Research Report

Project Title: Mathematical Sciences recruitment and graduate outcomes – A diversity perspective of the landscape of Mathematical Sciences in UK universities

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Foreword

Data from UCAS shows that recruitment to mathematical sciences degrees in the UK has been declining slightly over the last 5 years, from 9.2k in 2017 to 8.4k in 2021. However, it turns out that this masks some quite dramatic changes in recruitment for individual institutions, with larger departments seeing increases, sometimes as large as 100%, while many smaller departments have seen corresponding decreases. This may seem benign and could readily be attributed to market forces at work. However, when combined with the observation that the section of the recruitment market that is declining consists of degrees that ask for a grade B or less at A-level (or equivalent), there are questions surrounding whether there is an effect on the diversity of mathematics students being accepted to study for mathematical sciences degrees, and consequently on the mathematical sciences graduate population.

There is also an important question of whether the outcomes for mathematical sciences graduates are pre-determined by their grades in A-levels, Highers/Advanced Highers or equivalent qualifications. Does the institution from which a student graduates (for which pre-university attainment grade is a proxy) affect their outcome after graduation and, in particular, the contribution they make as a mathematical sciences graduate to the wider UK economy? Is a landscape of mathematical sciences degree courses with diverse entry requirements beneficial to ensuring the future supply of mathematical sciences graduates to the UK economy, including those who go on to become mathematics teachers?

The Council for the Mathematical Sciences (CMS) and the Heads of Departments of Mathematical Sciences (HoDoMS) asked Ortus Economic Research to undertake research to examine the landscape regarding recruitment to mathematical sciences first degree subjects across the UK and outcomes achieved by graduates from these degrees. The research sought to examine pre-university entry attainment patterns (i.e. A-levels in England, Wales and Northern Ireland and Highers and Advanced Highers in Scotland) and to examine diversity from the perspectives of sex and socio-economic background in relation to graduate outcomes. The aim of the study has been to help inform a better understanding of how such diversity relates to mathematical sciences graduates' careers.

The report which follows presents the findings from this work.

On behalf of the CMS and HoDoMS we would like to thank Ortus Economic Research for producing this report, and in particular for undertaking all of the data analysis.

In addition, we would also like to thank those members of the HoDoMS and CMS communities who reviewed drafts of the report, and contributed many insightful suggestions while it was under development.

Professor Mary McAlinden (HoDoMS)

Professor Catherine Hobbs (CMS)

Executive summary

The findings summarised below all draw on data analysis using descriptive statistics.

1. Overall, the number of acceptances to mathematical sciences degrees fell slightly over the period 2017-2021, but trends differ between institutions according to their entry requirements. Those with the highest entry requirements accepted increasing numbers of entrants. Those with lower entry requirements accepted fewer entrants, with the largest relative declines among institutions with the lowest entry requirements.
2. There was little evidence that an institution's entry requirement is associated with differing employment and/or further study rates post-graduation. Around 89% of graduates were in employment and/or further study post-graduation, irrespective of the entry requirement category of the institution from which they graduated.
3. A slightly higher proportion of women graduates were in further study and/or employment than men (92% versus 88%), and this was consistent across different levels of entry requirement. Conversely, a smaller proportion of women graduates were unemployed than men (3% versus 7%); this was also consistent by entry requirement.
4. The proportions of graduates in study, further study and/or employment were very similar for graduates from the most deprived backgrounds (IMD first quintile) and those from the least deprived (IMD fifth quintile) (88% versus 90%). This is reasonably consistent across different levels of entry requirement. IMD refers to the UK Indices of Multiple Deprivation.
5. Mathematical sciences graduates work across the economy and a high proportion were employed in managerial/professional/ associate professional occupations (85% of employed mathematical sciences graduates worked in these occupations 15 months after graduation) in sectors including: financial and insurance services; professional, scientific and technical services; education; information and communication. For comparison, 76% of all graduates and 82% of graduates from science subjects who are in employment are in these occupations.
6. There was a difference between the proportions of employed mathematical sciences graduates from the highest and lowest entry requirement institutions working in managerial/professional/ associate professional occupations (91% versus 75% after 15 months).
7. Sectors in which mathematical sciences graduates were working varied by institutions' entry requirements. For example, the proportion of employed mathematical sciences graduates from lowest entry requirement institutions working in financial and insurance services after 15 months was lower than the proportion of employed graduates from highest entry requirement institutions in this sector (13% versus 28%).
8. In contrast, the proportion of employed mathematical sciences graduates from the lowest entry requirement institutions working in education professions (including teaching) 15 months after graduation was notably higher than the proportion of employed graduates from the highest entry requirement institutions (25% versus 8%).
9. The proportion of mathematical sciences graduates employed in managerial/professional/ associate professional occupations working in education was higher for graduates from the most deprived backgrounds (IMD first quintile) than for the least deprived backgrounds (IMD fifth quintile) (27% versus 13%).
10. Conversely the proportion of mathematical sciences graduates employed in managerial/professional/associate professional occupation working in financial and insurance services was lower for graduates from the most deprived backgrounds (IMD first quintile) than for the least most backgrounds (IMD fifth quintile) (17% versus 25%).

Introduction

There is ongoing discussion within the mathematical sciences community about trends in recruitment to higher education, diversity and the importance of degree-level and higher mathematical sciences skills to society and the economy. Analysis of UCAS data suggests a notable difference in trends in recruitment to institutions with different levels of entry requirement (based on UCAS tariffs) – in particular, a fall in the number of accepted applicants to mathematical sciences degrees in lower tariff and medium tariff institutions, compared with a rise in higher tariff institutions [Hobbs, 2022]. There is concern that these trends might impact on the supply of degree level and higher level mathematical sciences skills to particular sectors of the UK economy, and in particular to the supply of mathematical sciences graduates going into teaching.

The 2017 Smith Review of post-16 mathematics [Smith, 2017] highlighted both the importance of basic numeracy skills to the UK economy and the earnings premium associated with higher levels of achievement in mathematics. It pointed to growing demand for mathematical skills as the increasing sophistication of technology drives changes in the economy and the nature of work. The Smith Review also notes that higher levels of achievement in mathematics are associated with higher productivity, a key determinant of economic growth.

The 2013 Deloitte report "*Measuring the Benefits of Mathematical Science Research in the UK*" [Deloitte, 2013] noted that mathematical sciences research has direct economic benefits as new tools and techniques are developed and applied and broader, more indirect effects, as they become commonplace. The impacts of innovation in mathematical sciences are often long lasting. The Deloitte report emphasised how mathematical sciences research leads to new understanding, new tools and techniques, and refinements to existing tools and techniques. In turn, these lead to outcomes such as an increase in the skills-base of the UK, new patents and commercial applications, product and process innovation, improved decision making and more efficient management practices. These can have positive impacts on enabling infrastructure, driving productivity, employment and overall economic growth, manifesting in improved sustainability and wellbeing as well as in traditional monetary terms.

As Lord Stern noted in his preface to the 2018 Bond Review, "*The Era of Mathematics: An Independent Review of Knowledge Exchange in the Mathematical Sciences*" [Bond, 2018] the mathematical sciences permeate economic and social activity, and their influence and impact are profound. The Bond Review also highlighted the demand for mathematical sciences skills reflected in employer reports of skills shortages and skills gaps, and noted the role of higher education institutions in the development of a larger workforce of mathematicians both within and outside academia to support innovation and economic growth in the UK.

The research presented here sets out to explore the main types of employment that mathematical sciences graduates go into after graduation and whether this is associated with the type of institution attended (for which entry tariff is a proxy) and by student diversity characteristics such as sex and socio-economic status. The focus will be on graduates from first degrees (e.g. BSc and MMath qualifications), rather than those who continue with their studies to undertake a further higher degree (e.g. MSc, PhD). The aim is to investigate whether the graduate workforce capacity is enhanced substantially by mathematical sciences graduates from all types of institution, and whether diversity characteristics impact on the nature of employment outcome of such graduates.

Methodology

The research set out to respond to a key question:

- How do career outcomes vary among mathematical sciences graduates from HE institutions with different entry requirements, and how does this relate to diversity?

This report presents descriptive statistics (i.e. describing the visible characteristics of the datasets), rather than inferential statistics, to answer this question. Where numbers of survey respondents are shown, they are rounded to the nearest 5 in line with Higher Education Statistics Agency (HESA) rules. All calculations are based on unrounded data.

Data were commissioned from the Universities and Colleges Admissions Service (UCAS) showing the number of applications accepted by each UK institution to mathematical sciences degrees by the number of points achieved in A-level Mathematics and Further Mathematics (which are offered to students in England, Wales and Northern Ireland), and by the number of points achieved in Highers and Advanced Highers (offered in Scotland).

UCAS does not record achievement in Highers and Advanced Highers at subject level, so while the analysis uses achievement in mathematics subjects for A-level students, it uses a general measure of achievement which includes mathematics for Higher students, but which does not explicitly reflect mathematics achievement. The analysis does not include other qualifications such as, for example, the International Baccalaureate.

