

Office for
Students



A geography of employment and earnings

Experimental statistics classifying
local variations in graduate opportunities

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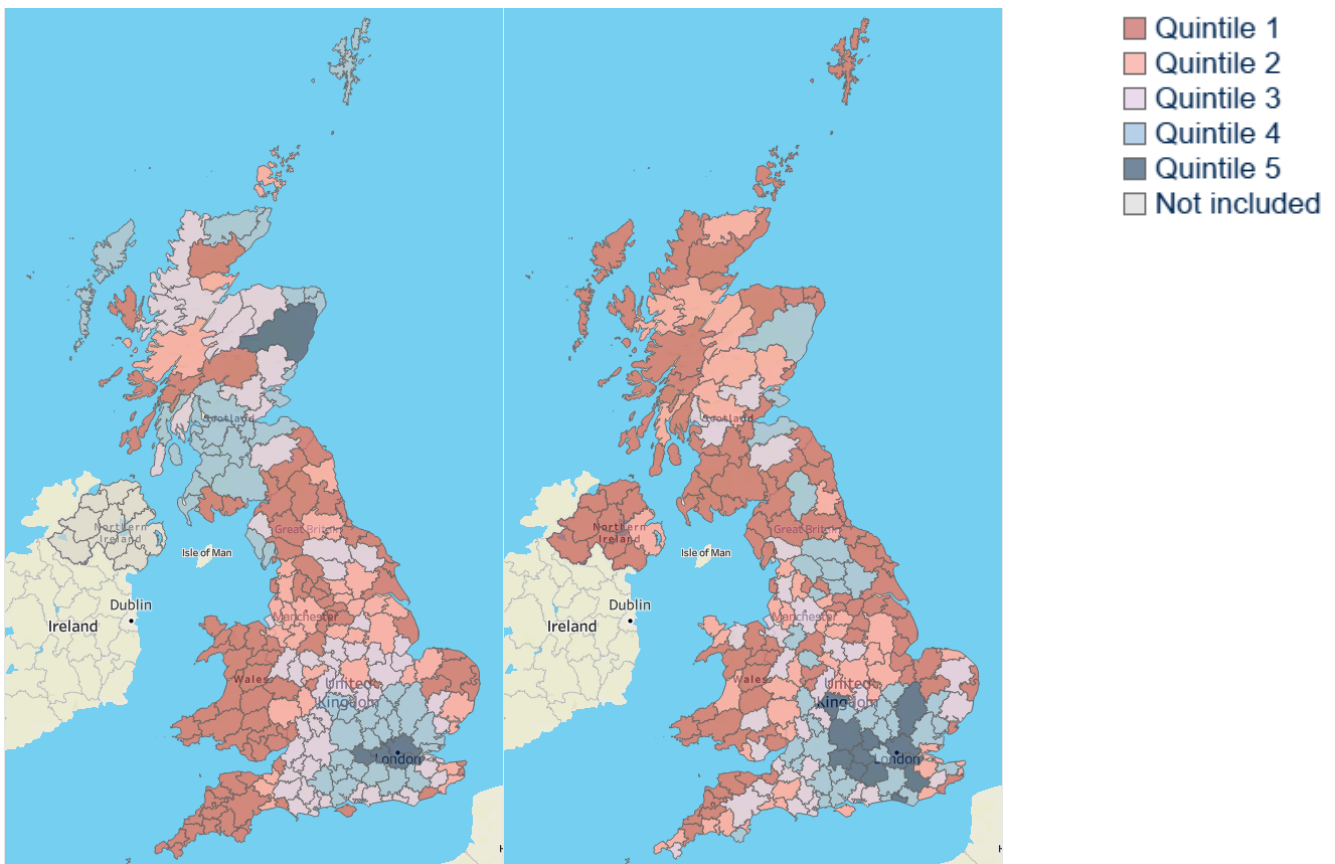
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Summary

1. This report presents a method for grouping areas based on measures of local graduate opportunity. This method could help contextualise graduate outcomes by capturing some of the labour market differences experienced by graduates living in different parts of the UK. We demonstrate it with two different measures:
 - a. **Above-threshold earnings or higher-level study** using Longitudinal Education Outcomes (LEO) data. Areas are classified using the proportion of graduates earning over a threshold or studying at a higher level three years after graduation.
 - b. **Highly skilled employment** using Census 2011 data (to be replaced by Graduate Outcomes survey data in future). Areas are classified based on the proportion of all employed people who are in professional or managerial jobs.
2. We developed this method using travel to work areas (TTWAs), which are defined using commuting patterns. Using this definition, most people work in the same TTWA as their home. There are 228 TTWAs in the UK, mostly centred around towns and cities.
3. For each measure we divided the TTWAs into five groups, or 'quintiles'. Figure 1 shows the two groupings. The map on the left shows areas grouped by the proportion of graduates earning above the threshold or in higher-level study, and the map on the right shows areas grouped by rates of highly skilled employment. Dark blue areas have the highest rates (quintile 5), and dark red areas have the lowest (quintile 1).

Figure 1: Groupings using earnings data (left) and highly skilled employment (right)



Source: OfS analysis of LEO data (left) and 2011 Census data (right). Quintile 5 areas have the highest rates.

4. To illustrate how the groupings could be applied, we used the LEO earnings-based grouping to dig deeper into differences in employment outcomes between black and white graduates. We found that:
 - a. Overall, 60 per cent of white graduates earned above the threshold (around £23,000) or were in higher-level study, compared to 57.5 per cent of black graduates.
 - b. However, this masks some of the difference between the groups, because black graduates were almost four times more likely to live in the areas with the highest graduate opportunity rates.
 - c. When only graduates living in top quintile areas were considered, 73.5 per cent of white graduates earned above the threshold or were in higher-level study, compared to 59.9 per cent of black graduates. This gap is significantly larger than the overall gap.
 - d. Conversely, for black and white graduates in the bottom quintile similar proportions earned above the threshold or were in higher-level study (52.1 per cent compared to 51.9 per cent).

This publication is an experimental official statistic and we are actively seeking feedback on the methods and any improvements that could be made to these or to the presentation of the groupings.

We are also keen to understand how you might use these classifications. Please get in touch with us at official.statistics@officeforstudents.org.uk to let us know your thoughts and feedback.

Introduction

5. As the Office for Students, we want to ensure that students leave their courses with the knowledge, qualifications, skills and attributes that are required by employers, both now and into the future, or which support the setting up of their own businesses. We want to see educated graduates, from all forms of higher education, who can flourish in the world as it is today and might be tomorrow.¹
6. In this report we show one way of adding a geographical context when considering graduate outcomes. Although individual students will define their success beyond graduation in relation to their own goals and motivations, for illustrative purposes this report focuses on earnings and highly skilled employment. The method we introduce in this publication could potentially use other graduate outcome measures, draw from other data sources, or be applied to different geographies.
7. While this report highlights the differences between areas and provides a way to account for them, we also show that there are good opportunities for graduates available everywhere in the country. We are not presenting certain areas as better alternative destinations for graduates but giving geographical context for wherever they chose to live.
8. We are publishing this research report because we consider that there is a strong public interest in publishing information about student outcomes from higher education. Understanding the geographical context for different groups of graduates may be particularly important in gaining a better understanding of employment outcomes and how they are linked to the area where the graduates are living. For instance, information that allows us to articulate the ways in which graduates living in the South West looking for employment face a different situation to those entering the labour market in London. We judge that publishing new, innovative classifications, which are intended over the longer term to improve the information available about student outcomes, is consistent with our general duties in section 2 of the Higher Education and Research Act 2017.
9. We are developing and publishing this quintile-based approach in anticipation that it could potentially provide a useful mechanism for the contextualisation of data about graduate employment outcomes. We expect that methods for understanding the geographical context of graduate employment outcomes will be of interest and value to a range of stakeholders. By introducing a new classification of local variations in graduate opportunities, through this publication of experimental statistics,² we are involving potential users at an early stage in assessments of their suitability.

