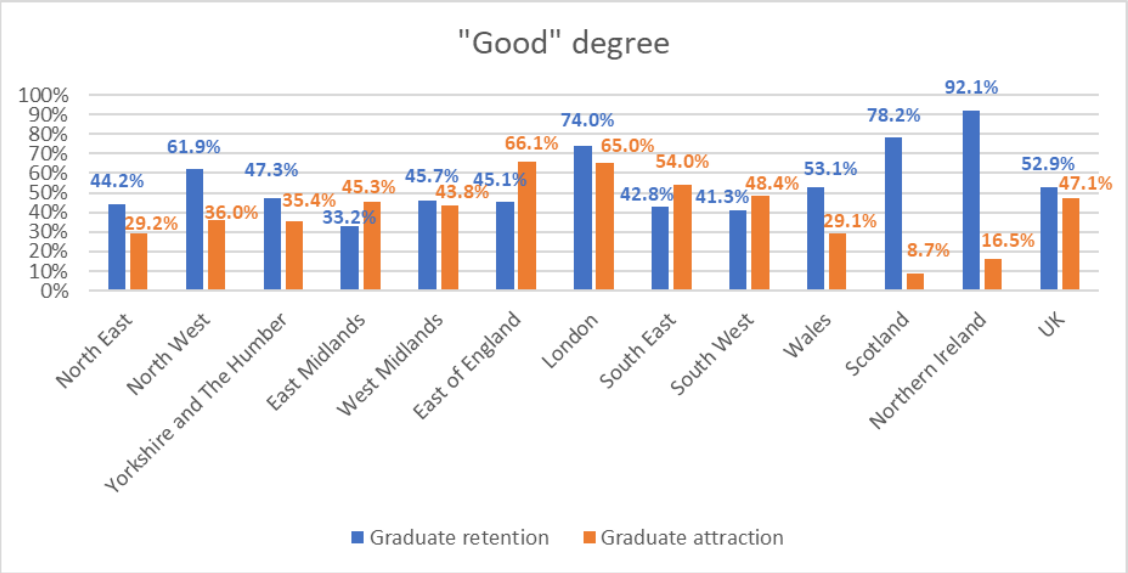
Class of first degree

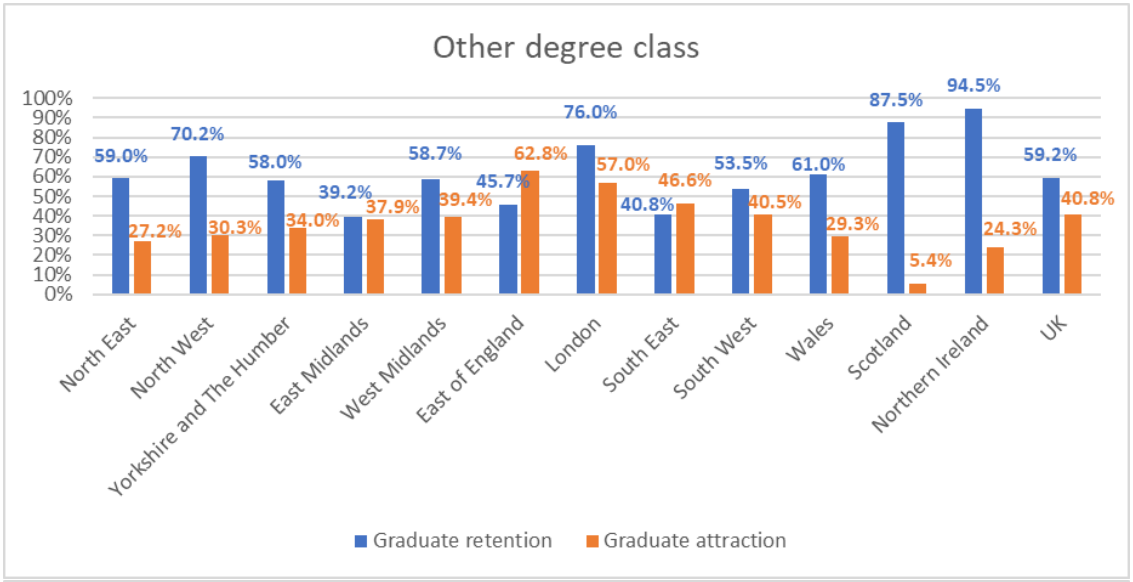
Achieving high grades at university is associated with higher earnings and better employment opportunities in the labour market (Feng and Graetz, 2017). Moreover, in the absence of adequate information about job seekers' talents and skills, firms often consider the class of degree as an indicator of employees' ability (Naylor et al., 2016). However, degree classes are not a perfect measure of graduates' academic ability, as they are not equivalent across universities and fields of study.