A-level Mathematics and Further Mathematics point scores were summed to provide an overall measure of A-level achievement. Equal weight was given to achievement from both qualifications. Higher and Advanced Higher point scores were summed in a similar manner. In the analysis presented here, A-level attainment is measured on a scale of 0–6[1], while Higher/Advanced Higher attainment is measured on a scale of 0–20[2]. Therefore, the highest possible summed point score for A-level Mathematics and Further Mathematics is 12, while the highest possible summed point score for Highers and Advanced Highers is 40. In both cases, the lowest possible score is 0. Applying a weighting of 0.3 to the summed point scores for Highers/Advanced Highers normalises the range of these scores to the range used for A-levels.

This combined score in A-levels/Highers was then used to calculate an average entry requirement for each institution, weighted by the number of accepted applicants achieving the combined score in A-levels/Highers, to produce an overall actual average entry tariff for each institution. It should be noted that the analysis is based on the actual tariff achieved by accepted applicants, which may differ considerably from the published entrance tariffs.

Institutions were ranked according to this measure of entry requirements to mathematical sciences degrees, and grouped into quintiles for the purposes of this research. It should be noted that these quintiles group institutions by their average entry requirement, and not by the number of acceptances, which differs in each quintile (see the section on *Student numbers*). Individual institutions are not identified in the analysis presented here. Such rankings by entry requirement were calculated for each year of the UCAS data used in this work (the 2017 to 2021 cycles) and for the period overall. This average 2017–2021 ranking of institutions into quintiles is used in the analysis presented in this report; differences in any individual institution's ranking each year are generally negligible, and this approach is inclusive of institutions whose offer of mathematical

[1] For A-levels, the following points per grade are used: A* = 6, A = 5, B = 4, C = 3, D = 2, E = 1. A zero represents a qualification that was not achieved.

[2] For Highers and Advanced Highers, the following points per grade are used: A = 4, B = 3, C = 2, D = 1. The five highest grades are counted. A score of 20 points therefore represents five A grades in different subjects. As with A-levels, a zero represents a qualification that was not achieved.

sciences degrees has changed over the period. The convention used throughout is that the first quintile includes the 20% of institutions with the lowest tariffs and the fifth quintile includes the 20% with the highest tariffs.

Institutions in the first quintile, with the lowest average entry requirements, tend to recruit students with a Mathematics A-level at grade B or below (most commonly, at grade C or B) and without a Further Mathematics A-level. Institutions in the third quintile, with the 'most average' entry requirements, tend to recruit students with a Mathematics A-level at grade B or above and without a Further Mathematics A-level or with a Further Mathematics A-level at grades B or below. In contrast, institutions in the fifth quintile, with the highest average entry requirements, tend to recruit students with both Mathematics and Further Mathematics A-levels, most commonly at A and A* grades.

Since UCAS does not record subject level achievement in Highers and Advanced Highers, the approach means that institutions which primarily recruit students with these qualifications will be ranked mainly on the overall achievement of their entrants across all subjects, while institutions which primarily recruit students with A-levels will be ranked mainly on their achievement in Mathematics and Further Mathematics.

A ranking based on UCAS data on accepted applicants also means that institutions which do not recruit students through UCAS (The Open University, for example) are excluded. Throughout this report such institutions will be referred to as non-UCAS institutions and results for these institutions will be reported collectively as a single distinct category, for overall completeness.

The grouping of institutions by quintile, based on a weighted average of their entry requirements to mathematical sciences degrees, was then applied to data commissioned from HESA on graduate diversity and graduate outcomes in order to explore differences between institutions. These data combine HESA's administrative data on the graduate population, and follow-up post-graduation surveys on their economic activities (for example, further learning including postgraduate study, employment). The analysis focuses on graduates from first degrees in mathematical sciences, rather than the entrants to these degrees, to better reflect the contribution of mathematical sciences to the UK economy. Differences in achievement within mathematical sciences degrees are outside the scope of this report.

The 2017–2021 average ranking of institutions by entry tariff, as described earlier, is used in the analysis of graduate data covering the period 2015/16–2019/20, rather than matching UCAS cycle by year to graduate outcomes by year (which would require the use of more historical data on accepted applicants). The analysis is restricted to graduates who are domiciled in the UK, to reflect the availability of data on prior attainment.

The analysis explores the diversity of graduate outcomes by sex (non-binary graduates are not included in the analysis, for privacy reasons)[3], the young participation rate in higher education in their home area (measured using POLAR4 quintiles[4]), and the level of relative deprivation in their home area (measured using the English Indices of Multiple Deprivation (IMD) quintiles and equivalent measures in other UK nations). While it was also an original objective of the research to explore differences by ethnicity, the required data were not available to the researchers due to data protection restrictions.

The analysis draws on two different HESA surveys of graduate activity. The Destination of Leavers from Higher Education survey (DLHE) covers those graduating in 2015/16–2016/17. Its replacement, the Graduate Outcomes Survey (GOS), covers those graduating in 2017/18–2019/20. One key distinction between the two is that the DLHE survey asked graduates about their activity

[3] The HESA data field records the sex of the student, as opposed to the gender with which they identify.
[4] See HESA (2022) Definitions: Students. Available at: https://www.hesa.ac.uk/support/definitions/students

6 months after graduation, while the GOS survey asks about activity 15 months after graduation. It is noted that the longer timescales following graduation for the GOS survey means fewer graduates respond. The analysis of graduate destinations distinguishes between the two surveys to reflect both short-term outcomes, and more settled outcomes from mathematical sciences degrees.

The research presented here does not attempt to quantify the monetary value of mathematical sciences to the UK economy. Previous research has done so. For example, in 2013 the Deloitte Review [Deloitte, 2013] estimated that mathematical sciences research – carried out by academic institutions, research centres, businesses, government and individuals, and adding to the store of accumulated mathematical knowledge – employed around 2.8 million people in the UK in 2010 (10% of all employment) and contributed £208 billion in Gross Value Added (GVA) (16% of total GVA). Instead, a qualitative approach is adopted here which aims to describe the role of mathematical sciences graduates in relation to the workforce.

Student numbers on mathematical sciences degrees by entry tariff

Published UCAS data [UCAS, 2022] shows that recruitment to mathematical sciences degrees in the UK has been decreasing slightly over the 5 years from 2017-2021 (Table 1).

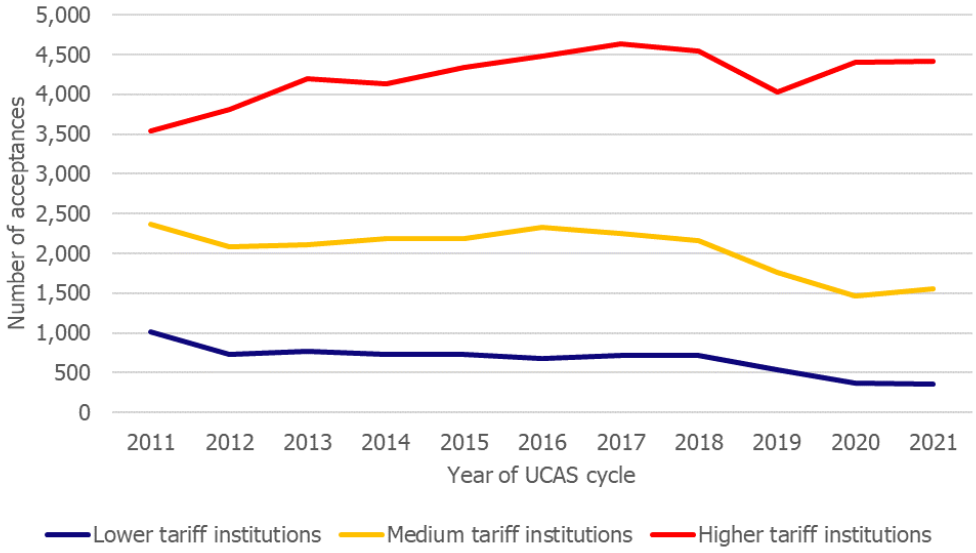
Table 1: Accepted applicants (all domiciles) to mathematical sciences degrees (JACS3 subject group G), 2011 to 2021

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	8,360	8,100	8,475	8,470	8,730	9,070	9,205	9,200	8,285	8,600	8,375

Source: UCAS 2021 entry provider-level end of cycle data resources [UCAS, 2022]

However, looking at this data by institutions' entry requirements (measured by actual UCAS tariff on entry, a proxy for pre-entry achievement) shows a difference in recruitment trends between institutions with higher tariffs, where acceptances of applications from UK domiciled students have risen over the previous decade, and those with medium and lower tariffs where acceptances have fallen (Figure 1). Note that the high/medium/low categories are used by UCAS but thresholds are not explicitly defined in their data. In this report the data have been re-analysed using the quintile approach described in the Methodology section earlier. Nevertheless, Figure 1 is thought-provoking, and presents a trend for mathematical sciences that is not present in other cognate disciplines such as Computer Science [Hobbs, 2022].

