

The Path to PhD

Socioeconomic Background and
Barriers to STEM Postgraduate Study

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Report at a Glance



5,600+

Between 2015 and 2023, the UK lost out on as many as 41% (5,600) of potential STEM researchers from low-socioeconomic backgrounds from its talent pipeline.

The higher the degree, the lower the proportion of students from low-socioeconomic backgrounds.

24%

of STEM undergraduate students are from low-socioeconomic backgrounds compared to

18%

of STEM PhD students



15.5%

All STEM subjects have a progression gap – but mathematics and statistics PhDs have the lowest share of students from low-socioeconomic backgrounds.



400,000

UK STEM students were tracked through the system between 2015 and 2023 to inform this research alongside more than 2 million students across all subjects.

STEM PhDs disproportionately out of reach to those from lower socioeconomic backgrounds

66%

of all STEM PhD researchers from high-socioeconomic backgrounds, yet only

33%

of the population of England and Wales are from those backgrounds

Key Findings



1. Students from low-socioeconomic backgrounds face serious barriers to studying STEM as postgraduates.
 - a. **Only 33% of the population of England and Wales come from the highest socioeconomic backgrounds** – but students from these backgrounds make up 66% of all STEM.
 - b. **The higher the degree, the lower the proportion of students from low-socioeconomic backgrounds.** Students from low-socioeconomic backgrounds make up 24% of STEM undergraduate students, but just 18% of STEM PhD students and 22% of all STEM postgraduate research students.



2. STEM's progression gap is steeper than almost any other subject area, with the biggest progression gaps in maths and statistics, physics and chemistry.
 - a. **Students from low-socioeconomic backgrounds progress to STEM PhDs at lower rates than they do in humanities and social sciences.** Only arts PhDs see a steeper progression gap than STEM.
 - b. **All STEM subjects have a progression gap – but mathematics and statistics PhDs have the lowest share of students from low-socioeconomic backgrounds, only 15.5%.** Even subjects with relatively high proportions of undergraduates from low-socioeconomic backgrounds, like computer science, see numbers of students from low-socioeconomic backgrounds drop at postgraduate level. A third of computer science undergraduates come from low-socioeconomic backgrounds, but by PhD level, the proportion has dropped to just 19%.



3. Even the highest-achieving students from low-socioeconomic backgrounds struggle to progress to STEM postgraduate study.
 - a. **The two strongest predictors of progression to PhD for any student remain prior attainment and the type of institution attended at undergraduate.** Students from low-socioeconomic backgrounds are less likely to both achieve top grades at school or progress to high-tariff universities for undergraduate.
 - b. **Even when they get top grades or attend a high-tariff university, fewer students from low-socioeconomic backgrounds progress to postgraduate study.** Attainment and institution type account for only part of the progression gap. 10.8% of students from the highest socioeconomic backgrounds with a first class degree will progress to a PhD, compared with 7.9% of students from the lowest socioeconomic backgrounds. At 'Golden Triangle'¹ universities, 15.7% of undergraduates from the highest socioeconomic backgrounds progress to a PhD compared with 10.4% of students from the lowest socioeconomic backgrounds.



4. The UK is missing out on talented PhD researchers, threatening the UK's future innovation in key Modern Industrial Strategy sectors, from AI to advanced manufacturing, clean energy to life sciences.
 - a. **Between 2015 and 2023, had disadvantaged high achievers progressed at the same rates as their advantaged peers, the UK could have unlocked 52% more STEM PhD researchers and 41% more STEM masters students from low-socioeconomic backgrounds.** Talented STEM students from low-socioeconomic backgrounds typically exit the pipeline after undergraduate study. Despite gaining top A level grades, a first-class degree and/or studying at a top research university, students from low-socioeconomic backgrounds are still less likely to progress to PhD than those from high-socioeconomic backgrounds.
 - b. **Women and ethnic minorities from low-socioeconomic backgrounds in particular progress to STEM postgraduate study at lower rates.** Women from low-socioeconomic backgrounds are less likely than men to progress to STEM masters and PhD. Non-white students from low-socioeconomic backgrounds progress to masters at higher rates than white students from the same backgrounds, but progress at a lower rate to PhD.



5. Students from low-socioeconomic backgrounds describe financial pressures and difficulties navigating a complex funding and application system without support when trying to reach STEM postgraduate study.
 - a. **In focus groups, students describe discovering a love of research early as undergraduates – but struggle to navigate complex application and funding systems alone.** Students describe having little prior knowledge and limited understanding from family and friends.
 - b. **What holds these students back is not a lack of ability or ambition, but practical barriers that fall unevenly.** Students in our focus groups described a pathway that is hard to navigate without inherited knowledge, a funding system which is complex and sometimes insufficient and support that rests on the luck of an individual supervisor.
 - c. **Financial pressures during PhD study are the single biggest challenge faced by STEM PhD students from low-socioeconomic backgrounds.** Students in our focus groups, many of whom held stipends, reported constant financial stress and feared financial and professional precarity throughout doctoral study.

Recommendations

Martingale Foundation is calling on all with a stake in the future of the UK's research and innovation to work together to tackle this progression gap and unlock the UK's hidden STEM talent.

Our goal is to strengthen pathways into STEM PhDs for talented students from low-socioeconomic backgrounds, ensuring the best minds are working on the biggest challenges regardless of background. The UK cannot afford to lose another 5,600 talented STEM students to an unequal postgraduate pipeline.

Success requires coordinated action: funders, universities, mission groups, funding bodies and regulators all have a part to play.



1. Engage prospective researchers earlier

- Outreach:** Funders and universities should support targeted outreach and recruitment interventions at undergraduate level, modelled on industry graduate schemes and raise awareness of research career pathways for undergraduate students from their first year.
- Research readiness:** Funders should fund targeted masters provision as part of PhD programmes, structured as one masters year plus three or four PhD years, to increase the research readiness of students from low-socioeconomic backgrounds.