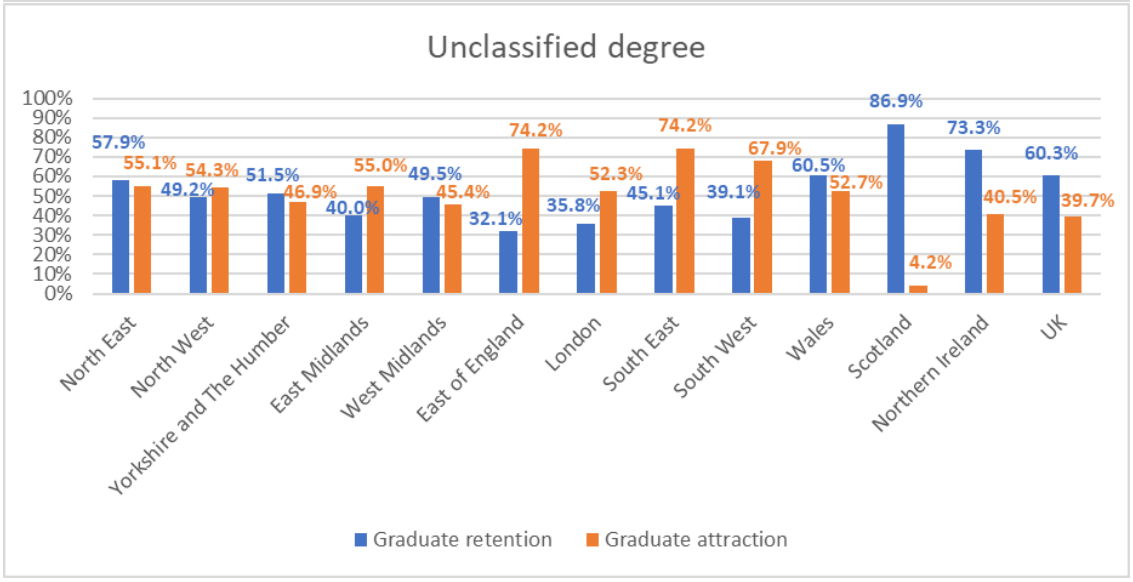
As Figure 5 shows, there is a significant interdependence between graduates' class of first degree and regional retention/attraction rates. Specifically, new graduates holding a "good" bachelor's degree (that is, first-class or upper-second class honours) are less likely to stay in their region of study for work than those achieving lower degree classes. In England, the retention rates of graduates earning a good degree range from 33.2% in the East Midlands to 74.0% in London, with the UK average standing at 52.9%. The North East exhibits the largest difference in retention rates (14.8 percentage points) between the good-degree holders and graduates attaining a lower degree class, followed by the West Midlands (13.0 percentage points) and the South West (12.3% percentage points). Conversely, the attraction rates are higher among the good-degree holders (UK average: 47.1%) than those with a lower degree class (40.8%). The disparities in the attraction rates between these two groups of students are more considerable in London and the South West (8.0 and 7.9 percentage points, respectively). Figure 5 also presents the attraction and retention rates of new graduate workers with unclassified degrees. These degrees cover a small proportion of all first degrees (5.7%) and are more common in health-related courses (such as medicine and dentistry) and higher education institutions located in Scotland.

In a nutshell, it appears that the degree class is another reflection of graduates' ability. As in the case of graduates' migration behaviour by type of institution described earlier, students who perform well at university are more likely than others to relocate for work when they finish their course.

Figure 5 – Graduate attraction and retention rates by region and class of first degree







Note: The class of degree is applicable to first-degree qualifiers only. A "good" degree describes a first-class or upper-second class honours degree. Of the 148,090 GOS respondents of the 2018/19 academic year with a first degree and a known location of employment within the UK, 77.5% were awarded a "good" degree, 16.8% other classified degrees (i.e., lower-second class honours or third class/pass), and 5.7% held unclassified degrees.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Industry sector

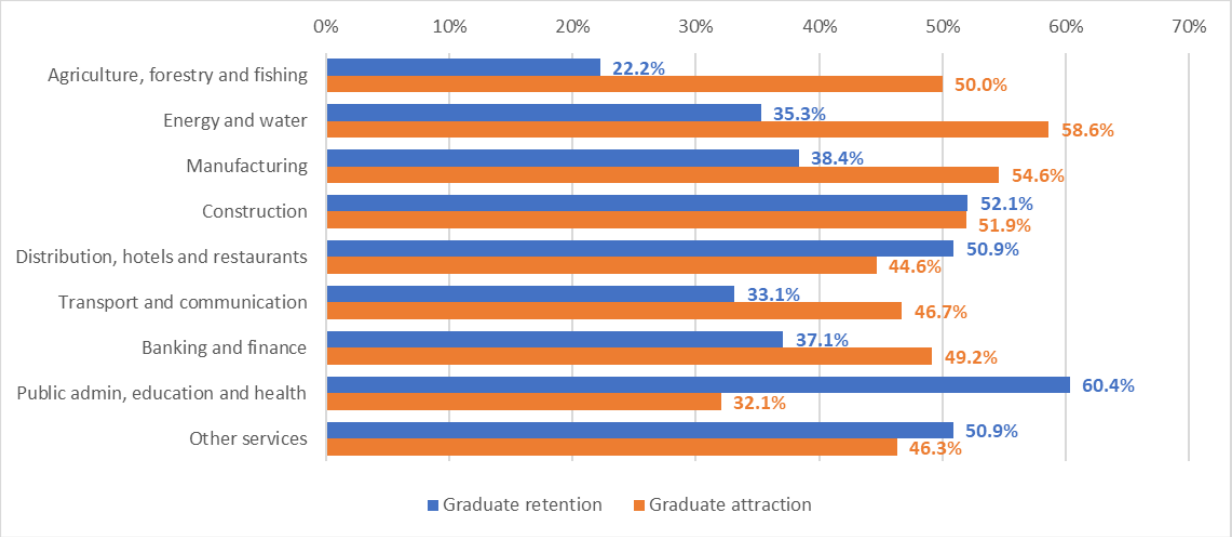
The "public administration, education and health" sectors show, on average, the highest retention rate (64.9%) among the new graduate workers who completed their studies in 2018/19 (Table 3). This is likely tied to the fact that employment opportunities in the public sector are more evenly distributed across the UK regions than jobs in the private sector, thus affecting the retention decisions of new workers. The above-mentioned sectors employ a huge proportion (45.6%) of new graduate workers nationally. For instance, health and social work activities demonstrate a steadily high fraction of vacancies compared to other sectors, while personnel shortages are widespread across the National Health Service system (Taylor et al., 2021). On the other hand, graduates employed in "manufacturing" (48.5%), "transport & communication" (49.3%), and "banking & finance" (50.1%) are the least likely to stay locally for work after completing their course. It is noteworthy that the financial and transport/communication sectors exhibit a high variance in the retention rates across the English regions, primarily driven by London's exceptionally high figures (81.7% and 82.7%, respectively). This picture reflects the increased demand for a labour force with associated skills in London, as many large firms operating in these sectors are headquartered in the capital. However, it should be noted that the broad industrial classification adopted for this analysis likely hides dissimilarities in mobility choices of graduates between sectors (see the relevant note in Table 3).