Figure 1: Accepted applicants to mathematical sciences degrees by institutions' entry requirements, UK domiciled students, 2011 to 2021



Source: UCAS 2021 entry provider-level end of cycle data resources [UCAS, 2022]

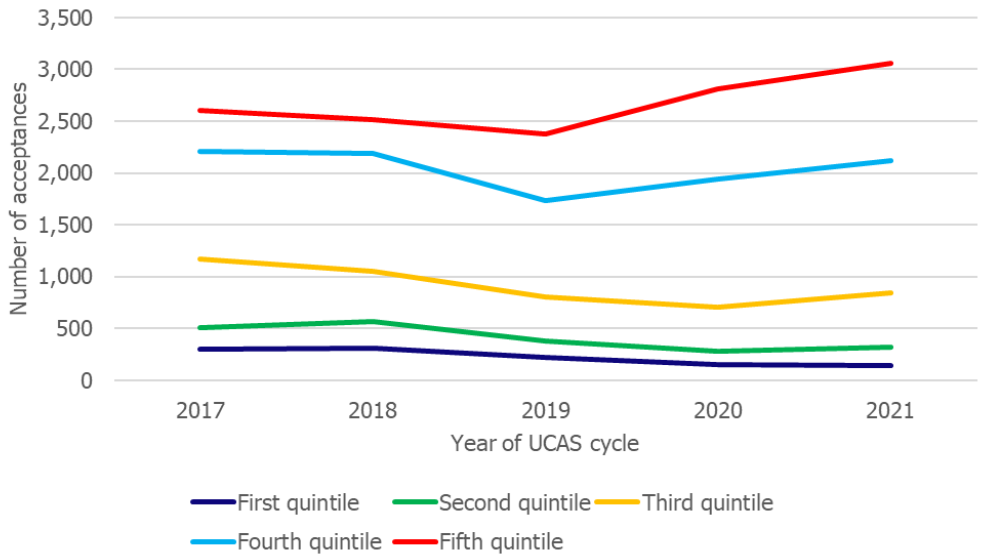
The recruitment trends are exaggerated if students domiciled outside the UK are included, primarily because institutions with higher entry requirements tend to attract more overseas students (97% of students accepted to mathematical sciences degrees in lower tariff institutions in 2021 were UK domiciled, compared with 90% of students accepted to medium tariff institutions and 70% of students accepted to higher tariff institutions [UCAS, 2022]). Overall, the total number of acceptances from UK domiciled students showed relatively steady growth between 2012 and 2017, but fell 10% between 2018 and 2021 [UCAS, 2022]. It should be noted that the years 2020 and 2021 were substantially affected by the global pandemic, during which qualification grades (for

A-levels and Highers) were awarded in a different way and average grades were, in general, higher than in previous years [Glaister, 2024].

The analysis undertaken in this report reflects Figure 1, with an increase in accepted applicants among institutions with the highest entry requirements to mathematical sciences degrees (the fifth quintile) over the period examined (Figure 2), and increasingly large relative declines in the number of accepted applications by institution as the entry requirements reduce (Figure 3 and 4).

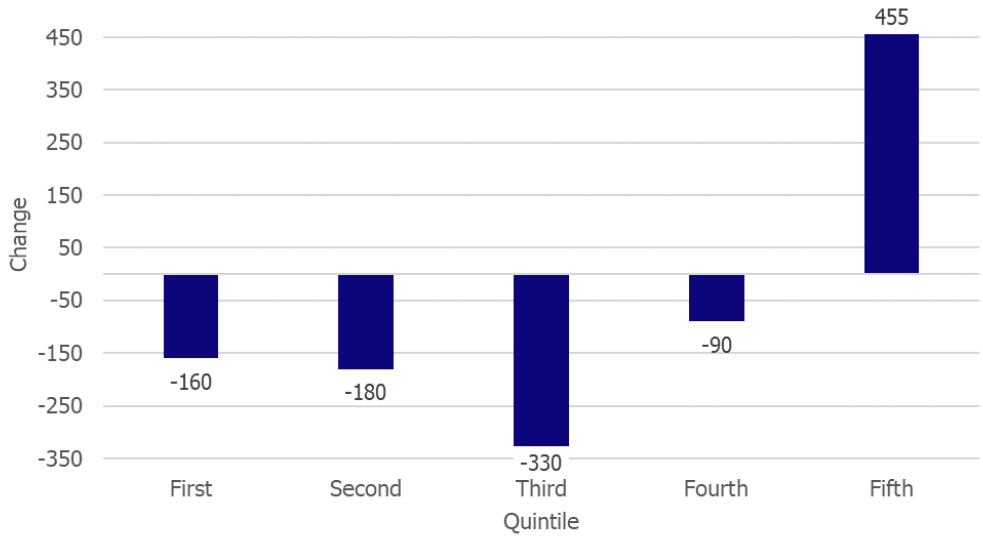
It is important to note that the total number of accepted applicants differs in each quintile, which group institutions by their average entry requirement and not by student numbers. Institutions with higher entry requirements accept more applicants than those with lower entry requirements. This is consistent across the period examined.

Figure 2: Accepted applicants to mathematical sciences degrees by institutional entry requirement quintile (fifth quintile = highest), UK domiciled students, 2017 to 2021



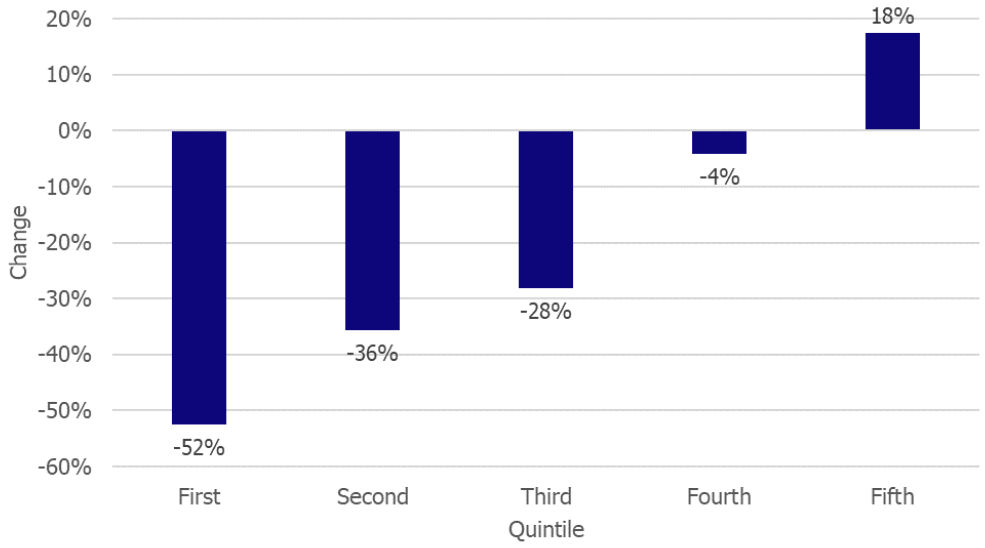
Source: Ortus analysis of UCAS data

Figure 3: Change in the number of accepted applicants to mathematical sciences degrees by institutions' entry requirements (quintiles, fifth = highest), UK domiciled students, 2017 to 2021



Source: Ortus analysis of UCAS data

Figure 4: Percentage change in the number of accepted applicants to mathematical sciences degrees by institutions' entry requirements (quintiles, fifth = highest), UK domiciled students, 2017 to 2021



Source: Ortus analysis of UCAS data

In terms of diversity characteristics of students accepted to mathematical sciences degrees, HESA data shows that men accounted for 63% of enrolments to first degree courses in mathematical sciences in 2020/21, and women accounted for 37% [HESA, 2023].

Graduate outcomes

This section examines graduate outcomes from mathematical sciences degrees, and how they vary according to institutions' entry requirements and student diversity characteristics. In this report graduate outcomes from first degrees only are considered. The DLHE survey is considered first, which captures the outcomes of graduates six months after graduation from first degrees in the academic years 2015/16 to 2016/17. This is followed by outcomes from its replacement survey the GOS, which captures the outcomes of graduates 15 months from their first degree for the academic years 2017/18 to 2019/20.

Outcomes six months after graduation from the DLHE: 2015/16 to 2016/17

There appear to be only small differences in mathematical sciences graduate outcomes after six months, based on their institutions' entry requirements (Table 2).

A slightly higher proportion of mathematical sciences graduates from the 20% of institutions with the lowest entry requirements (first quintile) were unemployed six months after graduation (8%) than graduates from institutions with higher entry requirements (6%). There was minimal difference in the proportions that were in the employment category for institutions with the lowest entry requirements (first quintile) compared with institutions with the highest entry requirements (58% versus 59%). The nature of mathematical sciences graduate employment is explored later in this report.

Table 2: Graduate outcomes from the DLHE survey by HEI entry requirements to mathematical sciences degrees, 2015/16 to 2016/17

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	25%	28%	24%	25%	24%	14%	24%
Employment and further study	5%	5%	6%	6%	5%	7%	6%
Employment	58%	58%	59%	57%	59%	65%	59%
Unemployed	8%	6%	6%	6%	6%	4%	6%
Other	4%	4%	4%	5%	6%	10%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*905*	*985*	*1,510*	*2,825*	*3,620*	*1,000*	*10,840*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Outcomes after six months among mathematical sciences graduates from institutions that recruit outside the UCAS system (listed as 'Other HEIs' in Table 2) showed more notable differences than those observed among institutions using UCAS. The lowest proportion of unemployed graduates were from non-UCAS institutions (the largest of which is The Open University) (4%). The proportion of graduates from non-UCAS institutions who were in employment (65%) was

higher than the average for all HEIs[5] (59%), while the proportion who were in the further study category was lower (14% versus 24%). A higher than average proportion of graduates from non-UCAS institutions was engaged in other activities (10% versus 5%). This category includes travel, volunteering, caring responsibilities and retirement.