2. Clear access and fairness towards postgraduate students

- Terms and conditions:** Funders' terms and conditions should regard PhD students as 'researchers in training', including, but not limited to, standardised access to parental and carers' leave, part-time living-cost support and sickness and return-to-work policies.
- Finances:** Universities and funders should provide access to an advance on funding to cover moving costs, extend guarantor schemes to students from low-socioeconomic backgrounds, operate prompt stipend payment schedules and pay for travel, accommodation and conference costs up front rather than relying on reimbursement.
- Transparency:** PhD adverts should contain standardised information – stipend level, duration of funding, details of the project, the key requirements to apply including skills and experience, the application process and where applicants can ask questions. This would equip students to approach supervisors, gather information and put forward the strongest possible application.



3. Data tracking and accountability

- Fair access:** Government and regulators should extend fair access systems, such as the Office for Students' Access and Participation Plans (APPs), to cover both postgraduate taught and postgraduate research students.
- Monitoring:** Socioeconomic background should be included in existing reviews of the postgraduate community, such as part of the Postgraduate Research Experience Survey, to use data-driven approach to track the impact of outreach interventions in unlocking talent pipelines.
- Accountability:** UKRI and other major postgraduate research funders should emphasise postgraduate research fair access in their guidance materials to ensure that excellence, not one's ability to access support, dictates progression. This could include wording in grant terms and conditions through to criteria within the people section of the Strategy, People and Research Environment element of the Research Excellence Framework (REF).





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Foreword

Martingale was set up in 2022, in the aftermath of a pandemic that had shown the country what UK STEM research can do. It underpins our economic growth, innovation and national security, with PhD-level researchers at the centre of all of it. And yet too many talented people never reach that point, not because they lack the ability, but because of where they started in life.

We asked Public First to quantify this, following more than 400,000 UK STEM students through the system between 2015 and 2023 using data that has never been published before. The answer was stark and sobering: 5,600 potential STEM researchers lost to an opaque and complicated system – nearly 700 every year – where socioeconomic background serves as a steep barrier to progression to STEM postgraduate study. All the talent in the world cannot make up for lack of clarity and support.

Two students can graduate from the same top university, with the same top grades, studying the same subject – and this report shows that the one from a lower socioeconomic background remains less likely to go on to a PhD.

Potential isn't the variable here: background is. 65.6% of UK STEM PhD students come from the highest socioeconomic backgrounds, despite making up only 33% of the population in England and Wales. This isn't a new problem, but it is one that has never been properly measured until now.

This matters more than it ever has. From energy security to the growth sectors in the Modern Industrial Strategy (IS-8), the UK needs STEM researchers at a scale it hasn't before, with 80% of the occupations critical to IS-8 sectors expected to require a bachelor's degree or higher. Sovereign capability in AI, quantum, cybersecurity, fusion energy and more depend on a pipeline of domestic PhD-level talent that doesn't yet exist at the scale required.

Fairness in educational pathways doesn't stop at the undergraduate degree. It must include the research pathway. PhDs must be open to all based on their talent, and not on their background. We heard from students about how routes into PhDs are opaque, financial strains remain despite stipends and guidance and support rests on variable supervisor relationships. This is both an equity and efficiency argument: OECD research shows that reducing barriers to social mobility widens the pool of talent available to an economy, with real returns for innovation and growth. Where potential goes unrealised, so does prosperity.

Funders and universities are starting to pay attention, but this isn't a problem any one organisation can fix alone. Without real investment in the postgraduate pipeline, the UK risks losing specialist expertise vital for the success of the Modern Industrial Strategy. This could impact its position as a research and innovation leader at precisely the moment it needs that position most.

CASSANDRA HUGILL
CHIEF EXECUTIVE, MARTINGALE FOUNDATION



Introduction

The future of UK research and innovation relies on the UK's future STEM talent pool. The UK cannot hope to meet the challenges of the coming decades – the climate crisis, breakthroughs in health, data, technology, energy and AI – without a secure domestic STEM PhD pipeline training the next generation of talented STEM researchers. The UK's research and innovation landscape continues to face acute skills shortages.² Where might we be losing out on the next generation of UK scientific talent – and who is shut out from this system?

Low-socioeconomic students still progress to undergraduate study at lower rates than their more advantaged peers.³ This well-recognised problem continues to attract considerable public and political attention. Over £800 million is spent on widening access to undergraduate study every year, with universities, governments, regulators, mission groups, charities and industry all committing considerable resources to reducing barriers to undergraduate-level study.⁴

But after undergraduate study, these efforts to widen participation in higher education meet a cliff-edge. Access to postgraduate study has historically received far less attention than undergraduate.⁵ Recent important research has shown the steep barriers students from low-socioeconomic backgrounds face when trying to progress to further study: high costs, imposter syndrome and a 'hidden curriculum' facing students without a wide academic network and with little familial experience of higher education.⁶ There are also growing efforts across the higher education and research sector to highlight best practice to support postgraduate students, regardless of background. But with little public data, monitoring and sector-wide targeted action, we do not know nearly enough about who progresses to postgraduate study and to studying for PhDs and who is lost along the way.

This research, conducted by Public First for Martingale Foundation, addresses this gap. Drawing on previously unpublished data, covering more than 2 million students across all subjects (STEM and non-STEM) and levels of study since 2015, it sets out the scale of the socioeconomic gap in postgraduate STEM progression for the first time. It explores differences in progression through postgraduate study for STEM students from different socioeconomic backgrounds to understand where the STEM postgraduate pipeline is at its weakest. It also draws on qualitative research from focus groups with PhD students from low-socioeconomic backgrounds, exploring their experiences of postgraduate study to understand what more could be done to support students at every stage on the path to the PhD.

Guide to the data

Summary of the data

This research uses data from the Higher Education Statistics Agency (HESA) for the ~400,000 UK-domiciled students studying for a degree in a STEM subject at a UK university between 2015/16 and 2022/23. Each learner is allocated a unique identifier, allowing us to track students' progression at every stage of the university pipeline from undergraduate entry.

Defining socioeconomic background

In this research, we primarily use the National Statistics Socio-economic Classifications (NS-SEC). Developed by the Office for National Statistics, NS-SEC categorise **learners' socioeconomic background based on parental occupation** (the occupation of the primary earner in their household, including carers and guardians). They are widely used across UK government statistics, including through the Social Mobility Commission, the National Child Development Study and the Millennium Cohort Study.⁷

To compare different socioeconomic backgrounds, we break NS-SEC into a three-way split: **high**, **medium** and **low-socioeconomic backgrounds**. All learners in our sample are allocated to one of these three classifications.