The average UK attraction rates vary from 35.1% for graduates employed in the "public administration, education and health" sectors to 51.5% for those who found a job in the "manufacturing" industries (Table 3). Figure 6 focuses on the attraction and retention rates in the West Midlands. The lowest retention rate in this region is observed among new graduates working in the "agriculture, forestry & fishing" (22.2%) sectors, followed by the "transport & communication" (33.1%) and "energy & water" (35.3%) industries. In contrast, the "public administration, education and health" (60.4%) and "construction" (52.1%) sectors see the highest retention rates in the region.

Figure 7 presents the sectoral distribution of new graduate workers employed in the West Midlands and other selected regions. The majority of new graduates who work in the West Midlands (regardless of where they studied) are occupied in the "public administration, education and health" sectors (52.1%). This figure is 6.5 percentage points higher than the national average of 45.6%. The "banking & finance" sector (16.0%) is the second most frequent destination of new graduates in the West Midlands, albeit it lags behind the corresponding share seen in other regions and the national average (21.2%). Interestingly, the construction sector in the West Midlands attracts a higher share of graduates (2.1%) than its neighbouring regions and the UK overall (1.8%). A recent report by the Construction Skills Network predicts that the construction industry will grow by an annual average rate of 4.8% until 2025 in the West Midlands, requiring 25,000 additional employees during this period (Construction Industry Training Board, 2021). Private housing and infrastructure are the key drivers of this growth. As the latter report highlights, ongoing works on the West Midlands Metro, city centre improvements, and other projects (such as the "Alexander Stadium" and the Games Villages constructed for the forthcoming 2022 Commonwealth Games in Birmingham) have increased the labour demand.

Collectively, the above findings suggest that occupational specialisation is another determinant that drives the post-university migration behaviour of graduates. The sectoral distribution of graduates is influenced by the offered opportunities across industries and the regional trends in the demand for specific skills.

Figure 6 – Graduate retention and attraction rates by industry sector in the West Midlands



Note: The graduate retention and attraction rates shown in the graph are derived from Table 3.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Table 3 - Graduate attraction and retention rates by region and grouped industry sector