Outcomes 15 months after graduation from the GOS: 2017/18 to 2019/20

Differences in mathematical sciences graduate outcomes after 15 months, based on their institutions' entry requirements, were relatively small (Table 3). For example, a higher proportion of mathematical sciences graduates from the 20% of institutions with the highest entry requirements were in the categories of further study, or employment and further study, 15 months after graduation (27%), compared with graduates from the 20% of institutions with the lowest entry requirements (23%). Table 3 also shows that a similar proportion of graduates from the 20% of institutions with the highest entry requirements were in employment to those from institutions with the lowest entry requirements (64%, compared with 65%).

Table 3: Graduate outcomes from the GOS survey by HEI entry requirements to mathematical sciences degrees, 2017/18 to 2019/20

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	14%	11%	13%	13%	16%	9%	14%
Employment and further study	9%	10%	12%	12%	11%	9%	11%
Employment	65%	69%	62%	65%	64%	69%	65%
Unemployed	7%	6%	7%	5%	5%	4%	5%
Other	4%	4%	6%	5%	5%	8%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*900*	*1,165*	*2,015*	*3,725*	*4,615*	*535*	*12,955*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Again, the most notable differences appear to be between institutions that recruit using UCAS, and those that do not. Slightly lower proportions of mathematical sciences graduates from non-UCAS institutions were unemployed (4%) or in the combined categories of further study, and employment and further study (18%) than those that recruited through UCAS. Non-UCAS institutions had a higher proportion of graduates in employment (69%) than most of the other institution groupings. (The figure is the same as for institutions with the second lowest entry requirements (second quintile)). As with DLHE, a higher proportion from non-UCAS institutions were undertaking other activities such as travel, volunteering, caring responsibilities and retirement.

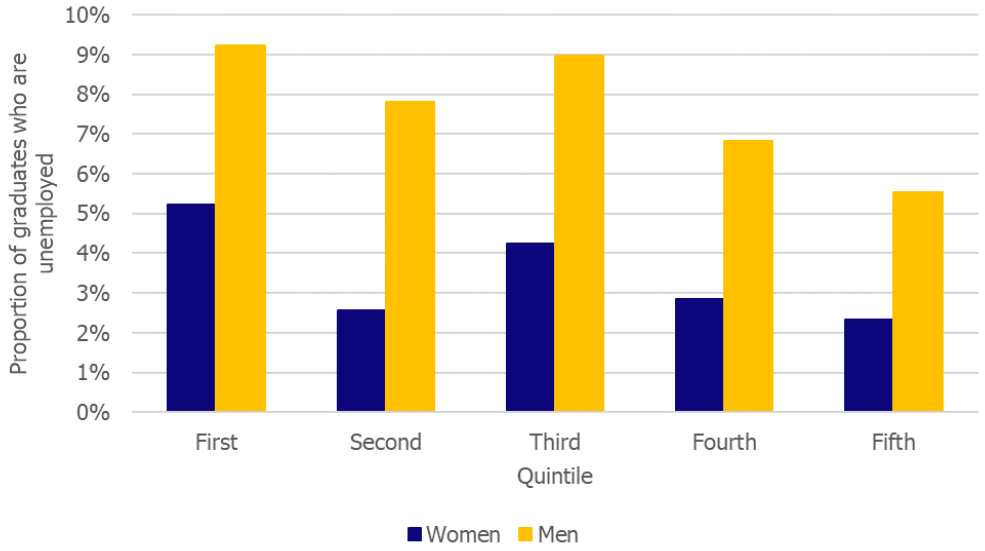
[5] 'All' here refers to all HEIs offering mathematical sciences undergraduate degrees.

Graduate outcomes 2017/18 to 2019/20 by diversity characteristic

(a) Graduate outcomes 2017/18 to 2019/20 by sex

Tables analogous to the previous one giving graduate destinations for women and men graduates are given in Appendix 1. They show differences in unemployment outcomes between women and men which persists across the quintiles. Notably, a lower proportion of women graduates were unemployed (3%) compared with men (7%) (Appendix 1 and Figure 5). A higher proportion of women were in the combined categories of employment, further study, or further study and employment, than men (92%, compared to 88%) (see Appendix 1) and this observation was consistent across different levels of entry requirements. However, it should be remembered that women account for fewer mathematical sciences graduates than men.

Figure 5: Unemployment among mathematical sciences graduates by institutions' entry requirements (quintiles, fifth = highest), 2017/18 to 2019/20



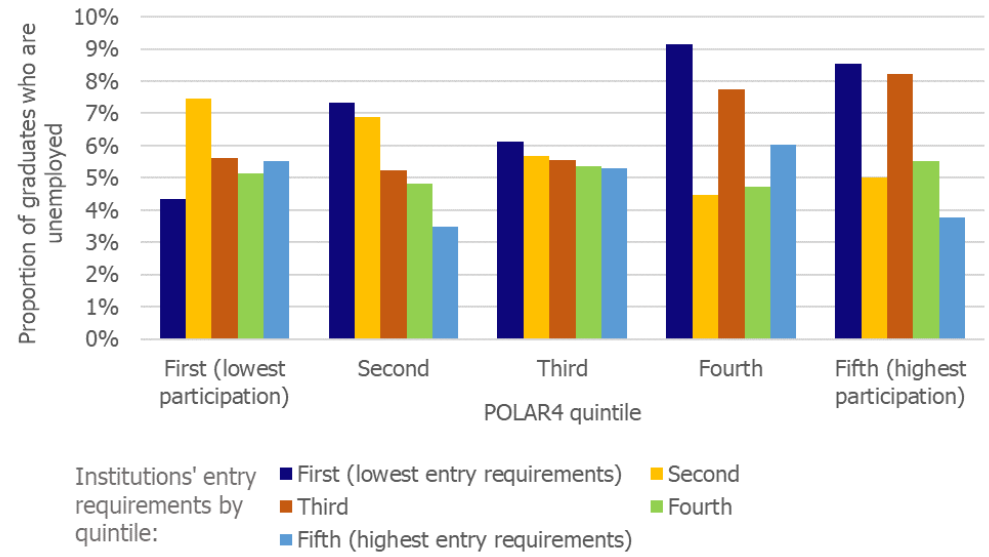
Source: Ortus analysis of UCAS and HESA data. Charts show unrounded data.

(b) Graduate outcomes 2017/18 to 2019/20 by socio-economic background

Corresponding tables giving graduate destinations broken down by socio-economic background are given in Appendices 2 (for POLAR4 quintiles) and 3 (for IMD quintiles).

Figure 6 shows the proportion of mathematical sciences graduates who were unemployed broken down by POLAR4 quintiles, where the first POLAR4 quintile represents the lowest 20% participation neighbourhood. At the outset it should be noted that across all POLAR4 quintiles unemployment amongst mathematical sciences graduates was relatively low. There were small differences in the proportions of mathematical sciences graduates who were unemployed across entry requirement quintiles, by POLAR4 quintile. However, there is no clear pattern by institutions' entry requirements.

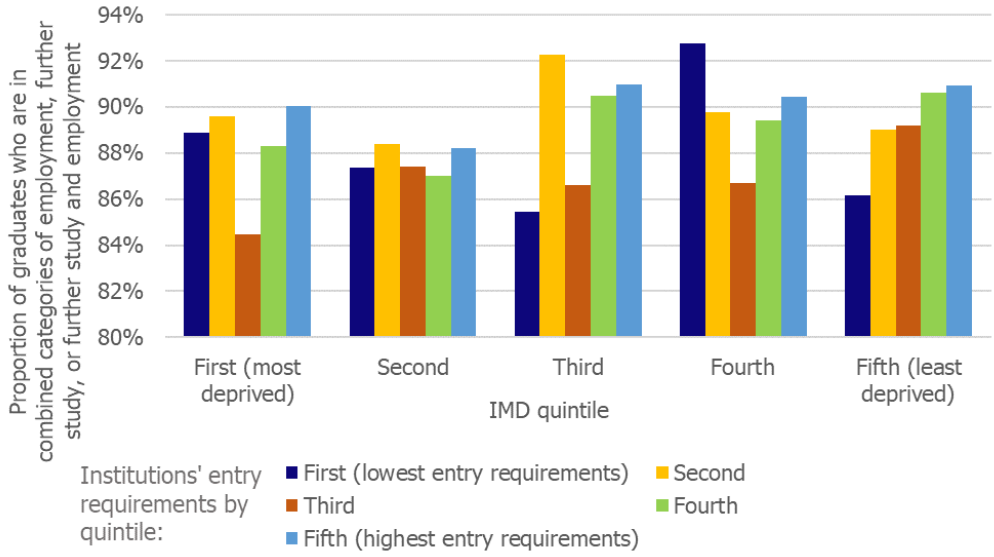
Figure 6: Unemployment among mathematical sciences graduates by institution's entry requirements (quintiles, first = lowest) and POLAR4 quintile (first = lowest participation), 2017/18 to 2019/20



Source: Ortus analysis of UCAS and HESA data. Charts show unrounded data.