HIGH

NS-SEC classes 1–2

Higher and lower managerial, administrative and professional occupations.

e.g. CEOs, doctors, senior civil servants, engineers, teachers

MEDIUM

NS-SEC classes 3–4

Intermediate occupations, together with small employers and own-account workers.

e.g. clerical workers, secretaries, shopkeepers, sole traders

LOW

NS-SEC classes 5–8

Lower supervisory and technical, semi-routine and routine occupations, plus those who have never worked or are long-term unemployed.

e.g. foremen, sales assistants, care workers, cleaners, waiters

We also explore other suggestive measures of an individual's socioeconomic background where relevant, in order to compare trends and see how far NS-SEC classifications correlate with other identifiers. This includes **parental/carers level of education** (whether a learner had at least one parent/carers who participated in higher education or is a first-generation student), which has a high correlation with learners' socioeconomic background by NS-SEC.

Defining STEM

Many different subjects fall under the Science, Technology, Engineering and Mathematics (STEM) subject classification. We grouped all STEM courses into three categories: **broad STEM**, **mid STEM** and **tight STEM**.

Common Aggregation Hierarchy (CAH) Group	Broad STEM	Mid STEM	Tight STEM
CAH01 Medicine & Dentistry	✓	✓	—
CAH02 Subjects Allied to Medicine (nursing, pharmacy)	✓	—	—
CAH03 Biological & Sport Sciences (bio only)	✓	✓	✓
CAH04 Psychology	✓	—	—
CAH05 Veterinary Science	✓	✓	—
CAH06 Agriculture & Food	✓	✓	—
CAH07 Physical Sciences	✓	✓	✓
CAH08 General/Multidisciplinary Sciences	✓	✓	✓
CAH09 Mathematical Sciences	✓	✓	✓
CAH10 Engineering	✓	✓	✓
CAH11 Computing	✓	✓	✓
CAH12 Architecture, Building & Planning	✓	—	—

For this research, we focus on **'tight STEM'** (biology, physical sciences – including physics and chemistry, mathematical sciences, engineering, computing and general/multidisciplinary sciences). We exclude subjects relating to medicine, health, psychology and architecture, all of which typically have particular undergraduate and postgraduate pathways distinct from other STEM routes. We refer to 'tight STEM' subjects as 'STEM' throughout unless otherwise specified.

Defining attainment and institution type

An important part of this research is investigating rates of progression for learners according to their prior attainment and institution(s) of study to establish how far high-achieving students from low-socioeconomic backgrounds – such as students who achieved a first-class degree, who entered university with top grades or who attended a top university – progress to STEM postgraduate study compared to their more advantaged peers. For attainment, we use two different measures:

For attainment, we use two different measures:

- **Degree classification** (e.g. first class degree, 2:1, 2:2, third class degree/pass)
- **UCAS tariff** (a numerical value reflecting learners' qualifications on entry to higher education, such as their A levels or equivalent, divided into deciles)

For institution type, we categorise universities into four groups based on analysis of their relative STEM research income and intensity, teaching profile, and selectivity for undergraduate entry: **'Golden Triangle'**, **'research intensive'**, **'pre-1992'** and **'post-1992'**. These groupings are indicative only. A full list of institutional allocations is included in the **Appendix**.



Chapter 1

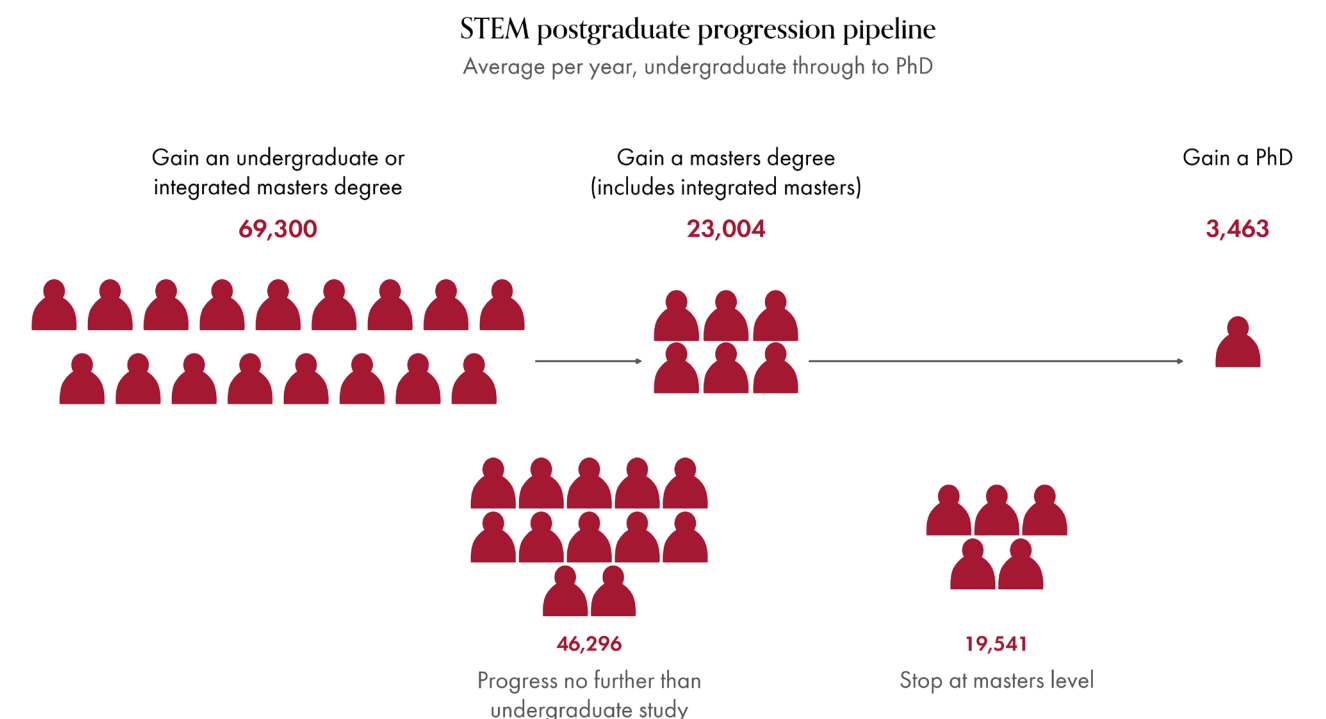
Establishing the STEM Progression Gap

Establishing the STEM progression gap

Half a million UK students begin an undergraduate degree every year.⁸ Of these, around 55,000 will gain an undergraduate degree in a 'tight STEM' subject, studying anything from mathematics to astrophysics, plant science to biotechnology. Around 23,000 will gain a standalone masters degree, with 14,000 gaining an integrated masters degree; only a fifth of all STEM students study for an integrated masters as their first degree.⁹

Fewer than 3,500 will reach the highest level of study, obtaining a PhD. Though small in number, these students are essential to the future of UK innovation. They represent vital specialist technical knowledge and expertise in some of the most difficult and complex areas of research.