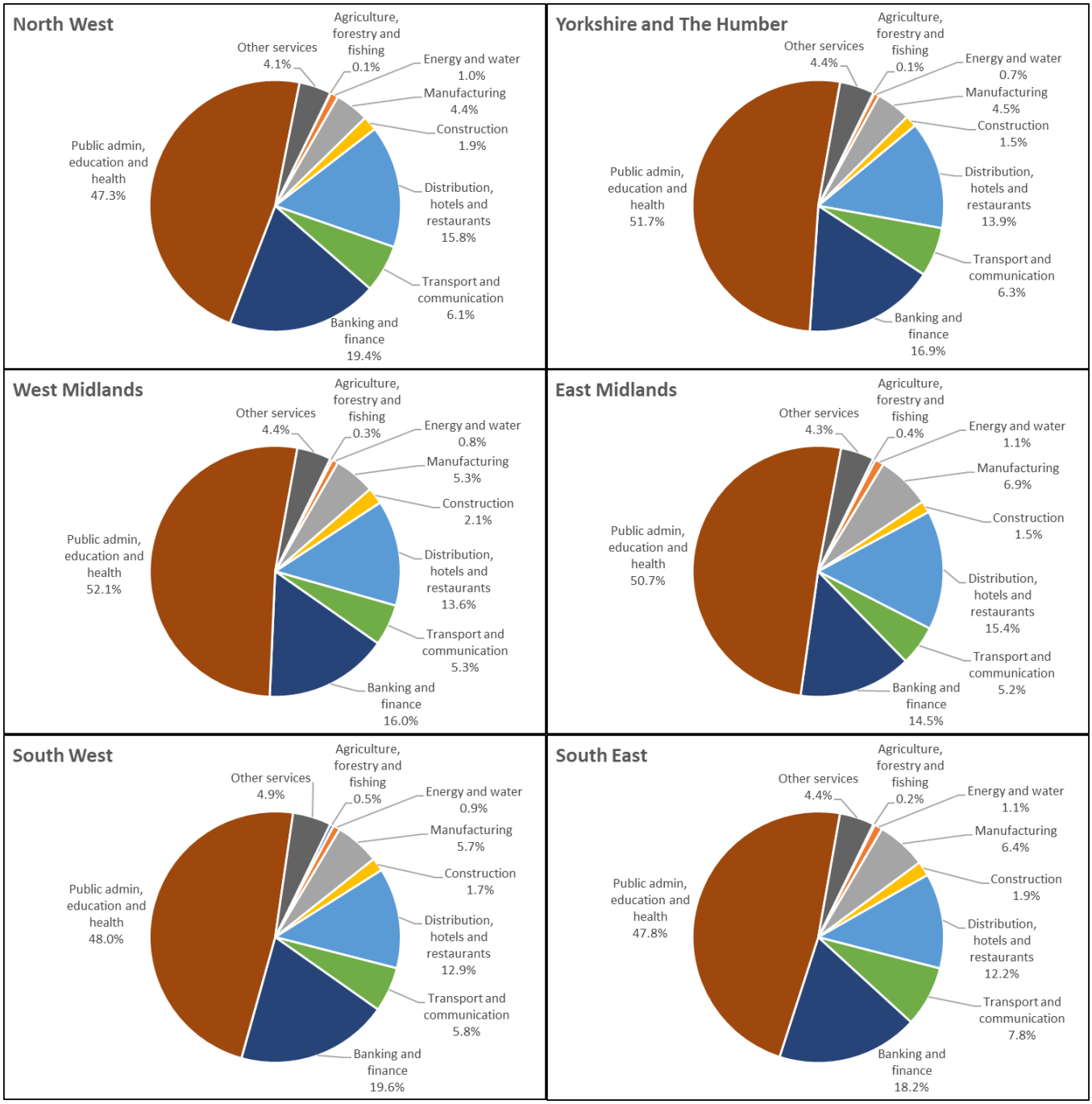
Region	Industry sector								
	Agriculture, forestry and fishing	Energy and water	Manufacturing	Construction	Distribution, hotels and restaurants	Transport and communication	Banking and finance	Public admin, education and health	Other services
	Graduate retention rate								
North East (NE)	0.0%	35.3%	46.3%	47.2%	50.6%	37.0%	35.7%	64.3%	54.2%
North West (NW)	60.0%	66.0%	53.1%	63.3%	66.5%	54.8%	58.4%	69.8%	60.4%
Yorkshire & the Humber (Y&H)	*	36.4%	37.4%	35.4%	52.4%	39.5%	41.5%	61.9%	48.1%
East Midlands (EM)	37.5%	36.2%	33.8%	23.3%	41.2%	26.0%	25.5%	52.6%	37.4%
West Midlands (WM)	22.2%	35.3%	38.4%	52.1%	50.9%	33.1%	37.1%	60.4%	50.9%
East of England (EE)	66.7%	37.5%	48.8%	52.3%	46.3%	34.1%	30.9%	56.2%	43.6%
London (LD)	20.0%	65.9%	46.7%	66.4%	73.9%	82.7%	81.7%	70.7%	75.6%
South East (SE)	28.6%	40.0%	49.3%	34.5%	43.9%	32.8%	29.4%	52.7%	39.6%
South West (SW)	44.4%	42.3%	43.1%	49.0%	47.5%	31.8%	36.4%	61.6%	46.1%
Wales	63.6%	60.0%	57.4%	63.0%	56.0%	41.0%	50.4%	66.6%	54.1%
Scotland (ST)	100.0%	85.8%	68.7%	78.2%	87.1%	69.8%	72.6%	84.9%	82.3%
Northern Ireland (NI)	100.0%	100.0%	91.4%	85.7%	91.7%	91.1%	91.1%	86.6%	93.8%
UK	51.6%	56.9%	48.5%	52.4%	58.2%	49.3%	50.1%	64.9%	57.0%
	Graduate attraction rate								
North East (NE)	*	20.0%	35.6%	15.0%	32.3%	29.1%	27.5%	25.2%	31.6%
North West (NW)	*	28.6%	47.6%	37.4%	35.3%	45.4%	41.9%	26.6%	36.9%
Yorkshire & the Humber (Y&H)	80.0%	45.5%	43.0%	44.0%	36.9%	40.6%	41.6%	30.2%	39.9%
East Midlands (EM)	70.0%	45.2%	53.7%	50.0%	41.7%	45.8%	45.4%	39.3%	50.4%
West Midlands (WM)	50.0%	58.6%	54.6%	51.9%	44.6%	46.7%	49.2%	32.1%	46.3%
East of England (EE)	78.9%	68.4%	81.2%	70.9%	70.4%	68.0%	72.0%	51.5%	66.2%
London (LD)	*	64.6%	59.9%	56.0%	50.7%	61.0%	61.0%	45.2%	48.6%
South East (SE)	83.3%	70.5%	63.7%	63.3%	51.5%	57.4%	58.0%	45.1%	50.8%
South West (SW)	50.0%	64.5%	59.1%	57.6%	47.3%	44.2%	51.2%	43.9%	44.7%
Wales	36.4%	6.3%	32.5%	21.6%	29.5%	28.1%	34.0%	24.6%	30.5%
Scotland (ST)	13.3%	15.7%	10.8%	8.1%	5.8%	9.6%	10.2%	7.9%	11.3%
Northern Ireland (NI)	16.7%	0.0%	14.9%	10.0%	22.9%	16.3%	17.6%	17.9%	23.1%
UK	48.4%	43.1%	51.5%	47.6%	41.8%	50.7%	49.9%	35.1%	43.0%
Total number of new graduate workers by industry sector (UK)	640	2,390	11,230	4,380	30,885	19,310	51,195	110,115	11,405
Distribution (%) of new graduate workers by industry sector (UK)	0.3%	1.0%	4.6%	1.8%	12.8%	8.0%	21.2%	45.6%	4.7%

Note: The industry sectors are based on the UK Standard Industrial Classification (SIC) of economic activities. Because of the small sample size in specific sectors across regions, the grouping of sectors presented in this table follows the aggregate structure recommended by the UK Labour Force Survey. The table excludes graduates with an unknown sector of employment and those whose employment location is outside the UK or unknown.