Looking by IMD quintiles (see Appendix 3) presents a similar picture. The proportion of mathematical sciences graduates from the most deprived backgrounds (IMD first quintile) who were in the combined categories of employment, further study, or further study and employment was slightly lower than the proportion from the least deprived (IMD fifth quintile) (88%, compared to 90%).

Figure 7: Combined categories of employment, further study, or further study and employment among mathematical sciences graduates by institution's entry requirements (quintiles, first = lowest) and IMD quintile (first = most deprived), 2017/18 to 2019/20



Source: Ortus analysis of UCAS and HESA data. Charts show unrounded data.

Graduate employment by sector and occupation

According to UCAS [UCAS MS, 2022], the key areas of employment for mathematical sciences graduates include banking and finance, business consulting and management, engineering and construction, IT and computing, local and central government, pharmaceuticals, teaching and research. The highest paid jobs for mathematical sciences graduates include roles in actuarial science and risk management, cryptology, computer science and information research, financial analysis, data science and statistics [ibid.].

The Bond Review [Bond, 2018] notes that financial services, security, defence, health, manufacturing, transport, filmmaking and many other sectors all make use of many fields within the mathematical sciences, while "developments in genomics, data science, economics, physics, quantum computing, biology, advanced engineering, epidemiology, zoology, sociology, geography, ecology, climate science, cybersecurity, social media analytics and numerous other fields all require the use not only of existing mathematical methods, but also the development of new, more powerful mathematical tools to continually spur advances and innovation". ONS data [ONS, 2022] show how sectors employing mathematical sciences graduates underpin the UK economy. Financial and insurance services in particular support the rest of the economy, trading extensively with all other sectors. Accounting services, management consultancy services, telecommunications and computing services also each have trade relationships across the whole economy, though with less monetary value than financial and insurance services.

Substantial skills shortages limit the capacity of mathematical sciences to contribute to economic growth. In 2019, 5% of employers across England, Wales and Northern Ireland had vacancies which were proving difficult to fill because of a shortage of candidates with the right skills, knowledge and experience [DfE, 2020]. In total, there were 214,000 skill shortage vacancies, almost a quarter of all vacancies. Of these, 24% (more than 51,000 vacancies) were at least partly attributed to a lack of complex numerical/statistical skills. 23% of skills shortage vacancies in professional occupations were associated with a lack of complex numerical/statistical skills. Skills shortage vacancies affected by a lack of complex numerical/statistical skills were most prevalent in the public administration sector (37% of skills shortage vacancies) and in the information and communication sector (34%).

As well as causing difficulties recruiting new staff, a lack of mathematical science skills also impacts on employers' existing workforces. 13% of employers in England, Wales and Northern Ireland said in 2019 that their staff lacked all the skills to do their jobs competently, with 1,245,000 employed people having skills gaps [DfE, 2020]. A lack of the required complex numerical/statistical skills accounts for 23% of skills gaps, affecting more than 286,000 workers. 36% of skills gaps among people working in professional occupations include a lack of complex numerical/statistical skills. 40% of skills gaps in the information and communication sector are at least partly attributed to a lack of complex numerical/statistical skills among its employees.

Skills issues within the workforce are compounded by a lack of mathematics teachers. The House of Commons Library reports [Long, 2022] that vacancy rates for secondary mathematics teachers in November 2021 were among the highest of all subjects, accounting for 0.7% of the workforce in England. Secondary mathematics teachers are listed among shortage occupations across the UK by the Migration Advisory Committee [HMSP, 2022]. The National Foundation for Educational Research, meanwhile, has reported lower levels of retention among mathematics teachers than other subjects [Long, 2022]. A number of initiatives have been developed to improve teacher recruitment and retention, including early career payments for mathematics teachers starting their postgraduate Initial Teacher Training in 2018/19, 2019/20 or 2020/21 [DfE, 2019]. Similarly, the government announced in 2021 that new mathematics teachers would receive salary boosts for the first five years of their career [DfE, 2021].

Employment outcomes six months after graduation: 2015/16 to 2016/17

According to the DLHE survey, the majority (77%) of graduates from mathematical sciences degrees who were in employment six months after graduating in 2015/16 or 2016/17 were working in managerial, professional or associate professional occupations (Table 4). These are generally considered to be high-skilled occupations, the majority of which require a graduate qualification on entry[6].

Table 4 reveals some differences in occupations among mathematical sciences graduates in employment six months after graduation by institutional entry requirements. It can be seen that the proportion of graduates from institutions with the lowest entry requirements who were working in managerial/professional/associate professional occupations (65%) is considerably lower than the proportion from institutions with the highest entry requirements (85%), six months after graduation. The 'Other occupations' are jobs that would not generally be expected to need graduate qualifications but might be taken up by graduates in the absence of other opportunities. It should of course be noted that a graduate's employment six months after graduation is not necessarily an indicator of longer-term career outcomes.

Table 4: Employed graduates' occupations by HEI entry requirements to mathematical sciences degrees, 2015/16 to 2016/17

Occupation	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Managerial/Professional/Associate Professional occupations	65%	66%	75%	76%	85%	77%	77%
Other occupations	34%	33%	25%	24%	15%	23%	23%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*565*	*610*	*985*	*1,770*	*2,280*	*715*	*6,915*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 5 shows the distribution of graduates from mathematical sciences degrees who were in employment six months after graduating in 2015/16 or 2016/17, by their sector of employment[7]. Overall the financial and insurance activities, professional, scientific and technical activities, education, information and communication sectors employed the largest proportions of mathematical sciences graduates, and the table focuses on these sectors while aggregating others.

[6] Occupations are defined in Office for National Statistics (2010) *Standard Occupational Classification 2010: Volume 1, Structure and descriptions of unit groups*. Newport: ONS. Available at: https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010/soc2010volume1structureanddescriptionsofunitgroups

[7] Sectors of employment are defined in Office for National Statistics (2009) *UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007): Structure and explanatory notes*. Newport: ONS. Available at: https://www.ons.gov.uk/methodology/classificationsandstandards/ukstandardindustrialclassificationofeconomicactivities/uksic2007

Of particular note is the higher percentage of graduates from the 20% of institutions with the lowest entry requirement (19%; 105 graduates) who were working in education compared to those from the 20% of institutions with the highest entry requirements (10%; 225 graduates). The percentage of graduates working in financial and insurance activities, by contrast, was much higher for graduates from the highest entry institutions than for the lowest entry institutions (23% versus 13%; 515 graduates versus 75 graduates respectively).

Table 5: Employed graduates' industries by HEI entry requirements to mathematical sciences degrees, 2015/16 to 2016/17

Sector	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Financial and insurance activities	13%	13%	22%	20%	23%	8%	19%
Professional, scientific and technical activities	8%	13%	17%	20%	21%	8%	17%
Education	19%	13%	12%	9%	10%	34%	13%
Information and communication	11%	9%	12%	12%	16%	9%	13%
All other sectors	49%	52%	37%	39%	30%	41%	38%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*560*	*610*	*985*	*1,760*	*2,265*	*715*	*6,895*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Employment outcomes 15 months after graduation: 2017/18 to 2019/20

The GOS data given in Table 6 shows that a much higher proportion (85%) of employed mathematical sciences graduates from 2017/18 to 2019/20 worked in managerial/ professional/associate professional occupations 15 months after graduation than the previous DLHE cohort after 6 months, where the corresponding figure was 77% (Table 4). This figure of 85% is considerably higher than the sector average across subjects. On average, 76% of all graduates and 82% of graduates from science subjects who are in employment are in these occupations [HESA, 2022].

There was still a notable gap between the percentage of employed mathematical sciences graduates from the institutions with lowest entry and highest entry requirements working in such occupations (75% versus 91%). However, the total proportion of those from the lowest entry institutions working in managerial/professional/associate professional occupations 15 months after graduation increased substantially compared with the previous DLHE cohorts when measured after 6 months, which was 65% (Table 4).

Table 6: Employed graduates' occupations by HEI entry requirements to mathematical sciences degrees, 2017/18 to 2019/20

Occupation	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Managerial/Professional/Associate Professional occupations	75%	76%	81%	85%	91%	84%	85%
Other occupations	25%	24%	19%	15%	9%	16%	15%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*600*	*855*	*1,445*	*2,750*	*3,360*	*395*	*9,410*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 7 shows the distribution of graduates from mathematical sciences degrees who were in employment 15 months after graduating in 2017/18 to 2019/20, by sector of employment. As in Table 5, the focus is on those sectors employing the largest proportion of mathematical sciences graduates, and other sectors are aggregated.