¹ For more on the OfS strategy, see www.officeforstudents.org.uk/about/our-strategy/.

² Experimental statistics: A subset of newly developed or innovative official statistics undergoing evaluation. Experimental statistics are published to involve users and stakeholders in the assessment of their suitability and quality at an early stage.

Above-threshold earnings and highly skilled employment

10. In this analysis we have developed two separate and complementary groupings, referred to as 'Local graduate opportunity groupings'.
11. The first grouping relies on an earnings-based measure using LEO data. It classifies areas across the UK based on the proportion of employed graduates in each area earning above a threshold,³ and the proportion of those studying who are studying at a higher level than their previous qualification.
12. To complement this, the second grouping relies on job type classification. In future we will create a version of this using Graduate Outcomes survey data, but as there is not sufficient data available yet we have instead created an indicative mapping based on Census 2011 data. This classifies areas based on the proportion of all employed people who are in professional or managerial jobs.⁴
13. Both data sources pre-date the COVID-19 pandemic, which means that any disruption to working locations or differences in remote working patterns will not yet have an impact on the groupings.

Travel to work areas

14. We have used travel to work areas (TTWAs) in this analysis. While the method would work for other geographies, TTWAs seem a natural fit. They are defined using commuting patterns to determine areas where most people live and work in the same area. Thus, relatively few people in each TTWA cross over to a different TTWA to go to work. Each one tends to consist of a major town or city and the area around it. There are 228 of these areas in the UK.⁵
15. Because these areas are developed statistically, they differ greatly in size. More than 50 TTWAs have fewer than 60,000 people living in them whereas the largest TTWA, relating to London and some surrounding areas, has 8.4 million people.⁶
16. Within some TTWAs, particularly those containing large cities, there will be sub-areas where the employment patterns are very different to the rest of the TTWA. The groupings are designed to broadly indicate the job profile for people living in each area rather than capturing everything which is distinctive about the area.

³ The threshold for each year is defined as the national median earnings for graduates and non-graduates aged 25-29 years, which in 2017-18 was £23,000. See paragraph 21 for more information.

⁴ For the purposes of this analysis, professional or managerial jobs are defined as Standard Occupational Classification (SOC) groups 1-3. See paragraph 44 for more information.

⁵ See the Office for National Statistics website for more information on travel to work areas: <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/traveltoworkareaanalysisingreatbritain/2016>.

⁶ See <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/traveltoworkareaanalysisingreatbritain/2016#population>.

17. An alternative to TTWAs that we could have used is the larger Government Office Regions (NUTS1), which splits the UK into just 12 regions. This would be simpler to use and understand, but it would hide substantial variation within these large areas. For instance, areas on the East Anglian coast would be counted in the same region as areas just outside London, thereby hiding significant differences in these labour markets. For this reason, we have used smaller areas for this analysis.
18. Another alternative mapping we could have used is the smaller Middle Layer Super Output Areas (MSOAs), of which there are 7,201 in England and Wales. This would have been better at capturing variation between smaller areas, but much more volatile due to smaller population sizes. They would also potentially be less meaningful, because people from one MSOA would travel to many others to work. For these reasons, this analysis uses TTWAs, which are larger and are aligned to typical commuting patterns.

Feedback

This report is an experimental official statistic which falls under the official statistics' Code of Practice. We are actively seeking feedback for this analysis. Please email comments to Adam Finlayson at official.statistics@officeforstudents.org.uk.

In particular, we welcome feedback on the following aspects:

- Whether the TTWAs are suitable for this purpose
- Whether there are groups of students or types of provision which could be misunderstood using these quintiles
- Whether there may be unintended consequences from using these quintiles in combination with other student characteristics.

Grouping 1: Graduates with above-threshold earnings or in higher-level study (LEO data)

Data and definitions

19. The Longitudinal Education Outcomes (LEO) data is a dataset of education records joined to UK tax and benefits data. It shows whether graduates were in paid work or study, and how much they were paid. It includes people who were self-employed as well as those who worked for an employer.⁷
20. The LEO data also records where graduates lived during the tax year. We have used this to assign each graduate to a travel to work area and combine the outcomes for all graduates in each area.
21. The outcome measure we have used in this classification⁸ is based on:
- UK undergraduate qualifiers
 - both full-time and part-time courses
 - universities and colleges in England and universities in Wales and Scotland⁹
 - graduates in paid employment or further study three years after graduation.

It measures the proportion of these graduates who were:

- Earning over a threshold.** The threshold for each year is defined as the national median earnings for graduates and non-graduates aged 25 to 29 years¹⁰, which in 2017-18 was £23,000. All graduates earning over this threshold will count positively towards the metric, whether they earned £24,000 or £100,000.
- Or, studying at a higher level.** For those in further study three years after graduation, the study will count positively if it is at a higher level than the qualification they graduated from previously. For instance, if a student qualified with a first degree and three years later were

⁷ The LEO data used in this publication is derived from datasets owned by the Department for Education (DfE). The DfE does not accept responsibility for any inferences or conclusions derived from the LEO data by third parties.

⁸ Note this measure is subject to consultation so may change in future versions of the grouping.

⁹ There are higher education graduates from colleges in Scotland and Wales, but these are not currently included in the core LEO dataset. These make up a small part of the sector in Wales but a significant part in Scotland. It is not clear how this impacts the results: while graduates from Scottish colleges may have lower earnings than those from Scottish universities, they are more likely to study at a higher level.

¹⁰ The median for national earnings is based on all 25 to 29-year-olds, including both graduates and non-graduates. The median for each financial year is drawn from the annual ONS/HMRC publication, Personal Incomes Statistics, and rounded to the nearest £500. The medians used in the other years were £21,500 in 2015-16 and £22,000 in 2016-17.

studying for a masters' degree it would count positively, whereas if they were studying for another undergraduate degree this would not count as higher-level study.

22. Note that graduates who are not in paid employment or study are not included in the measure. This is because LEO data does not record how they are spending their time and therefore the extent to which the lack of paid employment or study was a choice rather than an undesired outcome is unknown. This means the measure should not be used as a marker of the overall economic health of an area.
23. We have pooled three years of LEO data to increase the sample size and robustness. This analysis covers the financial years 2015-16, 2016-17 and 2017-18, which relate to the graduates who completed their course between August 2011 and July 2014. The total number of graduates is similar in each year, as is the overall proportion of graduates earning above the threshold or in higher-level study.