In line with HESA's disclosure control, the asterisk (*) denotes suppressed percentages that correspond to totals with fewer than 23 graduates (i.e., the denominator of the fraction is less than 23). Similarly, the underlying numbers of graduates used to calculate the rates in each cell are rounded to the nearest multiple of 5.

Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Figure 7 – Distribution of new graduate workers by grouped industry sector of employment in selected regions



Note: The share of new graduate workers in each industry sector refers to all GOS respondents in employment in the reported region, irrespective of the region of their studies. In each graph, the percentages sum up to 100%.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Level of skilled employment (occupation groups)

It is not surprising that 76.3% of university graduates are employed in high-skilled occupations (managerial and professional jobs) 15 months after completing higher education (Table 4). New graduate workers holding these positions are less likely than others to stay in their region of study after finishing their course. In particular, the average probability of staying regional stands at 57.4% for high-skilled employees, nearly four percentage points higher than for graduates who work in low-skilled occupations (i.e. "sales and customer service"; "process, plant and machine operatives"; and "elementary" occupations). Conversely, the attraction rates are higher among the graduates starting in managerial/professional occupations (42.6%) than those in medium-skilled (40.3%) and low-skilled (38.9%) employment. Again, these figures suggest that graduates with a more advanced skillset are more geographically mobile than others and are sufficiently flexible in pursuing career opportunities in other regions.

Table 4 - Graduate attraction and retention rates by region and level of skilled employment

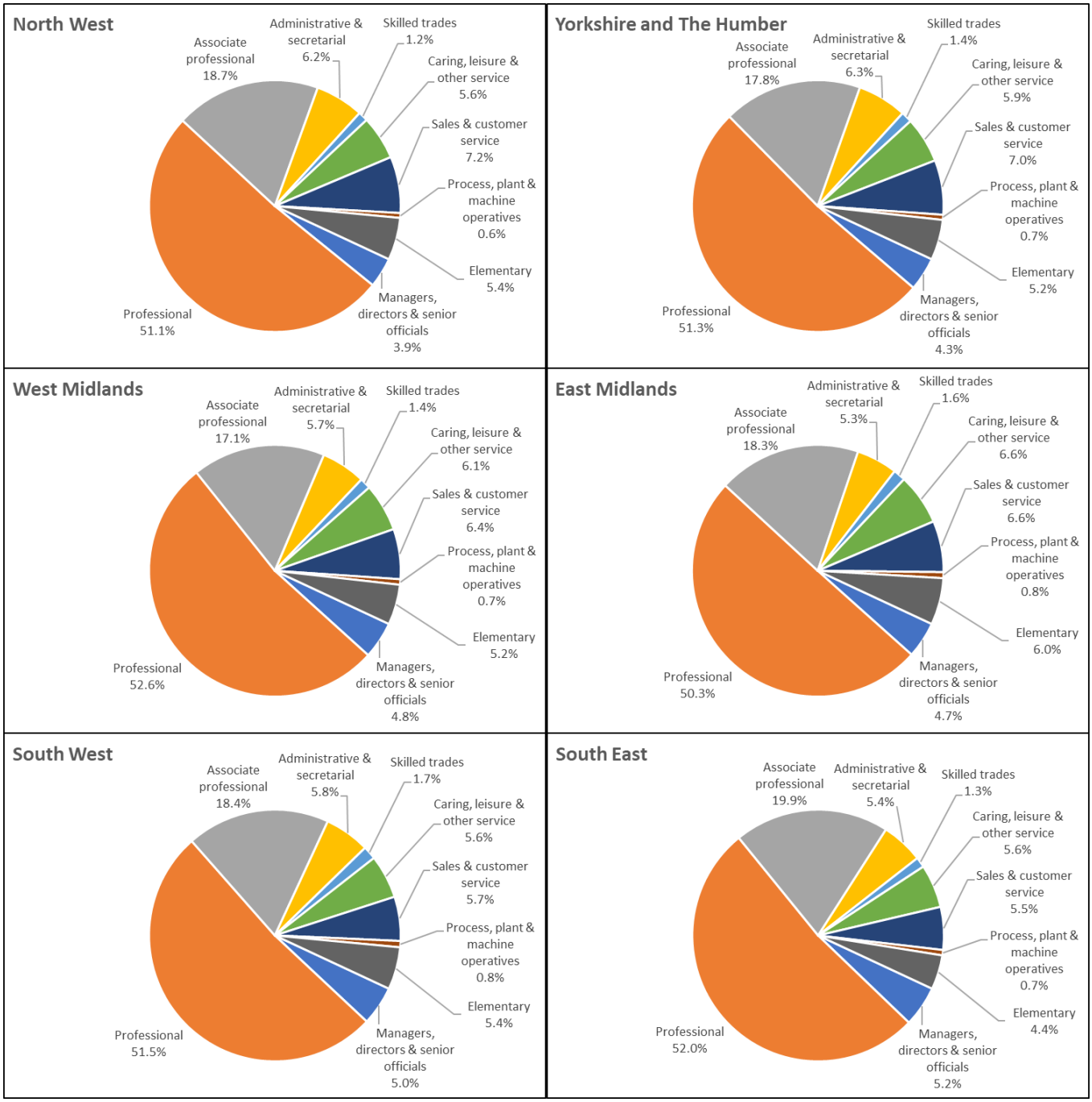
Region	Employment level		
	High-skilled	Medium-skilled	Low-skilled
	Graduate retention rate		
North East (NE)	50.5%	54.6%	57.8%
North West (NW)	64.4%	65.0%	67.2%
Yorkshire & the Humber (Y&H)	51.0%	55.7%	56.4%
East Midlands (EM)	39.4%	40.9%	43.9%
West Midlands (WM)	49.4%	55.0%	56.2%
East of England (EE)	47.6%	45.8%	51.2%
London (LD)	74.1%	76.7%	73.4%
South East (SE)	42.6%	43.6%	47.2%
South West (SW)	47.8%	51.1%	51.9%
Wales	58.9%	62.3%	57.5%
Scotland (ST)	78.4%	86.3%	89.4%
Northern Ireland (NI)	87.0%	92.9%	93.8%
UK	57.4%	59.7%	61.1%
	Graduate attraction rate		
North East (NE)	27.7%	24.3%	29.4%
North West (NW)	33.7%	35.0%	32.1%
Yorkshire & the Humber (Y&H)	34.9%	35.7%	35.3%
East Midlands (EM)	44.0%	39.3%	40.1%
West Midlands (WM)	39.0%	40.6%	44.3%
East of England (EE)	60.8%	63.6%	67.3%
London (LD)	54.6%	51.9%	47.7%
South East (SE)	52.1%	49.4%	47.9%
South West (SW)	47.7%	47.6%	45.6%
Wales	29.0%	23.1%	27.5%
Scotland (ST)	9.9%	5.7%	5.1%
Northern Ireland (NI)	17.3%	19.8%	27.1%
UK	42.6%	40.3%	38.9%
Total number of new graduate workers by level of skilled employment (UK)	184,340	30,520	26,615
Distribution (%) of new graduate workers by level of skilled employment (UK)	76.3%	12.6%	11.0%