Fewer students from low-socioeconomic backgrounds go to university at all – but the more advanced the degree, the fewer students from low-socioeconomic backgrounds in the cohort.



This first chapter establishes the scale of the STEM postgraduate class gap. It shows that the path to a STEM PhD is narrow but also shaped by where students start. It makes clear the scale of the progression gap between students from low and high-socioeconomic backgrounds.

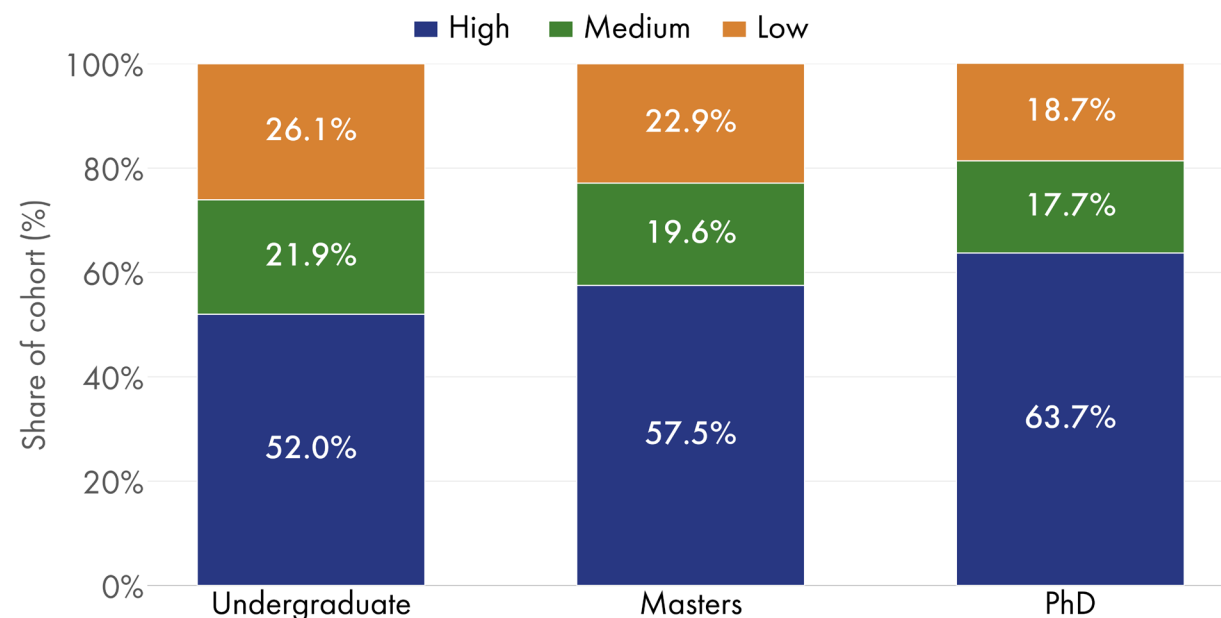
If STEM PhD students were a cohort of **100** people, only **18** of those PhD students would be from a low-socioeconomic background.

Fewer students from low-socioeconomic backgrounds go to university at all than their peers from high-socioeconomic backgrounds. 25% of people aged 18 to 20 from the lowest socioeconomic backgrounds are enrolled in higher education, compared to more than 46% of those from the highest.¹⁰

But getting into university for undergraduate study is not the final barrier students from low-socioeconomic backgrounds face. On all degree programmes, across all subjects, from undergraduate to masters (or integrated masters) through to PhD, there is a clear progression gap based on socioeconomic background.

Moreover, this gap widens at every stage of study. The more advanced the degree, the fewer students from low-socioeconomic backgrounds there are in the cohort.

Socioeconomic background by progression stage – all students (pooled)



NS-SEC, all subjects | Masters = any masters qualification or integrated masters
N (All Undergraduate) = 2,132,556 | N (Masters) = 487,216 | N (PhD) = 45,567

Although students from low- and medium-socioeconomic backgrounds progress to STEM postgraduate study at comparable rates, these similar progression rates likely have different causal explanations.