Table 7: Employed graduates' industries by HEI entry requirements to mathematical sciences degrees, 2017/18 to 2019/20

Sector	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Financial and insurance activities	13%	11%	19%	19%	28%	7%	21%
Professional, scientific and technical activities	9%	16%	17%	20%	21%	4%	18%
Education	25%	21%	16%	13%	8%	50%	15%
Information and communication	10%	11%	15%	15%	18%	8%	15%
All other sectors	43%	41%	33%	32%	24%	31%	31%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*640*	*885*	*1,490*	*2,810*	*3,380*	*400*	*9,610*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 7 also shows variations in employment by sector of employment after 15 months among the 2017/18 to 2019/20 cohort and there are once again clear differences between the institutions with the lowest and highest entry tariffs. In this case, the data shows that 25% of employed graduates from the 20% of institutions with the lowest entry requirement institutions were

working in education (160 graduates), compared to 8% in the 20% of institutions with the highest entry requirement institutions (285 graduates). This category includes teaching. In contrast, 13% of employed graduates from the 20% of institutions with the lowest entry requirement institutions were working in financial and insurance industries (80 graduates), compared to 28% in the 20% of institutions with the highest entry requirements (955 graduates).

Employment outcomes by diversity characteristic

(a) Employment outcomes by sex

Overall, among graduates who were in employment 15 months after graduating, a slightly smaller proportion of women (84%) worked in managerial/professional/associate professional occupations than men (86%), though Table 8 shows this is not true of institutions with the lowest entry requirements (first and second quintiles), where the proportion of women graduates in such occupations was higher than that of men graduates.

Table 8: Proportion of employed mathematical sciences graduates working in managerial/professional/associate professional occupations by sex and institutions' entry requirements (quintiles), 2017/18 to 2019/20

Sex	Institutions by entry requirement – quintiles						All HEIs	*No. of survey respondents*
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs		
Women	78%	77%	80%	85%	91%	83%	84%	*3,760*
Men	73%	75%	82%	85%	92%	86%	86%	*5,450*

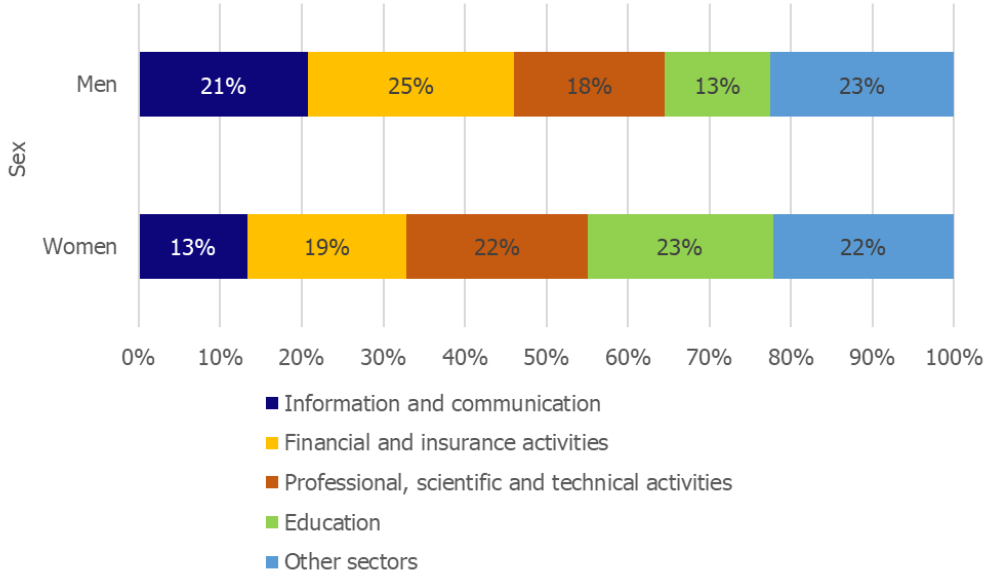
Source: Ortus analysis of UCAS and HESA data. The numbers of survey respondents are rounded to the nearest 5.
Note: The table shows the distribution of graduates in managerial/professional/professional occupations by institutions' entry requirements, not the distribution of all graduates, or the distribution of all employed graduates.

The analysis suggests considerable variation in the distribution of men and women graduates in managerial/professional/associate professional occupations by sector of employment (Figure 8). A smaller proportion of women in such jobs than men worked in the information and communication sector, and the financial and insurance activities sector. A larger proportion of women graduates in managerial/professional/associate professional occupations than men worked in professional, scientific and technical activities (22% versus 18%) and a notably larger proportion of women graduates in managerial/professional/associate professional occupations worked in education than men (23%, 720 graduates, versus 13%, 605 graduates). Differences by occupation and employment sector are also apparent when comparing men and women from institutions with different entry requirements (see Appendix 4). Across the entry requirement quintiles a higher proportion of men graduates than women graduates worked in information and communication or in financial and insurance, while, with the exception of the first and second lowest quintiles, a lower proportion of men graduates than women worked in professional, scientific and technical activities (Appendix 4). The difference in the proportion of women and men in managerial/professional/ associate professional occupations working in education was notably larger among graduates from institutions with the lowest entry requirements (40% and 26% respectively) than among graduates from institutions with the highest entry requirements (10% and 8% respectively). Among both women and men, the proportion of the graduates employed in managerial/professional/associate professional occupations 15 months after graduation working in education decreased as institutions' entry requirements rose (Figure 9). Conversely, the

proportions working in financial and insurance activities increased (for men, from the second quintile) while, for women graduates, the proportion working in professional, scientific and technical activities also increased as entry requirements rose.

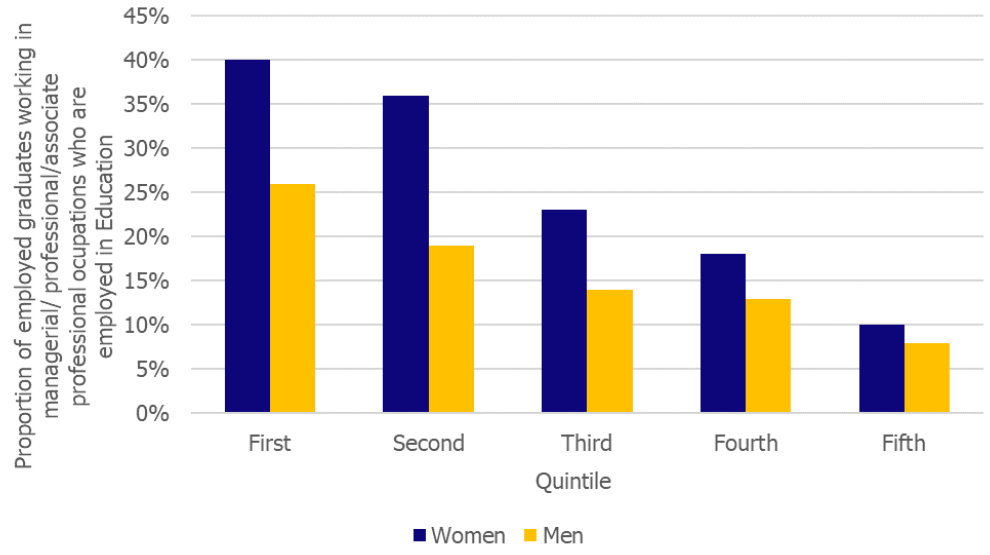
It should be remembered that a higher proportion of women graduates were in work than men, as highlighted earlier in this report (see *(a) Graduate outcomes 2017/18 to 2019/20 by sex*), but also that women account for fewer mathematical sciences graduates than men overall.

Figure 8: Proportion of employed mathematical sciences graduates working in managerial/professional/ associate professional occupations 15 months after graduation by employment sector and sex, 2017/18 to 2019/20



Source: Ortus analysis of UCAS and HESA data
Note: The chart shows the distribution of graduates employed in managerial/professional/professional occupations by employment sector, not the distribution of all employed graduates given in Table 7. Charts show unrounded data.

Figure 9: Proportion of the mathematical sciences graduates working in managerial/professional/ associate professional occupations 15 months after graduation who work in the Education sector, by sex and institutions' entry requirements (quintiles, fifth = highest), 2017/18 to 2019/20

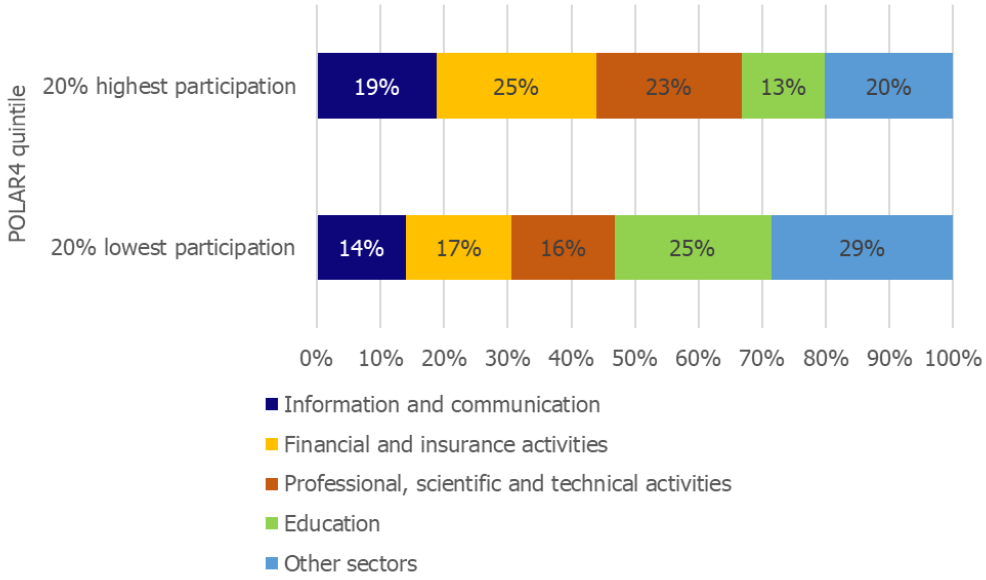


Source: Ortus analysis of UCAS and HESA data. Charts show unrounded data.