Grouping methodology

24. We have assigned each travel to work area a quintile based on the proportion of graduates living in that area who earned over the threshold or were in higher-level study. For instance, in London a high proportion of graduates earned over the threshold or were in higher-level study, so London is assigned the top quintile, five.
25. We have constructed the quintiles such that the number of graduates in paid employment or study in each quintile is as close to one-fifth as possible. This means that there may be different numbers of travel to work areas in each quintile.¹¹
26. Note that some UK areas were not used in the grouping.
 - a. Graduates living in Northern Ireland were not included. This is because Northern Irish providers are not included in the LEO data, and only a small proportion of graduates living in Northern Ireland studied elsewhere in the UK. Basing the grouping only on these graduates may be unreliable, so these areas are not included in the maps or the main data tables.
 - b. A small proportion of graduates had no recorded location. These graduates were not included in the grouping.¹²

¹¹ If there had been a natural grouping of areas with clearly distinct rates, we could have used that instead of arbitrary divisions into equally sized groups. However, there was no way to divide the groups which would create clear distinctions between them. Moreover, comparing different groupings is easier with consistently sized groups. This approach has been used before by the OfS when producing area-based access measures such as POLAR and TUNDRA.

¹² Northern Irish areas have been assigned proxy LEO quintiles, showing the group they would have been in based on the outcomes we can observe. These proxy quintiles are included in a supplementary data table for reference but are not part of the maps or compared to the highly skilled employment quintiles and should be used with caution.

27. Analysis of the area sizes showed that no further aggregation of areas was required. Combining areas together did not substantially improve the likelihood of an area being assigned the wrong quintile by chance. See Annex A for more detail on these simulations.

28. It is important to bear in mind that there may be multiple reasons why areas are in higher or lower quintiles. As well as differences in the local labour market and availability of study opportunities in different areas of the country, there are also differences in the personal characteristics, pre-higher education qualifications and subject studied for graduates in each area. This means the differences between areas should not be considered causal. In other words, it is not always the case that if a graduate moved to an area in a higher quintile their chance of earning above the threshold would increase.

Results

29. Table 1 shows the number of travel to work areas (TTWAs) in each quintile. It shows that the average proportion of graduates in each quintile earning above the threshold or in higher-level study ranges from 51.7 per cent in quintile 1 to 69.6 per cent in quintile 5.

Table 1: Summary table of LEO local graduate opportunity groups

Quintile	Number of TTWAs	Number of graduates	Percentage earning above threshold or in higher study			Range of values in quintile min - max (pts)
			Minimum (%)	Average (%)	Maximum (%)	
1 (lowest)	82	216,335	40.6	51.7	53.6	13.0
2	35	221,730	53.7	54.6	56.1	2.3
3	53	215,790	56.1	58.0	60.7	4.6
4	44	194,145	60.7	64.4	69.1	8.4
5 (highest)	4	244,290	69.5	69.6	71.4	1.9
Total	218	1,092,290		59.8		

Note: The Average column shows the average of the graduates in each quintile, rather than the average of the areas making up each quintile. In all figures and tables in this analysis, numbers are rounded to the nearest five and percentages are rounded to the nearest 0.1 per cent. Proportions and totals are calculated using unrounded numbers. There is no overlap between quintiles even though an area in one quintile may have the same rate as an area in another quintile after rounding.

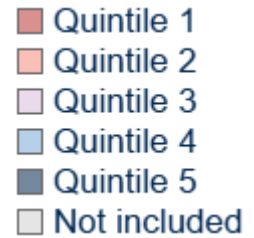
30. Table 1 shows that quintiles 2 and 5 are narrower than the others, both two percentage points wide. This does not mean the quintiles are unstable because the areas in these quintiles are reasonably sized (at least 300 graduates and often much larger).¹³ However, when using these quintiles care should be taken not to assume that areas in quintile 2 are very different from those in quintiles 1 or 3, and similarly that areas in quintile 5 are very different from those in quintile 4.

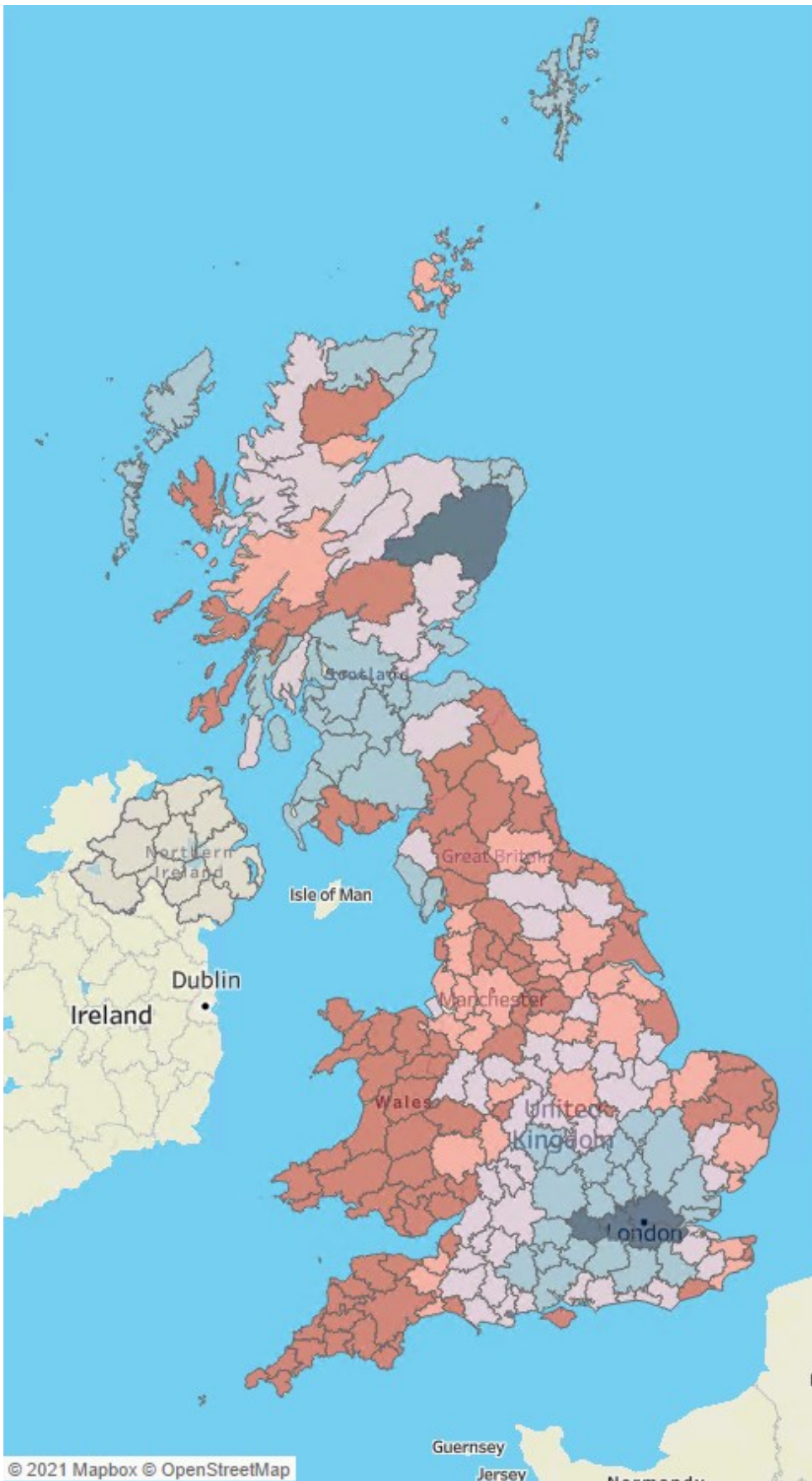
¹³ See Annex A for analysis showing the stability of the quintiles.