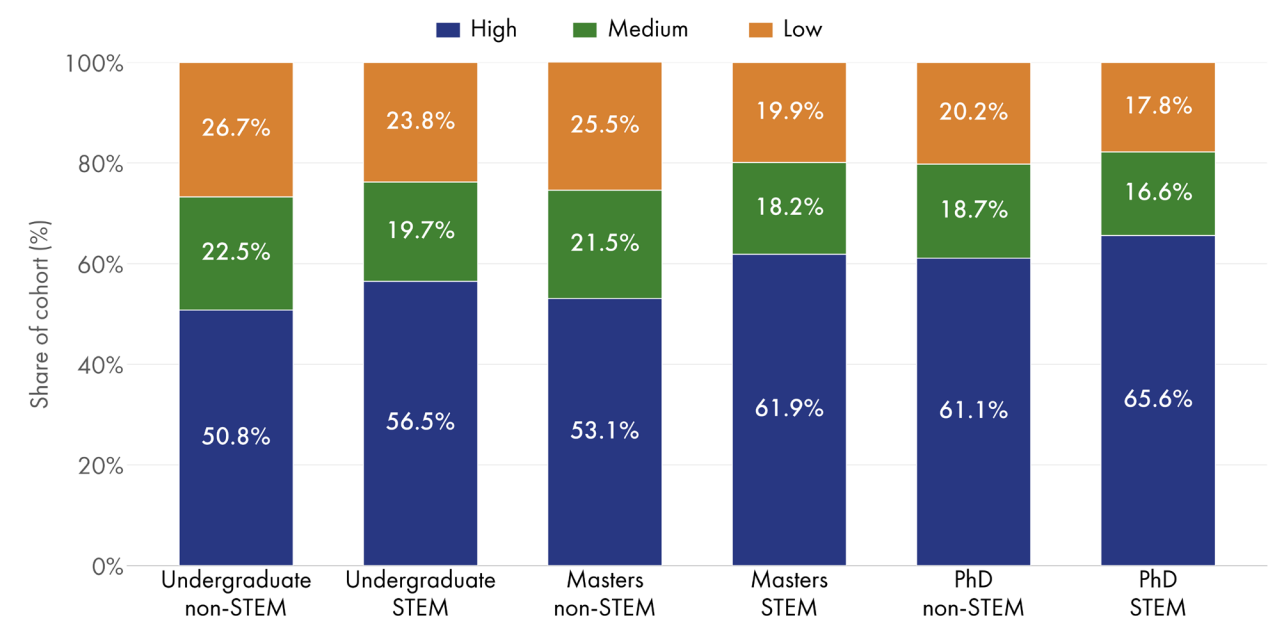
Students from medium-socioeconomic backgrounds enter undergraduate study across all subjects at overall slightly lower rates than students from low-socioeconomic backgrounds. In other studies which use other measures of disadvantage, students from comparable backgrounds progress at higher rates than the most disadvantaged students.¹¹ The trend we see in our data likely reflects differences in measures of socioeconomic disadvantage. There may also be significant differences based on subject studied; for instance, a much higher proportion of students from medium-socioeconomic backgrounds study medicine than students from low-socioeconomic backgrounds.¹²

Similar progression rates between students from low and medium socioeconomic backgrounds likely mask different barriers, expectations or priorities for students from medium-socioeconomic backgrounds compared to students from low-socioeconomic backgrounds, rather than similar experiences of barriers to study. Progression rates for students from both low and medium-socioeconomic backgrounds are both important, and further research is needed to better understand the motivations, choices and experiences of students from these groups. Overall, the fact remains that the majority of STEM students come from the highest socioeconomic backgrounds, who are much more highly represented in all STEM degree cohorts compared to students of all other backgrounds.

STEM's progression gap is steeper than almost any other discipline. Only Arts PhDs have fewer students from low-socioeconomic backgrounds than STEM PhDs.

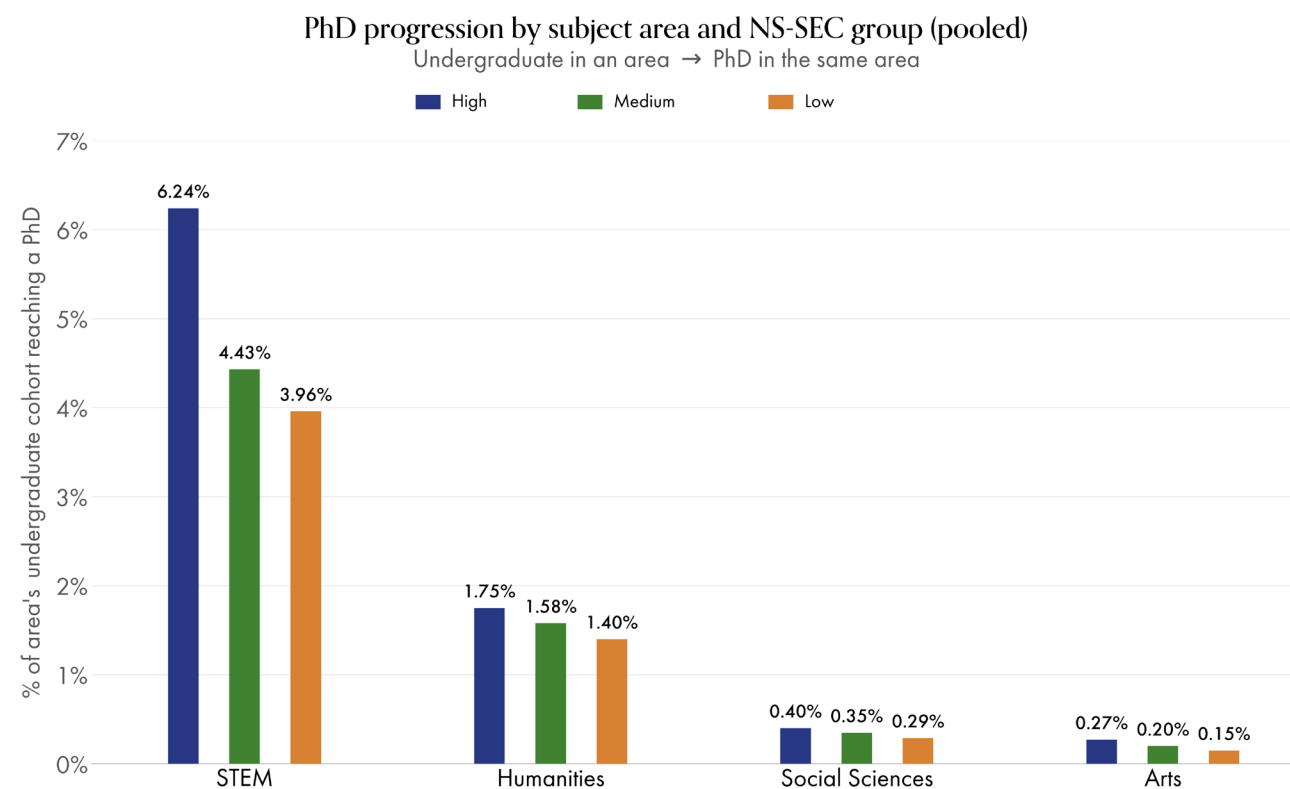
STEM has an acute postgraduate progression problem compared to many other subject areas. Across all levels of study, there are fewer students from low-socioeconomic backgrounds studying for STEM degrees than in all other non-STEM subjects.