(b) Employment outcomes by socio-economic background

The analysis suggests there are differences in employment in managerial/professional/associate professional occupations by employment sector among mathematical sciences graduates according to the level of participation among young people in their home area (POLAR4 quintiles). In particular, Figure 10 shows that a higher proportion of mathematical sciences graduates employed in managerial/professional/associate professional occupations 15 months after graduation worked in information and communication (19%), financial and insurance activities (25%) and professional, scientific and technical activities (23%) if they were from areas with the highest rates of participation in higher education among young people than from areas with the lowest rates of participation (respectively: 14%, 17%, 16%). Conversely, a higher proportion of those from areas with the lowest rates of participation in higher education among young people (POLAR4 lowest quintile) worked in education (25%), and also in other sectors (29%), than those from areas with higher rates of participation (respectively: 13%, 20%). Further information about the other POLAR4 quintiles can be found in Appendix 5.

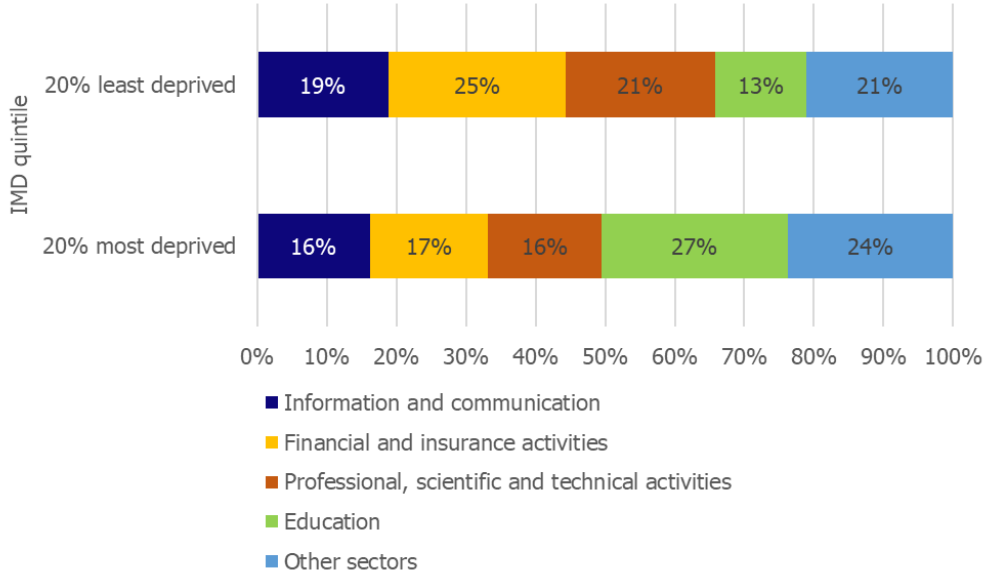
Figure 10: Proportion of employed mathematical sciences graduates working in managerial/professional/associate professional occupations 15 months after graduation by employment sector and POLAR4 quintile (highest and lowest), 2017/18 to 2019/20



Source: Ortus analysis of UCAS and HESA data
Note: The chart shows the distribution of employed graduates working in managerial/professional/professional occupations by employment sector, not the distribution of all employed graduates. Charts show unrounded data.

A similar pattern is apparent if employment in managerial/professional/associate professional occupations is considered according to the extent of deprivation of graduates' home areas, as measured by the Indices of Multiple Deprivation (IMD quintiles) (Figure 11). A notably higher proportion of graduates employed in managerial/professional/associate professional occupations 15 months after graduation worked in education if they are from the most deprived 20% of areas (27%), than if they are from the least deprived 20% of areas (13%). Further information about the other IMD quintiles is given in Appendix 5.

Figure 11: Proportion of employed mathematical sciences graduates working in managerial/professional/associate occupations 15 months after graduation by sector and IMD quintile (highest and lowest), 2017/18 to 2019/20



Source: Ortus analysis of UCAS and HESA data
Note: The chart shows the distribution of employed graduates working in managerial/professional/professional occupations by employment sector, not the distribution of all employed graduates. Charts show unrounded data.

Conclusions

The current research has explored the number of acceptances to mathematical sciences degrees in UK higher education institutions based on institutions' average actual entry requirements as well as the relationship between entry requirements and graduate outcomes, with some further exploration of outcomes by diversity characteristics. The research presents descriptive statistics to explore how graduate outcomes differ by institutions' entry requirements.

Overall, the number of acceptances to mathematical sciences degrees decreased over the period 2017-2021 (Table 1). However, recruitment trends differ considerably between institutions depending on their entry requirements. Those with the highest entry requirements are accepting increasing numbers of entrants. Those with lower entry requirements are accepting fewer entrants, with the largest relative declines among institutions with the lowest entry requirements.

Based on GOS survey data for the period 2017/18 to 2019/20, there are small differences in the proportions of graduates from the lowest entry tariff institutions and the highest entry tariff institutions in the categories of employment, further study, or employment and further study. The data shows that the proportions of graduates who were unemployed changed only slightly between the lowest tariff institutions (7%) and the highest tariff institutions (5%) (Table 3). A lower proportion of women graduates were unemployed than men (3% compared with 7%) (Appendix 1). There appears to be a more complex relation between institutions' entry requirements, graduate outcomes after 15 months and the level of deprivation of graduates' home area (measured by participation rates in higher education among young people (POLAR4) or relative deprivation (IMD)), but there are variations in employment and unemployment rates between both POLAR4 and IMD quintile groups.

Mathematical sciences graduates work across the economy. Based on GOS survey data (2017/18 to 2019/20) collected 15 months after graduation, a high proportion of mathematical sciences graduates work in managerial/professional/associate professional occupations (Table 6). High proportions of employed graduates were found to be working in sectors including financial and insurance services (21%); professional, scientific and technical services (18%); education (15%); information and communication (15%) (Table 7). An examination of the employment sectors in which graduates were working showed variations according to an institution's entry requirements (Table 7). A smaller proportion (75%) of mathematical sciences graduates from institutions with the lowest entry requirements were found to be working in managerial/professional/associate professional occupations after 15 months than the proportion of graduates from institutions with the highest entry requirements (91%) (Table 6). The proportion of employed mathematical sciences graduates from institutions with the lowest entry requirement working in education 15 months after graduation was considerably higher than the proportion of graduates from institutions with the highest entry requirements (25% versus 8%). This category includes teaching.

Mathematical sciences graduates are critical to the UK. The sectors they work in often underpin the economy. Those graduates working in teaching roles ensure the future pipeline of mathematicians to support continued growth. A shortage of secondary mathematics teachers is well known which threatens to constrain this pipeline [DfE, 2022], [Worth 2022].

Based on the research presented here, it is clear that mathematical sciences graduates have high rates of employment, irrespective of their pre-university entry qualification. They also have high rates of employment in managerial/professional/associate professional occupations, although the exact nature and type of employment does differ according to their institutional entry requirement. While there are some small differences observed by diversity characteristics such as sex or level of deprivation, graduate outcomes remain strong across the diversity groupings explored here. Importantly, a much higher proportion of employed graduates from the institutions with the lowest entry requirements are going into education roles. Maintaining the opportunity for

all those with both high and lower entry requirements to study mathematical sciences is important in order to provide a strong supply of mathematical sciences graduates for the economy, and specifically to continue to feed into the mathematics teaching profession.

Appendices

Appendix 1: Graduate destinations by HEI entry requirements to mathematical sciences degrees by sex, 2017/18 to 2019/20

Analysis is based on data from the Graduate Outcomes Survey.

Table 9: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Women

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	14%	10%	11%	12%	14%	6%	12%
Employment and further study	8%	11%	12%	13%	11%	10%	11%
Employment	69%	73%	67%	68%	67%	72%	68%
Unemployed	5%	3%	4%	3%	2%	4%	3%
Other	4%	3%	6%	4%	6%	8%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*395*	*465*	*850*	*1,525*	*1,395*	*275*	*4,895*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 10: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Men

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	15%	11%	15%	13%	17%	12%	15%
Employment and further study	11%	9%	12%	12%	10%	9%	11%
Employment	61%	67%	58%	63%	63%	66%	62%
Unemployed	9%	8%	9%	7%	6%	5%	7%
Other	5%	5%	6%	6%	5%	8%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*510*	*700*	*1,165*	*2,200*	*3,215*	*265*	*8,050*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Appendix 2: Graduate destinations by HEI entry requirements to mathematical sciences degrees and POLAR4 quintile, 2017/18 to 2019/20

POLAR4 describes the level of participation among young people of each UK domiciled graduate's home area, with the first quintile having the lowest participation and the fifth the highest. Analysis is based on data from the Graduate Outcomes Survey.