31. There are fewer TTWAs in quintile 5. This is because the quintiles are defined to have an equal number of graduates rather than an equal number of areas, and large number of graduates in the London TTWA make up most of quintile 5.

32. Figure 2 shows which area has been assigned to which quintile.

Figure 2: Map of LEO local graduate opportunity grouping





Source: OfS analysis of LEO data.

33. We have published some interactive maps and data tables published alongside this report to enable further exploration.

Example of use: ethnic group

34. To illustrate how these quintiles could be useful in contextualising graduate outcomes, in this section we consider outcomes for graduates from different ethnic groups, and how these vary by quintile.

35. Table 2 shows that graduates from different ethnic groups were not evenly distributed across the quintiles. Most black graduates were in quintile 5, the quintile with the highest rates of above-threshold earnings: 60.1 per cent compared to 16.4 per cent of white students. This is driven by the number of black graduates in London, which makes up most of quintile 5.

Table 2: Distribution of black and white students across LEO quintiles, based on location three years after graduation

Ethnic group	Number of graduates	LEO local graduate opportunity group				
		(lowest) 1	2	3	4	(highest) 5
Black	60,115	5.8%	11.0%	13.3%	9.7%	60.1%
White	863,790	22.0%	21.6%	20.7%	19.3%	16.4%

Note: This illustrative example focuses on black and white graduates. We have provided a table containing results for all ethnic groups in Annex B. Restricted to those graduating 2011-12 to 2013-14 who were in paid employment or further study in Great Britain (Northern Ireland is not included) three years later.

36. The differences in distribution by ethnic group indicate that considering the graduate outcome figures in isolation may mask the gaps between different groups. In our example, most black graduates are in areas with the highest rates of above threshold earnings, so based on geographical differences alone we would expect their graduate outcomes to be higher, on average, than white graduates.

37. However, Table 3 shows that overall, 60.0 per cent of white graduates earned above the threshold or were in higher-level study, compared to 57.5 per cent of black graduates – a gap of 2.5 percentage points. Table 3 also allows us to look more closely at this difference by seeing the different gaps for graduates in each quintile.

Table 3: Proportion of graduates earning over the threshold or in higher-level study, by ethnic group and LEO quintile

Ethnic group	Number of graduates	Overall	% earning above threshold or in higher-level study in quintile...				
			(lowest) 1	2	3	4	(highest) 5
Black	60,115	57.5%	52.1%	50.4%	53.5%	59.6%	59.9%
White	863,790	60.0%	51.9%	55.1%	58.7%	64.9%	73.5%
Gap (ppts)		2.5	-0.2	4.7	5.2	5.3	13.6

Note: This illustrative example focuses on black and white graduates. We have provided a table containing results for all ethnic groups in Annex B.

38. This table shows that the gaps between black and white graduates are larger in most quintiles than the overall gap would suggest. In quintile 5 the proportion of white graduates earning above the threshold or in higher-level study was 13.6 percentage points higher than for black graduates (73.5 per cent compared to 59.9 per cent), whereas the overall gap was only 2.5 percentage points.
39. Conversely, in areas which were part of the lowest quintile, black and white graduates had a similar proportion earning over the threshold or in higher-level study: 52.1 per cent compared with 51.9 per cent.
40. This example demonstrates how these quintiles can provide a simple way to take account of the geographical context when considering differences between groups of graduates.
41. However, it also highlights the limitations of this approach. While the definition of the London travel to work area means that many people travel from each part to work in other parts of London, and there are theoretically many jobs within realistic travelling distance, there will still be parts of London where a much smaller proportion of graduates work in highly paid jobs.

Grouping 2: Employees with highly skilled jobs (Census data)

Data and definitions

42. Alongside the earnings-based quintiles using LEO data, it is useful to consider quintiles based on highly skilled employment. In this analysis we use Census data, but in future we will use more recent survey data, including the Graduate Outcomes survey.
43. The comparator local area quintiles we have produced for this analysis use 2011 Census data¹⁴ to give the proportion of employees¹⁵ with highly skilled jobs.¹⁶ This is based on both graduates and non-graduates, of all ages.
44. The ONS have categorised jobs reported in the Census using a Standard Occupation Classification (SOC 2010)¹⁷, and we use this to identify jobs which can be considered highly skilled. For the purposes of this analysis, 'highly skilled' refers to jobs in the categories relating to professional and managerial roles (SOC major groups 1-3).¹⁸
45. Note that people who are unemployed are not included in this measure. This measure should therefore be taken as an indication of the type of jobs available in an area rather than an overall measure of employment availability.

Grouping methodology

46. Each travel to work area is assigned a quintile based on the proportion of employees living in that area who were in professional or managerial roles. For instance, in the London travel to work area a high proportion of workers were in professional or managerial roles, so London is assigned the top quintile, quintile 5.

¹⁴ Office for National Statistics; National Records of Scotland; Northern Ireland Statistics and Research Agency (2016): 2011 Census UK key statistics: Occupation Table (KS608UK). Nomis. This information is licensed under the terms of the Open Government Licence (<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3>).

¹⁵ Using the Census population: usual residents aged 16-74 in employment the week before the census day (27 March 2011) for the UK.

¹⁶ There are other ONS surveys which are more recent, but their sample size is too small for analysis of local areas.

¹⁷ See <https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010>.

¹⁸ Note: this analysis is using the original SOC2010 groupings, as published by ONS, which means for instance that veterinary nurses and higher-level teaching assistants are not counted as highly skilled jobs. This is an area which we will look to address when updating this grouping in future, for instance by using SOC2020.

Results

47. Table 4 presents the number of areas and the distribution of highly skilled proportions in each quintile. It shows that the areas in quintile 5 had highly skilled employment rates of around 50 per cent whereas, in quintile 1 areas, 25-35 per cent of workers were in highly skilled employment.