Socioeconomic background: non-STEM vs STEM, by progression stage (pooled)



NS-SEC High/Medium/Low, tight STEM | Masters = standalone STEM MSc or integrated masters (MEng/MSci) | N (Undergraduate non-STEM) = 1,694,754 | N (Undergraduate STEM) = 437,802 | N (Masters non-STEM) = 452,947 | N (Masters STEM) = 165,397 | N (PhD non-STEM) = 29,628 | N (PhD STEM) = 25,657

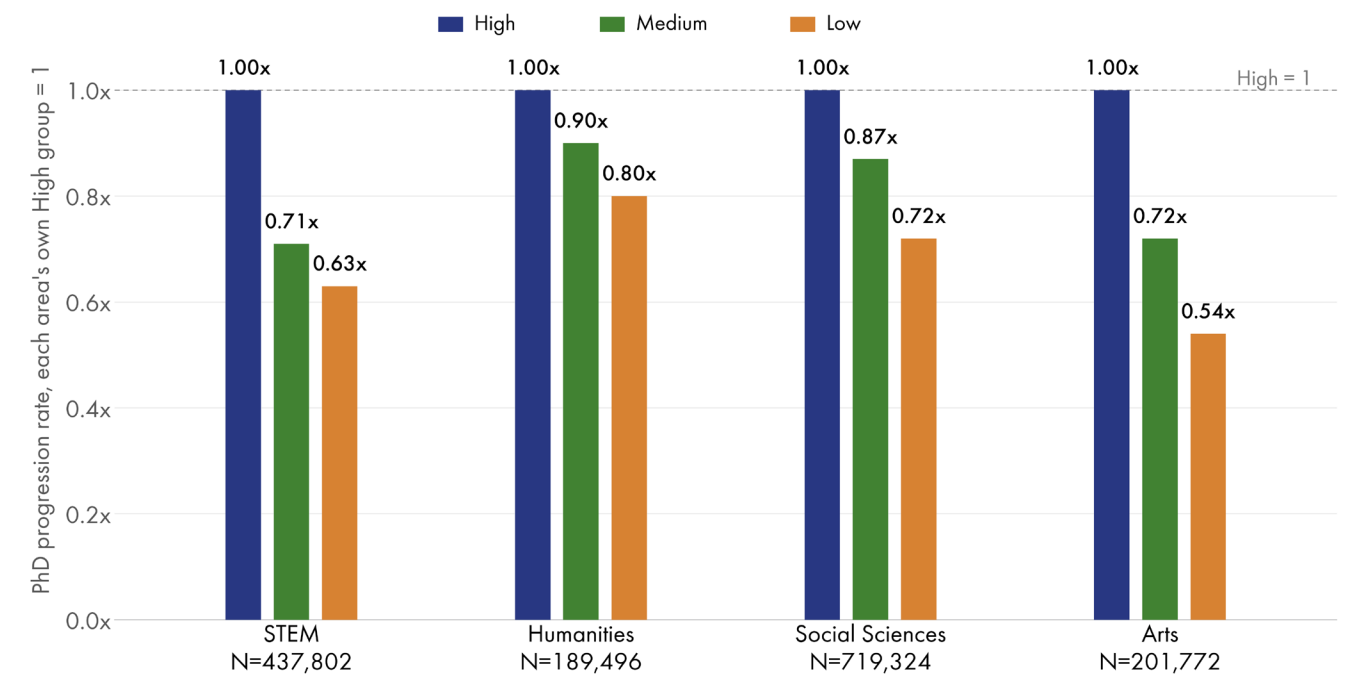
In absolute numbers, more STEM students progress to PhD than non-STEM students. Progression rates to PhD are generally below 1% of an undergraduate cohort across all non-STEM subjects, compared to 6-7% of an undergraduate cohort for a STEM degree. This may reflect a higher number of funded STEM PhDs compared to funded non-STEM PhDs.¹³



But if we compare progression rates across subject areas for students from low-socioeconomic backgrounds to students from high-socioeconomic backgrounds, we can see STEM's steep progression gap compared to other subject areas. Setting the progression rate to PhD for students from high-socioeconomic backgrounds to one allows us to see the relative progression rates for students from medium and low-socioeconomic backgrounds.

PhD progression relative to each area's own High NS-SEC group (pooled)

How steep the class gradient is within each subject area, not how high the rates are



This shows that:

- Students from low-socioeconomic backgrounds progress to STEM PhDs at lower rates than they do to humanities and social sciences PhDs. Students from low-socioeconomic backgrounds have a progression rate of 0.63, while humanities and social sciences subjects are higher at 0.80 and 0.72 respectively.
- Only arts PhDs have lower progression rates for students from low-socioeconomic backgrounds than STEM PhDs (a progression rate of 0.54, 0.46 lower than progression for students from high-socioeconomic backgrounds).

STEM degree cohorts are not representative of the general population.

33% of the UK are from low-socioeconomic backgrounds – but only

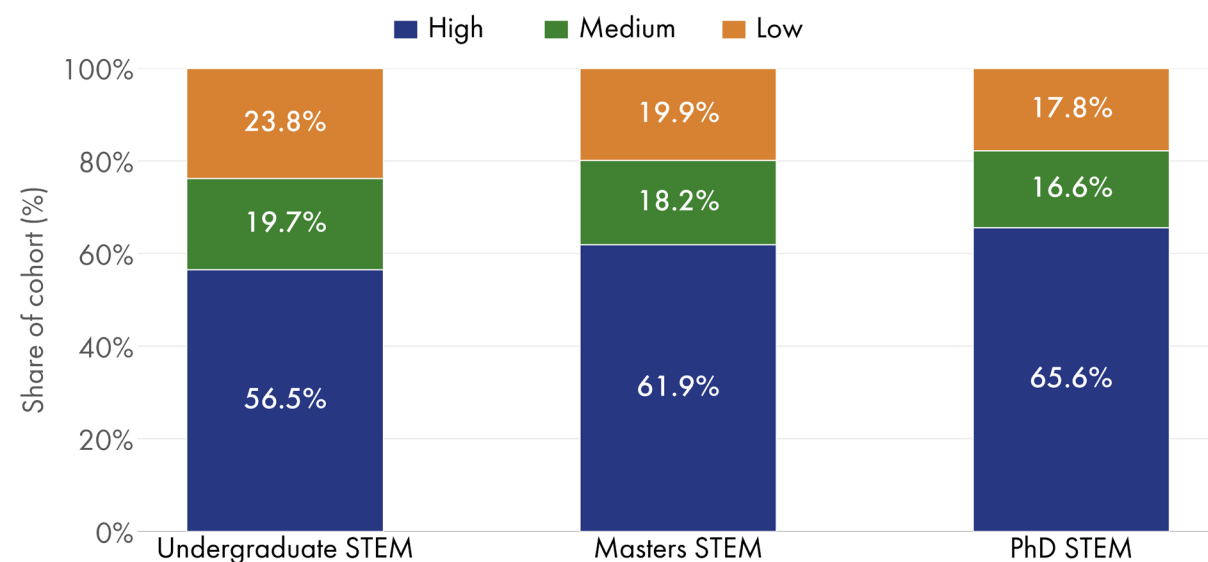
18% of STEM PhDs are from the same backgrounds.