Table 11: Graduate destinations by HEI entry requirements to mathematical sciences degrees: First POLAR4 quintile (lowest 20%)

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	16%	12%	10%	13%	16%	11%	13%
Employment and further study	12%	6%	17%	12%	14%	13%	12%
Employment	65%	71%	63%	65%	61%	69%	65%
Unemployed	4%	7%	6%	5%	6%	2%	5%
Other	2%	4%	4%	5%	4%	5%	4%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*115*	*150*	*140*	*300*	*230*	*60*	*1,000*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 12: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Second POLAR4 quintile

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	12%	10%	12%	12%	16%	13%	13%
Employment and further study	11%	11%	12%	10%	12%	7%	11%
Employment	68%	69%	66%	67%	63%	69%	66%
Unemployed	7%	7%	5%	5%	3%	1%	5%
Other	1%	4%	5%	6%	5%	10%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*150*	*230*	*260*	*475*	*500*	*90*	*1,705*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 13: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Third POLAR4 quintile

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	11%	9%	14%	14%	16%	8%	14%
Employment and further study	10%	9%	12%	14%	10%	4%	11%
Employment	69%	72%	60%	62%	63%	74%	64%
Unemployed	6%	6%	6%	5%	5%	8%	6%
Other	3%	4%	7%	4%	5%	6%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*180*	*230*	*400*	*640*	*715*	*110*	*2,275*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 14: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Fourth POLAR4 quintile

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	17%	9%	13%	12%	17%	7%	14%
Employment and further study	10%	11%	11%	12%	9%	8%	10%
Employment	58%	71%	64%	67%	64%	72%	65%
Unemployed	9%	4%	8%	5%	6%	6%	6%
Other	6%	4%	5%	5%	4%	7%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No of survey respondents	*240*	*250*	*570*	*870*	*1,035*	*115*	*3,080*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 15: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Fifth POLAR4 quintile (highest 20%)

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	14%	13%	13%	13%	15%	8%	14%
Employment and further study	6%	10%	12%	12%	11%	14%	11%
Employment	66%	66%	60%	64%	65%	64%	64%
Unemployed	9%	5%	8%	6%	4%	4%	5%
Other	6%	6%	7%	6%	5%	11%	6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*215*	*300*	*645*	*1,435*	*2,125*	*155*	*4,880*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Appendix 3: Graduate destinations by HEI entry requirements to mathematical sciences degrees and Index of Multiple Deprivation (IMD) quintile, 2017/18 to 2019/20

The English Indices of Deprivation and equivalent measures in other UK nations describe the level of deprivation of each UK domiciled graduate's home area, with the first quintile being the most deprived and the fifth the least. Analysis is based on data from the Graduate Outcomes Survey.

Table 16: Graduate destinations by HEI entry requirements to mathematical sciences degrees: First IMD quintile (most deprived 20%)

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	17%	14%	12%	13%	12%	10%	13%
Employment and further study	9%	12%	11%	13%	12%	14%	12%
Employment	63%	63%	62%	62%	66%	67%	63%
Unemployed	7%	7%	9%	6%	5%	6%	7%
Other	4%	3%	6%	5%	5%	3%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*185*	*165*	*280*	*315*	*305*	*80*	*1,335*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 17: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Second IMD quintile

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	13%	9%	14%	15%	16%	8%	14%
Employment and further study	8%	10%	14%	12%	10%	11%	11%
Employment	66%	69%	59%	59%	62%	73%	62%
Unemployed	6%	7%	7%	7%	6%	4%	6%
Other	6%	5%	6%	6%	5%	5%	6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*210*	*210*	*405*	*485*	*560*	*95*	*1,960*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 18: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Third IMD quintile

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	14%	8%	12%	13%	17%	16%	14%
Employment and further study	12%	9%	11%	13%	12%	5%	11%
Employment	60%	75%	64%	65%	62%	65%	64%
Unemployed	12%	5%	6%	5%	4%	7%	5%
Other	2%	3%	7%	5%	5%	8%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*165*	*220*	*395*	*660*	*830*	*105*	*2,380*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 19: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Fourth IMD quintile

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	13%	13%	13%	12%	17%	5%	14%
Employment and further study	12%	10%	12%	12%	10%	7%	11%
Employment	68%	67%	62%	65%	64%	71%	65%
Unemployed	5%	6%	7%	5%	5%	4%	5%
Other	3%	5%	6%	6%	5%	12%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*170*	*265*	*420*	*910*	*1,120*	*110*	*3,000*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 20: Graduate destinations by HEI entry requirements to mathematical sciences degrees: Fifth IMD quintile (least deprived 20%)

Activity	Institutions by entry requirement – quintiles						All HEIs
	First (lowest 20%)	Second	Third	Fourth	Fifth (highest 20%)	Other HEIs	
Further study	14%	10%	14%	12%	15%	7%	13%
Employment and further study	6%	9%	12%	11%	10%	11%	10%
Employment	67%	70%	64%	67%	66%	70%	66%
Unemployed	8%	5%	6%	4%	4%	2%	5%
Other	6%	6%	5%	5%	5%	10%	5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
No. of survey respondents	*165*	*300*	*505*	*1,345*	*1,795*	*140*	*4,255*

Source: Ortus analysis of UCAS and HESA data. Columns may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Appendix 4: Employment outcomes by sex and institutions' entry requirements (quintiles), 2017/18 to 2019/20

The following tables show the distribution of employed graduates working in managerial/professional/associate professional occupations, by sector of employment. Analysis is based on data from the Graduate Outcomes Survey.

Table 21: Proportion of employed graduates working in managerial/professional/associate professional occupations by sex, first quintile (20% lowest entry requirements), selected sectors

Sex	Information and communication	Financial and insurance activities	Professional, scientific and technical activities	Education	Other sectors	Total	*No. of survey respondents*
Women	10%	10%	10%	40%	30%	100%	*215*
Men	14%	18%	11%	26%	30%	100%	*230*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 22: Proportion of employed graduates working in managerial/professional/associate professional occupations by sex, second quintile, selected sectors

Sex	Information and communication	Financial and insurance activities	Professional, scientific and technical activities	Education	Other sectors	Total	*No. of survey respondents*
Women	14%	10%	19%	36%	21%	100%	*285*
Men	14%	14%	19%	19%	33%	100%	*355*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 23: Proportion of employed graduates working in managerial/professional/associate professional occupations by sex, third quintile, selected sectors

Sex	Information and communication	Financial and insurance activities	Professional, scientific and technical activities	Education	Other sectors	Total	*No. of survey respondents*
Women	15%	19%	22%	23%	21%	100%	*525*
Men	21%	22%	18%	14%	26%	100%	*630*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 24: Proportion of employed graduates working in managerial/professional/associate professional occupations by sex, fourth quintile, selected sectors

Sex	Information and communication	Financial and insurance activities	Professional, scientific and technical activities	Education	Other sectors	Total	*No. of survey respondents*
Women	14%	19%	25%	18%	25%	100%	*1,000*
Men	21%	22%	20%	13%	23%	100%	*1,270*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 25: Proportion of employed graduates working in managerial/professional/associate professional occupations by sex, fifth quintile (20% highest entry requirements), selected sectors

Sex	Information and communication	Financial and insurance activities	Professional, scientific and technical activities	Education	Other sectors	Total	*No. of survey respondents*
Women	14%	28%	27%	10%	20%	100%	*965*
Men	23%	32%	19%	8%	18%	100%	*2,030*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Appendix 5: Employment outcomes by socio-economic background, 2017/18 to 2019/20

The following tables show the distribution of employed graduates working in managerial/professional/associate professional occupations, by sector of employment. Analysis is based on data from the Graduate Outcomes Survey.

Table 26: Proportion of employed graduates working in managerial/professional/associate professional occupations by POLAR4, quintile, selected sectors

POLAR4 quintile	Information and communication	Financial and insurance activities	Professional, scientific and technical	Education	Other sectors	Total	*No. of survey respondents*
First quintile (20% lowest participation)	14%	17%	16%	25%	29%	100%	*585*
Second quintile	20%	23%	19%	16%	22%	100%	*1,830*
Third quintile	16%	22%	18%	20%	25%	100%	*1,365*
Fourth quintile	16%	21%	18%	22%	23%	100%	*1,015*
Fifth quintile (20% highest participation)	19%	25%	23%	13%	20%	100%	*3,045*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

Table 27: Proportion of employed graduates working in managerial/professional/associate professional occupations by IMD, quintile, selected sectors

IMD quintile	Information and communication	Financial and insurance activities	Professional, scientific and technical	Education	Other sectors	Total	*No. of survey respondents*
First quintile (20% most deprived)	16%	17%	16%	27%	24%	100%	*740*
Second quintile	17%	23%	20%	16%	24%	100%	*1,115*
Third quintile	17%	23%	20%	18%	22%	100%	*1,440*
Fourth quintile	18%	22%	18%	20%	23%	100%	*1,850*
Fifth quintile (20% least deprived)	19%	25%	21%	13%	21%	100%	*2,685*

Source: Ortus analysis of UCAS and HESA data. Rows may not sum to 100% due to rounding. The numbers of survey respondents are rounded to the nearest 5.

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