Table 4: Summary table of Census local graduate opportunity groups

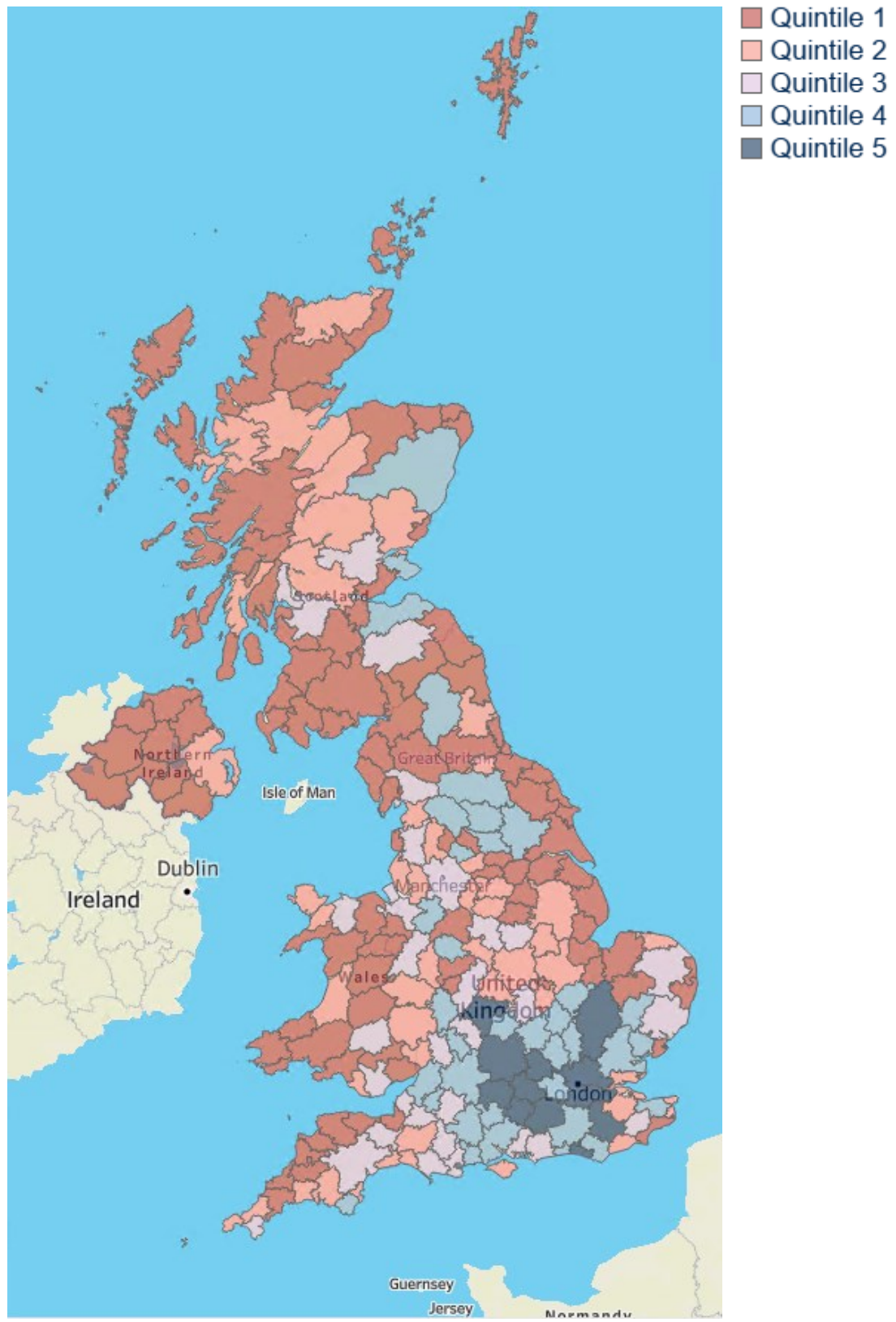
Quintile	Number of TTWAs	Total in employment	Percentage in highly skilled employment			Difference min to max (ppts)
			Minimum (%)	Average (%)	Maximum (%)	
1 (lowest)	101	5,993,925	24.4	32.6	35.6	11.1
2	47	5,867,140	35.6	36.7	38.2	2.6
3	33	6,066,790	38.3	39.2	40.1	1.7
4	36	5,907,585	40.1	43.7	47.0	6.8
5 (highest)	11	6,003,055	47.4	49.8	50.9	3.5

Note: The Average column shows the average of the employees in each quintile, rather than the average of the areas making up each quintile. There is no overlap between quintiles when unrounded figures are used, even though an area in one quintile may have the same rate as an area in another quintile after rounding.

48. Table 4 shows that quintile 3 is narrower than the others, at 1.7 percentage points wide. This does not mean that the quintile is unstable because the areas in this quintile are large (at least 13,750 employees and often much larger). However, when using these quintiles care should be taken not to assume that areas in quintile 3 are very different from those in quintiles 2 or 4.

49. Figure 3 shows which area has been assigned to which quintile.

Figure 3: Map of Census Local graduate opportunity groups



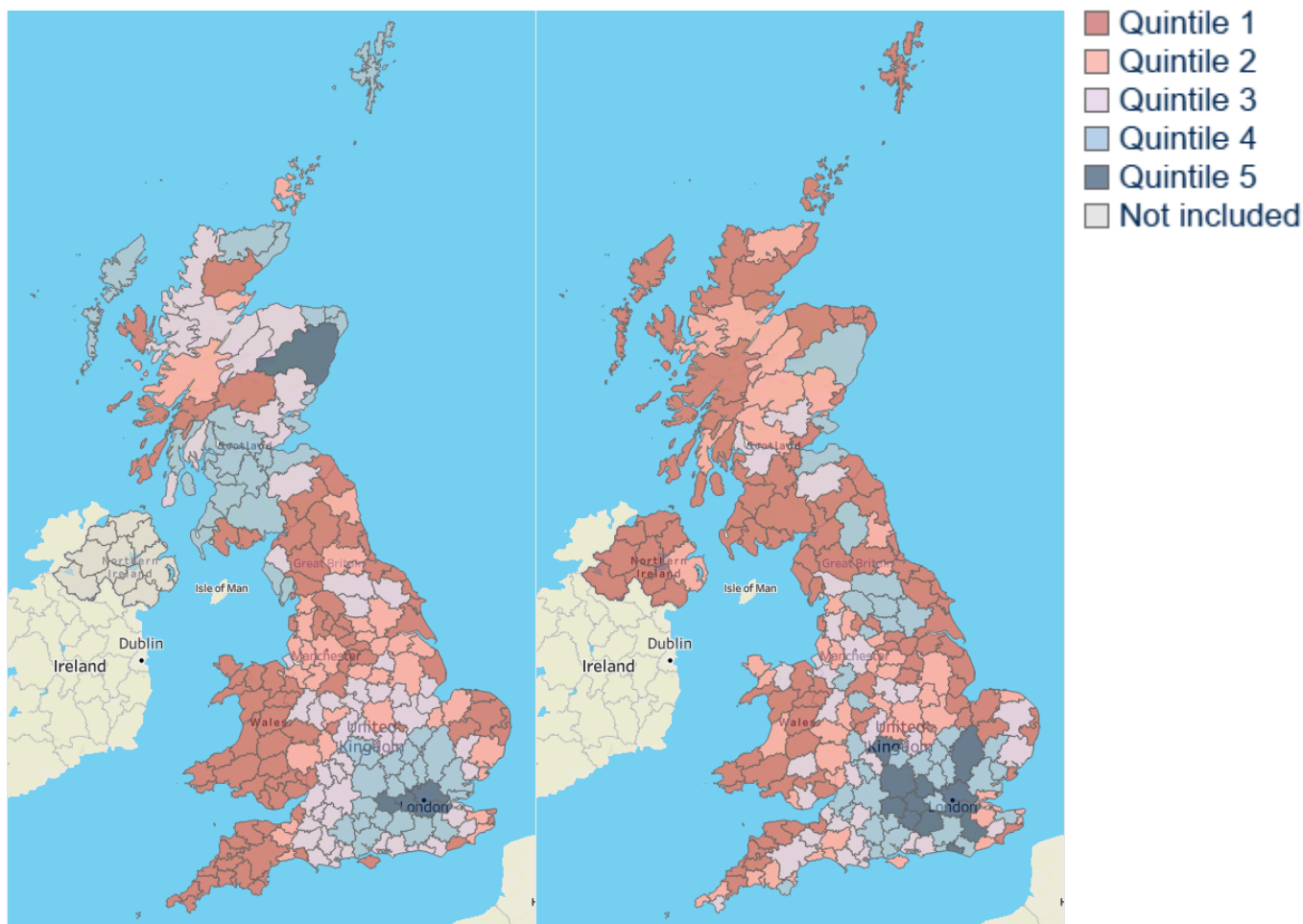
Source: OfS analysis of published Census 2011 data.