Note: The levels of skilled employment are formed according to the Standard Occupational Classification, as follows:
High-skilled: "Managers, directors and senior officials", "Professional occupations", and "Associate professional occupations".
Medium-skilled: "Administrative and secretarial occupations", "Skilled trades occupations", and "Caring, leisure and other service occupations".
Low-skilled: "Sales and customer service occupations", "Process, plant and machine operatives", and "Elementary occupations".
The table excludes graduates with an unknown occupation and those whose employment location is outside the UK or unknown. In line with HESA's disclosure control, the underlying numbers of graduates used to calculate the rates in each cell are rounded to the nearest multiple of 5.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Finally, Figure 8 illustrates the occupational distribution of recent graduates employed in selected regions (irrespective of their region of study), based on a more detailed occupational classification (9 groups). It appears that there are relatively small regional differences in how university graduates are spread across occupations. Graduates employed in the northern English regions are more likely to work in low-skilled occupations than those in the South regions. For instance, in the North West, 13.2% of new graduates work in "sales and customer service", "process, plant and machine operatives", and "elementary" occupations, whereas the corresponding share in the South East is 10.7%. These moderate regional differences in the occupational distribution are explained by the fact that the sample

comprises only highly-educated people and does not capture disparities in the overall skills composition of the workforce across regions. For instance, only 33.5% of the total working-age population in the West Midlands held a National Vocational Qualification (NVQ) level 4 or higher (which includes university graduates) in 2019, relative to 40.2% in the UK as a whole (Taylor et al., 2021).

Figure 8 – Distribution of new graduate workers by main occupation group in selected regions



Note: The presented occupations are based on the major group structure of the UK Standard Occupational Classification (SOC). The share of new graduate workers in each occupation group refers to all GOS respondents in employment in the reported region, irrespective of the region of their studies. In each graph, the percentages sum up to 100%.
Source: Own elaboration using the Graduate Outcomes Survey data from HESA (Higher Education Statistics Agency), 2018/19.

Conclusions and policy implications

This report explored patterns of graduate retention and attraction rates across the UK regions according to graduates' demographic and study characteristics (age, ethnicity, type of university attended, class of first degree) and their sectoral/occupational choices. This analysis complements and expands on earlier WMREDI work on regional brain drain and gain in the UK (Carrascal-Incera et al., 2021). Using recent data from the Graduates Outcomes Survey for the academic year 2018/19, we confirm that most university graduates are employed in their region of study 15 months after graduation. However, there are substantial regional differences in the likelihood of staying locally or relocating for work. For example, of the total 2018/19 graduates who moved to another region for work, 32.3% chose London as their employment destination.

Younger graduates show increased eagerness to pursue job opportunities in other regions after completing their course. Furthermore, Pakistani and Bangladeshi graduates are far more likely than other ethnic groups to remain in their region of study for work. This becomes more insightful from a policymaking viewpoint, considering that recent research from the UK suggests that the impact of receiving higher education on geographical mobility is strikingly lower among graduates from ethnic minority backgrounds (Britton et al., 2021). In addition, the present work provides supportive evidence that academic ability and the quality/selectivity of university attended are positively correlated with graduates' probability of moving out of their region of study. Moreover, occupational and sectoral specialisation is another parameter that influences graduates' post-university location, as the attraction/retention rates and the distribution of new workers vary significantly across industries and occupations. For instance, the "public administration, education and health" sectors demonstrate the highest graduate retention rate (64.9%), whereas the attraction rates are more prominent amongst the graduates employed in the "manufacturing" (51.5%) and "transport & communication" (50.7%) industries.