'No one explained any of this stuff... there's a complete barrier because we don't know what we don't know.'

MALE, NON-CDT, ENGINEERING & TECHNOLOGY, RESEARCH INTENSIVE UNIVERSITY

On all STEM degree programmes, there are far fewer students from low-socioeconomic backgrounds than students from high-socioeconomic backgrounds.

Socioeconomic background by STEM progression stage (pooled)

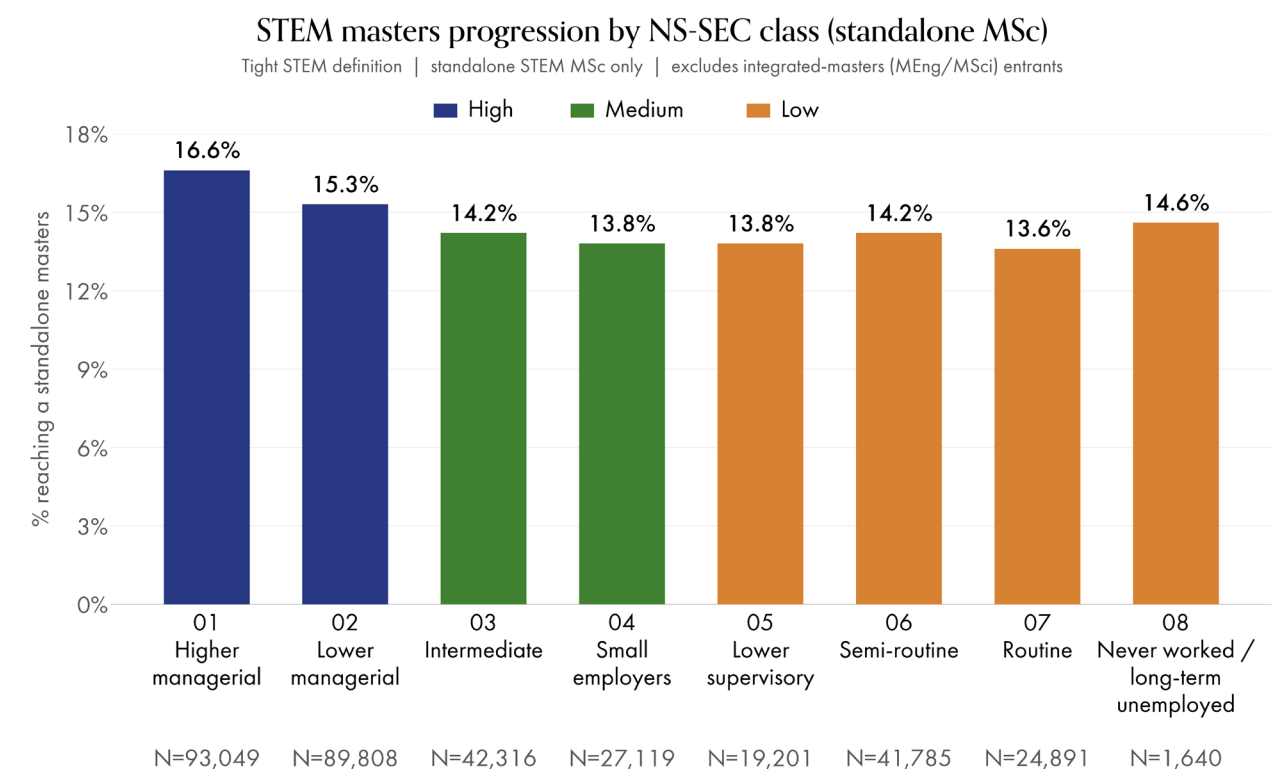


NS-SEC, tight STEM definition | Masters = standalone STEM MSc or integrated masters (MEng/MSci) |
 N (Undergraduate STEM) = 437,802 | N (Masters STEM) = 165,397 | N (PhD STEM) = 25,657

Progression from undergraduate to masters

Students from low-socioeconomic backgrounds make up less than a quarter (23.8%) of students on all STEM undergraduate degrees. By masters level, students from low-socioeconomic backgrounds drop to a fifth (19.9%).

Low-socioeconomic students progress to masters level study at lower levels than their peers. While 16.6% of students from the highest socioeconomic backgrounds progress from STEM undergraduate study to a STEM masters degree, only 14% of students from medium and lower socioeconomic backgrounds make the same leap.



Students from low-socioeconomic backgrounds are particularly underrepresented on integrated masters programmes (e.g. MEng, MSci).¹⁴ Only 17% of students on integrated masters degrees come from low-socioeconomic backgrounds, compared to 65.6% of students from high-socioeconomic backgrounds.

'I didn't know if I wanted to do a PhD or not... So I decided to do a masters by research just to see if I would like spending more than a month doing a specific project.'