50. See the interactive maps and data tables published alongside this report for more detail.

Comparison

51. Figure 4 shows a side-by-side comparison of the LEO graduate threshold quintiles and the Census highly skilled employment quintiles. The map on the left shows areas grouped by the proportion of graduates earning above the threshold or in higher-level study, and the map on the right shows areas grouped by rates of highly skilled employment. Dark blue areas have the highest rates (quintile 5), and dark red areas have the lowest (quintile 1).

Figure 4: Comparison of quintile maps using earnings data (left) and highly skilled employment (right)



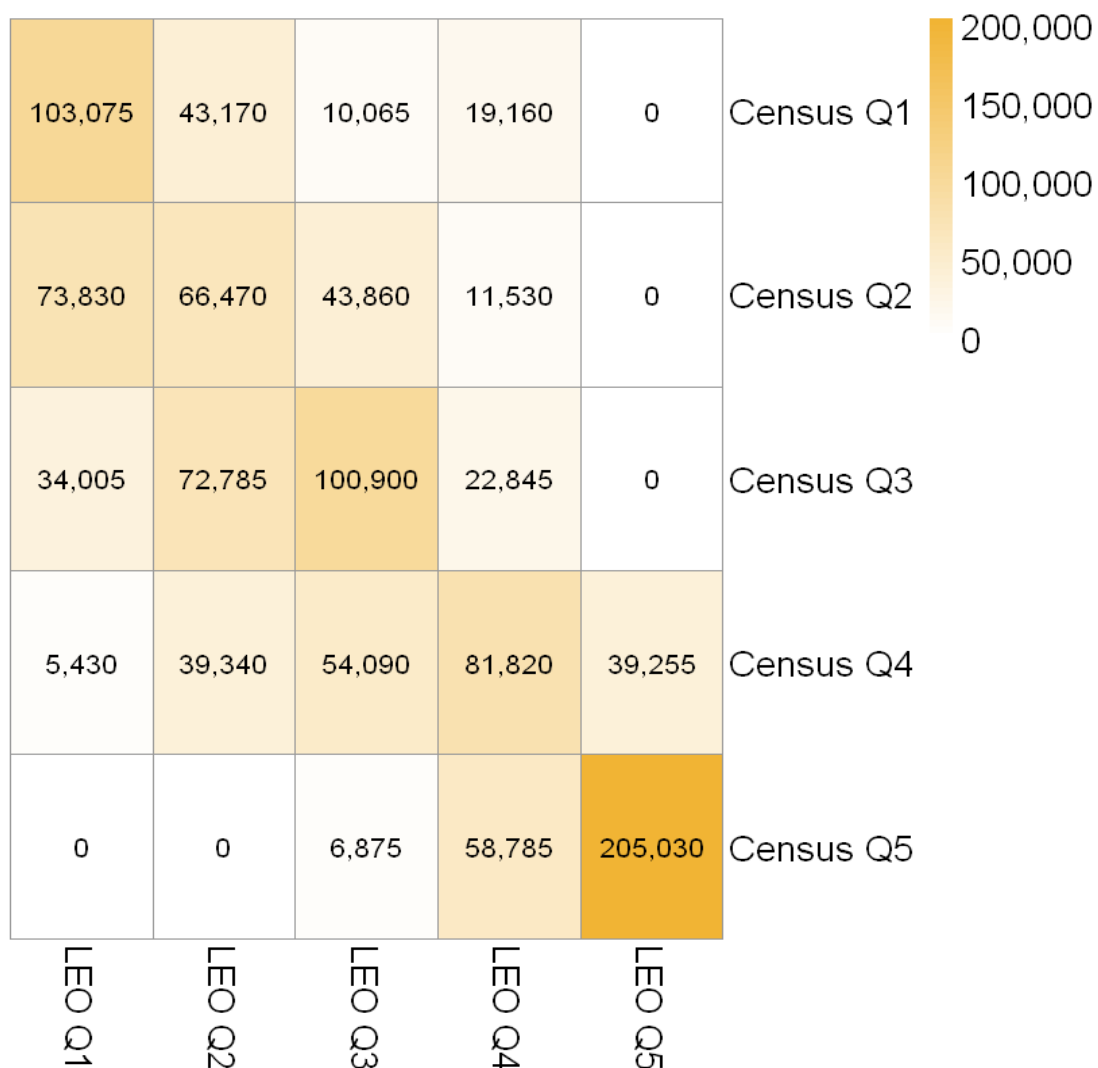
Note: LEO quintiles have not been produced for Northern Ireland due to a lack of consistent data.
Source: OfS analysis of LEO data (left); OfS analysis of published Census 2011 data (right).

52. Figure 4 shows that the patterns are broadly similar, with most high quintile areas centred around London, and coastal areas generally having lower quintiles.

53. However, there are also differences between the maps. Several areas in Scotland have higher quintiles when using the LEO graduate data than they do when using the Census data. This could be due to differences between the graduate population and the rest of the population living in those areas, due to the different time period being measured, or due to differences in the measure used to define the quintiles. Some areas in Scotland have an increased rate of higher-level study compared to the rest of the country, which could explain why they are assigned a lower quintile when using the highly skilled employment measure which does not include study.

54. In future publications when we use data from the Graduate Outcomes survey to produce the highly skilled quintiles, it will be interesting to see whether using a graduate population to define both groupings means there are fewer differences.
55. Figure 5 summarises this information by showing the number of graduates in TTWAs with the different combinations of quintiles when using the LEO or Census data. An alternative heatmap containing the underlying number of TTWAs for each quintile combination is available in Annex C.
56. Figure 5 shows that 205,030 of the 1,092,320 graduates used in the LEO analysis (19 per cent) lived in TTWAs assigned quintile 5 in both methods. Moreover, for 557,295 graduates (51 per cent) there was agreement between the quintile assignments using either data source.