The vigorous growth of specific sectors (such as digital, life sciences, and advanced manufacturing industries) and the creation of good jobs in the UK regions are likely to alter the dynamics influencing the retention and attraction rates of university graduates. This could, in turn, contribute to the economic development of certain regions and levelling up the country. Policies aiming to create new high-skilled jobs are crucial for attracting and retaining talent to a region. In this context, boosting innovation and research and development (R&D) investments can benefit the UK regions. R&D is a critical driver of economic growth, as it can augment the average gross value added (GVA) per capita. Moreover, increasing R&D expenditure in an area can play a significant role in its economic agglomeration, which triggers local multiplier effects through the knowledge spillovers between firms and the attraction of investments and highly-qualified employees from other regions or countries (Collinson, 2021).

However, the R&D intensity (defined as the proportion of total R&D expenditure over the GDP) is currently lower in the UK than the OECD average[5], and there are dramatic regional imbalances in the distribution of R&D investments. For instance, the wider London, Oxford and Cambridge areas absorbed 46% of the total public R&D funds in 2016, although they cover only 21% of the UK population (Forth and Jones, 2020). The UK Government recently announced its target to raise the annual public R&D spending to £22 billion by 2027, thus aiming to increase the total R&D investments (public and private) to 2.4% of the GDP in that year (HM Treasury, 2021). Provided that this increase in R&D investment is accompanied by an equal distribution nationally, it should open up opportunities for the further development of specific sectors and enhance the demand for high-level skills (such as STEM-related capabilities) across the UK.

In a closely related context, the role of universities in increasing the provision of such skills is vital for addressing the existing demand and supply imbalance at the national level. Higher education institutions could utilise the knowledge gained from their collaborations with local firms to upgrade their degree programmes and equip their students with the required skillsets, thus enhancing graduates' employability. University-led STEM assets (such as innovation

[5] Based on the OECD data, the gross domestic R&D spending (including state and business investments) as a ratio of GDP was 1.76% in the UK in 2019, well below the OECD countries' average of 2.48%.

centres, science parks, incubators and accelerators) constitute good examples of how upskilling and knowledge transfer could be strengthened through partnerships with businesses operating in a region (Taylor et al., 2021). In a similar vein, adjusting the secondary-school curriculum and improving the information offered to students (before applying to a university) about the expansion of demand for specific skills and the positive career outlooks of particular fields of study might contribute towards addressing skills shortages issues.

Moreover, improving the economic fundamentals of a region (including transport links and the housing market) is likely to increase its overall competitiveness and contribute to attracting more graduates to an area (Swinney and Williams, 2016). Similarly, access to finance is deemed a significant facilitating factor that would help start-up businesses grow, particularly in "left-behind" areas.

The present report concentrated on new graduates' retention and attraction rates, regardless of the region in which they were originally domiciled. Future WMREDI work aims to explore the extent to which regions retain their home-grown students after graduation relative to those who move to another region to study. This work will be based on explanatory analysis using multiple regression techniques and will allow us to understand better the migration flows across regions, particularly after accounting for differences in socio-demographic and spatial characteristics. In addition, future research could investigate the impact of COVID-19 on the mobility decisions of graduates. The shift to remote or hybrid working is likely to decrease geographical impediments to graduates' mobility and expand the pool of highly skilled employees available to businesses across the country (DCMS, 2021). What is the impact of these patterns on regional recovery and inclusive growth? Will these patterns result in companies operating in London recruiting more employees outside of the capital, thus further intensifying the competition for highly skilled graduates among businesses based in other regions? In a drastically evolving environment, it is imperative to address skills issues by identifying policies that reduce inequalities among regions and improve graduates' career opportunities, particularly of those from disadvantaged backgrounds.

References

Abreu, M. and Conway, F. (2021). *Graduate retention rates across UK cities and regions - a longitudinal analysis.* Productivity Insights Network. Available from https://productivityinsightsnetwork.co.uk/app/uploads/2021/08/PIN-Report_MA_FC.pdf.

Abreu, M., Faggian, A. & McCann, P. (2015). Migration and inter-industry mobility of UK graduates. *Journal of Economic Geography,* 15(2), pp. 353-385.

Arrow, K. J. (1973). Higher education as a filter. *Journal of Public Economics,* 2(3), pp. 193-216.

Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy*, 70(5, Part 2), pp. 9-49.

BEIS (2017). *Industrial Strategy - Building a Britain fit for the future.* London: BEIS (Department for Business Energy & Industrial Strategy). Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf.

Britton, J., van der Erve, L., Waltmann, B. & Xu, X. (2021). *London calling? Higher education, geographical mobility and early-career earnings.* IFS (Institute for Fiscal Studies). Available from https://ifs.org.uk/uploads/Higher-education-geographical-mobility-and-early-career-earnings.pdf.