Figure 5: Heatmap of quintile (Q) assignments by graduate population



Alternative LEO methods

57. In coming up with this method, we considered a few alternative ways of accounting for regional earnings differences using the LEO data. In this section we briefly discuss these alternatives and why we did not use them. As we do not currently hold granular Census data these methods have not been considered for the highly skilled measure.

Use different earning thresholds for each area

58. Instead of grouping areas according to the proportion of graduates earning over a threshold, we could have dealt with variations in earnings across the UK by setting a different threshold for each area. Rather than comparing all graduates to the national average for 25 to 29-year-olds, this would have compared graduates to an average calculated only using people living in the same area as them.

59. The effect would be that areas with lower average earnings would have a lower threshold, meaning more graduates would earn above it. Conversely, for areas with higher average earnings the threshold would increase, and fewer graduates would earn above it.

60. In most cases using this approach would give similar results to the current proposed approach – it is just a different way of formulating the contextual information.

61. We decided against this method for a few reasons, including the following.

- a. There is added complexity in explaining and understanding the measure – having different thresholds for every area makes it harder to understand what counts as a positive outcome.
- b. Data on non-graduate earnings using LEO data is currently only available for England and is not likely to be regularly updated.¹⁹ This means we would use graduate data to set the average earnings for each area, which in turn means that in each area half of graduates would earn above the threshold and half below. For areas where a single provider produces a significant proportion of the graduates in the area, the performance of that provider will have a large impact on the setting of the threshold, and therefore on whether the graduates from other providers are counted positively.
- c. Higher-level study cannot be accounted for by merely altering the earnings threshold. This means areas would be treated the same even though they have very different proportions of graduates in higher-level study, perhaps because one area has many higher education providers.

62. We have published the average LEO earnings for each area in the accompanying data tables.

¹⁹ DfE has published earnings data for students with different education levels by region, available at: <https://www.gov.uk/government/statistics/graduate-outcomes-leo-regional-outcomes-2016-to-2017>. There are other data sources for earnings, but the sample size is often not large enough to generate reliable estimates at TTWA geographies.

Create separate groupings by mode, subject or level of study

63. Instead of combining all graduates together to create a single grouping, we could use LEO data to create a separate grouping for different modes of study, subjects or levels.
64. For instance, a grouping for creative arts graduates would be based only on the creative arts graduates living in each area. This may be able to better capture differences in labour markets which are specific to the careers followed by those graduates.
65. We decided against this method for a few reasons, including:
- a. The current approach aims to create broad groupings which are straightforward to understand and use. Creating different groupings for different types of provision would greatly increase the complexity and make it harder to understand and use.
 - b. Given the number of interacting factors in graduate outcomes, even if the grouping accounted for one aspect there would still be the need to consider other factors alongside the groupings. It is more transparent to deal with the other factors separately rather than trying to combine them all into a measure designed to take account of geographical variation.
 - c. Only using a subset of the graduates in each area would make the outcomes more volatile, and more likely to be dominated by one or two larger providers. There would be cases where almost all the graduates in an area for the subject came from a single provider.

Creating LEO groupings without study data

66. Instead of creating LEO groupings based on both above-threshold earnings and higher-level study, we could have only used the above-threshold earnings rate for an area.
67. This would have made the groups easier to explain and understand and made them more comparable to the highly skilled quintiles. It may also have made it more appropriate for use in research relating only to earnings rather than graduate opportunities more broadly.
68. We decided against this method. The initial aim of the LEO analysis is to provide context for a measure which includes both above-earnings employment and higher-level study as positive graduate outcomes. A grouping based only on earnings may therefore be less helpful in understanding places where a significant proportion of graduates were in further study.
69. We have provided the proportion of graduates earning above the threshold, and the quintiles based only on that measure, in the supplementary tables.

Next steps

70. We plan to update this publication in summer 2021. We anticipate that there will be two main differences:

- a. Updating the data sources. As well as using more recent LEO data, it is hoped by that point the updated Graduate Outcomes survey data will enable us to produce quintiles based on that data for graduates rather than relying on the Census 2011 data.
- b. Using alternative TTWAs based only on those with a higher education qualification.²⁰ Graduates have different commuting patterns to non-graduates: they tend to travel further for work, which leads to larger TTWAs. It is likely that these will be more suitable when considering graduate employment, as they reflect discrete areas where graduates could be working. However, the LEO data currently available to the OfS means this categorisation is not possible until later in 2021.

71. In addition, the publication may include changes in response to feedback received following this first experimental statistics release.

Feedback

This report is an experimental official statistic which falls under the official statistics' Code of Practice. We are actively seeking feedback for this analysis. Please email comments to Adam Finlayson at official.statistics@officeforstudents.org.uk.

In particular, we welcome feedback on the following aspects:

- Whether the TTWAs are suitable for this purpose
- Whether there are groups of students or types of provision which could be misunderstood using these quintiles
- Whether there may be unintended consequences from using these quintiles in combination with other student characteristics.

²⁰ See the higher education TTWAs at:

<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/travelto-work-area-analysis-great-britain-2016#alternative-travel-to-work-areas>.

Annex A: Simulations to check stability of the LEO quintiles

72. This annex discusses simulations carried out to check the stability of the LEO quintiles and determine whether combining smaller areas is necessary.
73. An ideal classification would be stable if there is no change in the underlying graduate outcome rate. This analysis uses simulations to understand the probability of an area moving into a different quintile if different years of data were used but the underlying rate had not changed.

Method

74. First, for each travel to work area (TTWA) the simulation generates a new proportion earning over the threshold or in higher-level study from each area. This can be estimated from a binomial distribution: conceptually each graduate in the base population flips a (biased) coin which decides if they will earn over the threshold or not. The binomial distribution needs two parameters, N and p . These are estimated for each TTWA using the TTWA graduate population (for N) and the TTWA proportion earning above the threshold or in higher-level study (for p). Every pass of the simulation therefore generates a new above-threshold earnings rate for every TTWA.
75. Second, these simulated proportions are used to assign a new quintile based on the new proportions for all the TTWAs.
76. Each new set of quintiles generated by one pass of the simulation is compared to the quintile originally assigned, to calculate the difference to the reference quintile for each TTWA. This is repeated for 2,000 simulated classifications to give stable summary statistics.

Results

77. Figure A1 shows the distribution of simulated quintiles for areas in each original quintile. Each row represents the distribution of the simulated quintiles for areas in each original quintile. For instance, for the areas originally in quintile 1, 88 per cent of the time those areas were still in quintile 1, and 10 per cent of the time they were in quintile 2.

Figure A1: Distribution of simulated quintiles for areas in each original quintile (Q)

88%	10%	2%	0%	0%	Original Q1 (82 areas)
16%	69%	15%	0%	0%	Original Q2 (35 areas)
2%	12%	78%	8%	9%	Original Q3 (53 areas)
0%	0%	11%	85%	4%	Original Q4 (44 areas)
0%	0%	0%	12%	88%	Original Q5 (4 areas)
Simulated Q1	Simulated Q2	Simulated Q3	Simulated Q4	Simulated Q5	

78. Figure A1 shows that most of the time the simulated quintile stayed the same. The original quintile where the areas were most likely to change to a different quintile in the simulations was quintile 2, but even so 69 per cent of the time those areas stayed as quintile 2. It was rare for areas to change quintile by more than one.

79. In comparison, Figure A2 shows the distribution if all areas with fewer than 500 graduates in paid employment or study were combined with the area or areas geographically closest to them until the combined area had at least 500 graduates.

Figure A2: Distribution of simulated quintiles (Q) if small areas were combined until they had at least 500 graduates

88%	11%	0%	0%	0%	Original Q1 (64 areas)
15%	75%	10%	0%	0%	Original Q2 (30 areas)
0%	13%	83%	4%	0%	Original Q3 (49 areas)
0%	0%	11%	88%	1%	Original Q4 (36 areas)
0%	0%	0%	12%	88%	Original Q5 (4 areas)
Simulated Q1	Simulated Q2	Simulated Q3	Simulated Q4	Simulated Q5	

80. Figure A2 shows that combining the smaller areas does improve the stability, but not by much. Given the reasonable stability of the original areas and the reduced precision which would result from crudely combining areas together, it is better to use the original areas.

Annex B: Further tables on ethnic group differences

Table B1: Distribution of each ethnic group across LEO quintiles

Ethnic group	Number of graduates	LEO local graduate opportunity group				
		(lowest) 1	2	3	4	(highest) 5
Asian	90,940	12.2%	17.4%	16.9%	11.2%	42.3%
Black	60,115	5.8%	11.0%	13.3%	9.7%	60.1%
Mixed	30,730	11.6%	15.6%	17.5%	14.8%	40.4%
Other	9,135	8.4%	10.3%	11.4%	9.5%	60.5%
White	863,790	22.0%	21.6%	20.7%	19.3%	16.4%
Unknown	37,580	18.6%	18.7%	19.3%	16.9%	26.6%
Total	1,092,290	19.8%	20.3%	19.8%	17.8%	22.4%

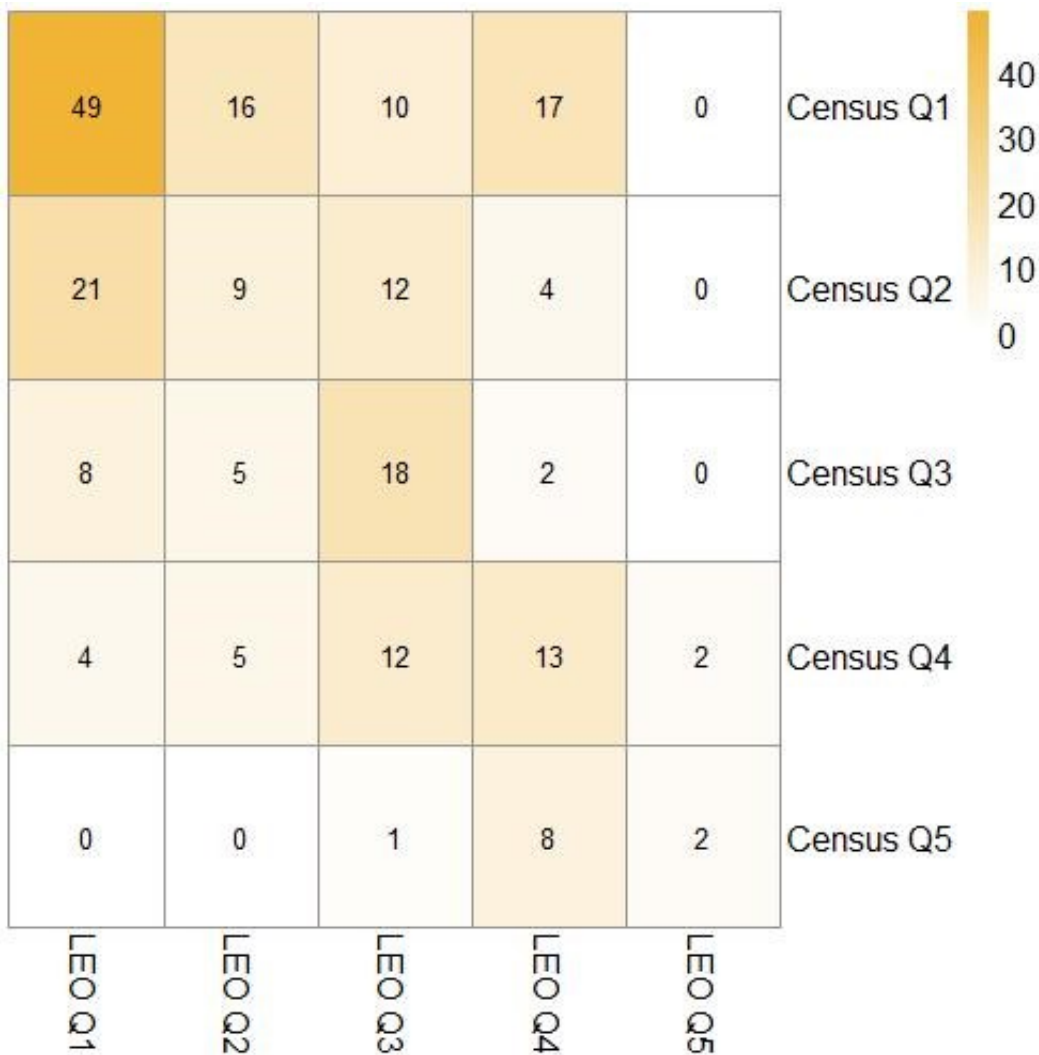
Table B2: Proportion of graduates earning over the threshold, by ethnic group and LEO quintile

Ethnic group	Number of graduates	% earning above threshold or in higher-level study in quintile...					
		Overall	(lowest) 1	2	3	4	(highest) 5
Asian	90,940	60.0%	47.7%	52.0%	55.1%	61.7%	68.2%
Black	60,115	57.5%	52.1%	50.4%	53.5%	59.6%	59.9%
Mixed	30,730	59.1%	49.8%	49.4%	53.7%	64.8%	65.8%
Other	9,135	61.8%	56.5%	54.4%	59.6%	65.8%	63.5%
White	863,790	60.0%	51.9%	55.1%	58.7%	64.9%	73.5%
Unknown	37,580	57.8%	53.2%	55.5%	55.6%	61.1%	62.1%
Total	1,092,290	59.8%	51.7%	54.6%	58.0%	64.4%	69.6%

Annex C: Alternative heatmap of travel to work areas (TTWAs)

81. Figure C1 shows the number of TTWAs with the different combinations of quintile assignments when using the LEO or Census data. For instance, 49 of the 218 areas²¹ are assigned quintile 1 whether considering above-threshold earnings or highly skilled employment.

Figure C1: Heatmap of quintile assignments by TTWAs



82. Figure C1 shows that 91 of the 218 TTWAs had the same quintile using either data source. However, this is skewed by several small areas being assigned different quintiles and misses the fact that most of the large areas had the same quintile in both approaches.

²¹ Areas in Northern Ireland are not included in the comparison.



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