Carrascal-Incera, A., Green, A., Kollydas, K., Smith, A. & Taylor, A. (2021). *Regional brain drain and gain in the UK: Regional patterns of graduate retention and attraction.* WMREDI (University of Birmingham). Available from https://www.birmingham.ac.uk/documents/college-social-sciences/business/research/wm-redi/wm-redi-project-docs/project-1a/regional-brain-drain-and-gain-in-the-uk-regional-patterns-of-graduate-retention-and-attraction.pdf

Christie, H. (2007). Higher Education and Spatial (Im)Mobility: Nontraditional Students and Living at Home. *Environment and Planning A,* 39(10), pp. 2445-2463.

Ciriaci, D. (2014). Does University Quality Influence the Interregional Mobility of Students and Graduates? The Case of Italy. *Regional Studies,* 48(10), pp. 1592-1608.

Collinson, S. (2021). *Levelling Up Through Innovation.* WMREDI (University of Birmingham). Available from https://blog.bham.ac.uk/cityredi/levelling-up-through-innovation.

Construction Industry Training Board (2021). *Construction Skills Network Industry Outlook 2021-2025.* Available from https://www.citb.co.uk/media/noopd5nx/west_midlands.pdf.

Craig, G. (2012) The history and pattern of settlement of the UK's black and minority ethnic population. In: Craig, G., et al. (Eds.) *Understanding 'Race'and Ethnicity: Theory, History, Policy, Practice.* Bristol: The Policy Press, pp. 41-69.

Dale, S. B. and Krueger, A. B. (2014). Estimating the Effects of College Characteristics over the Career Using Administrative Earnings Data. *Journal of Human Resources,* 49(2), pp. 323-358.

DCMS (2021). *Assessing the UK's Regional Digital Ecosystems.* Department for Digital-Culture-Media & Sport. Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1020407/Digital_Regional_Ecosystems_report_v9.1.pdf.

Economic Policy Centre (2019). *Northern Ireland Skills Barometer - Summary report*, Ulster University. Available from https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Skills-Barometer-2019-Summary-Report.pdf.

Elliott, R. J. R. and Lindley, J. K. (2008). Immigrant wage differentials, ethnicity and occupational segregation. *Journal of the Royal Statistical Society: Series A (Statistics in Society),* 171(3), pp. 645-671.

Faggian, A. and McCann, P. (2009). Human capital, graduate migration and innovation in British regions. *Cambridge Journal of Economics,* 33(2), pp. 317-333.

Feng, A. and Graetz, G. (2017). A question of degree: The effects of degree class on labor market outcomes. *Economics of Education Review,* 61, pp. 140-161.

Forth, T. and Jones, R. (2020). *The Missing £4 Billion - Making R&D work for the whole UK.* Nesta. Available from https://media.nesta.org.uk/documents/The_Missing_4_Billion_Making_RD_work_for_the_whole_UK_v4.pdf.

Fratesi, U. (2014). The mobility of high-skilled workers-causes and consequences. *Regional studies,* 48(10), pp. 1587.

Haapanen, M. and Tervo, H. (2012). Migration of the Highly Educated: Evidence from Residence Spells of University Graduates*. *Journal of Regional Science,* 52(4), pp. 587-605.

HM Treasury (2021). *Autumn budget and spending review 2021 - A stronger economy for the British people.* Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1029973/Budget_AB2021_Print.pdf.

Imeraj, L., Willaert, D., Finney, N. & Gadeyne, S. (2017). Cities' attraction and retention of graduates: a more-than-economic approach. *Regional Studies,* 52(8), pp. 1086-1097.

Industrial Strategy Council (2019). *UK Skills Mismatch in 2030*. https://industrialstrategycouncil.org/sites/default/files/UK%20Skills%20Mismatch%202030%20-%20Research%20Paper.pdf

Kitagawa, F., Marzocchi, C., Sánchez-Barrioluengo, M. & Uyarra, E. (2021). Anchoring talent to regions: the role of universities in graduate retention through employment and entrepreneurship. *Regional Studies*, pp. 1-14.

Naylor, R., Smith, J. & Telhaj, S. (2016). Graduate returns, degree class premia and higher education expansion in the UK. *Oxford Economic Papers,* 68(2), pp. 525-545.

Ostbye, S. and Westerlund, O. (2007). Is migration important for regional convergence? Comparative evidence for Norwegian and Swedish counties. *Regional studies,* 41(7), pp. 901.

Smith, D. P. and Sage, J. (2014). The regional migration of young adults in England and Wales (2002–2008): a 'conveyor-belt' of population redistribution? *Children's Geographies,* 12(1), pp. 102-117.

Swinney, P. and Williams, M. (2016). *The Great British Brain Drain - Where graduates move and why.* Centre for Cities. Available from https://www.centreforcities.org/wp-content/uploads/2016/11/16-11-18-The-Great-British-Brain-Drain.pdf.

Taylor, A., Green, A. & Hassan, S. (2021). *Priorities for up-skilling and re-skilling: what role can and should universities play?* WMREDI (University of Birmingham). Available from https://www.birmingham.ac.uk/documents/college-social-sciences/business/research/wm-redi/wm-redi-project-docs/project-1c/what-are-the-priorities-for-upskilling-and-reskilling-report-10.05.2021-v4.pdf.

Walker, I. and Zhu, Y. (2018). University selectivity and the relative returns to higher education: Evidence from the UK. *Labour Economics,* 53, pp. 230-249.

Zuccotti, C. V. (2015). Do Parents Matter? Revisiting Ethnic Penalties in Occupation among Second Generation Ethnic Minorities in England and Wales. *Sociology,* 49(2), pp. 229-251.

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