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

Progression from undergraduate study through to PhD in STEM

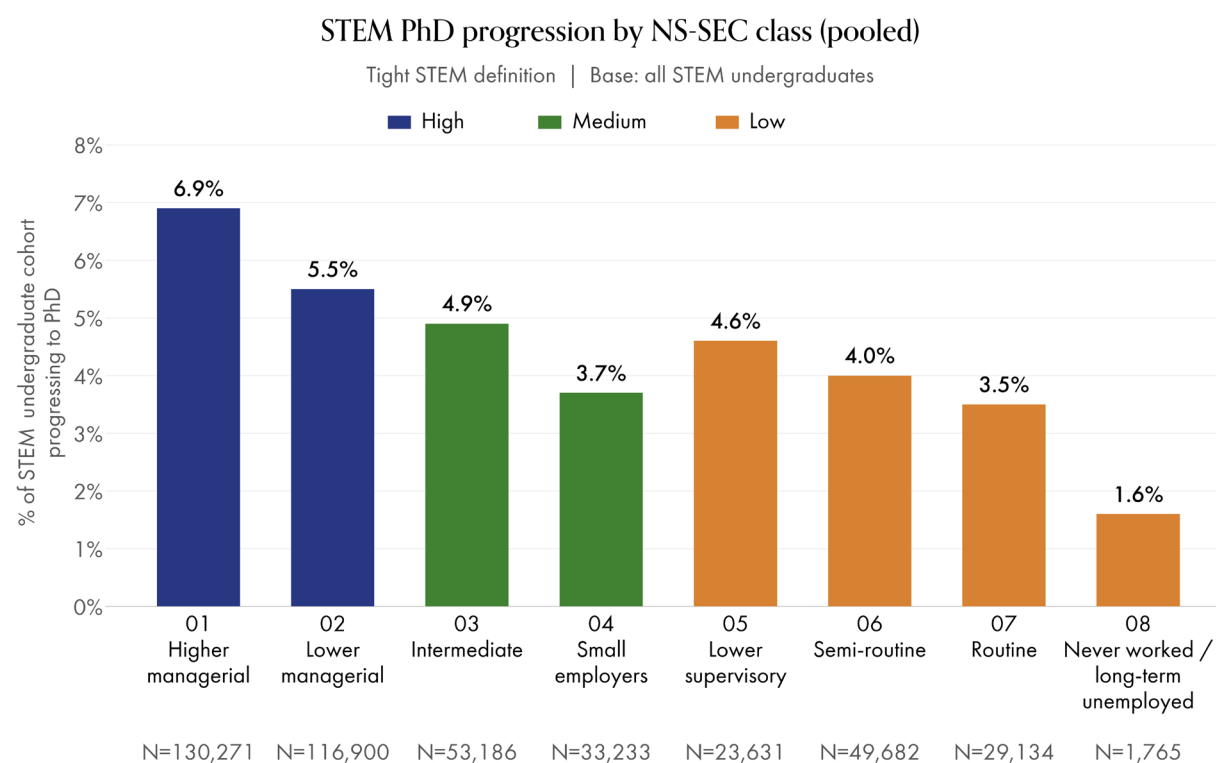
PhDs are the least socioeconomically diverse of all STEM degrees, with the exception of integrated masters programmes. By doctoral level, the proportion of students from low-socioeconomic backgrounds declines to only 17.8% of students, close to a sixth.

By contrast, the proportion of students from high-socioeconomic backgrounds increases throughout the pipeline.

- Students from high-socioeconomic backgrounds make up 56.5% of STEM undergraduate cohorts. This rises to 61.9% of masters STEM students.
- By PhD, 65.6% – almost two thirds – of STEM PhD students are from high-socioeconomic backgrounds.

Fewer than 10% of all STEM undergraduates eventually progress to PhD, regardless of background. Yet of those who progress to doctoral study, students from the highest socioeconomic backgrounds progress at higher rates than students from lower socioeconomic backgrounds. There is a 3.5 percentage point progression gap between students from the highest socioeconomic backgrounds – those whose parents/carers hold higher managerial professions – and those from the lowest, whose parents/carers work in routine/manual professions.

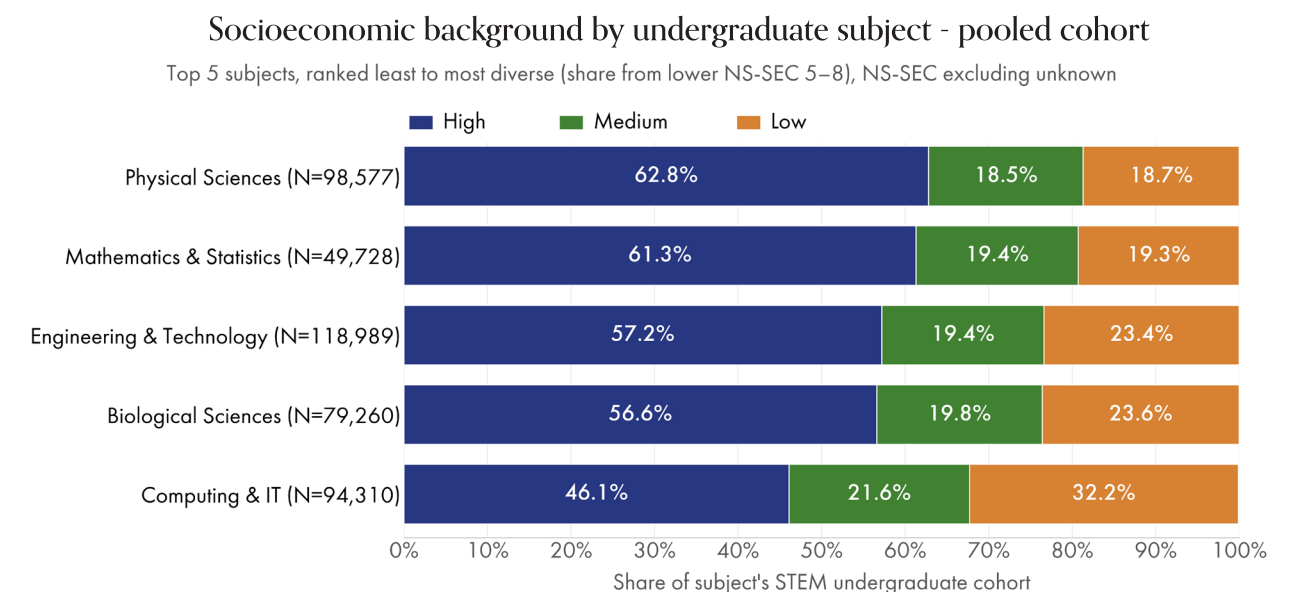
Some STEM subjects have particularly small proportions of students from low-socioeconomic backgrounds compared to others.



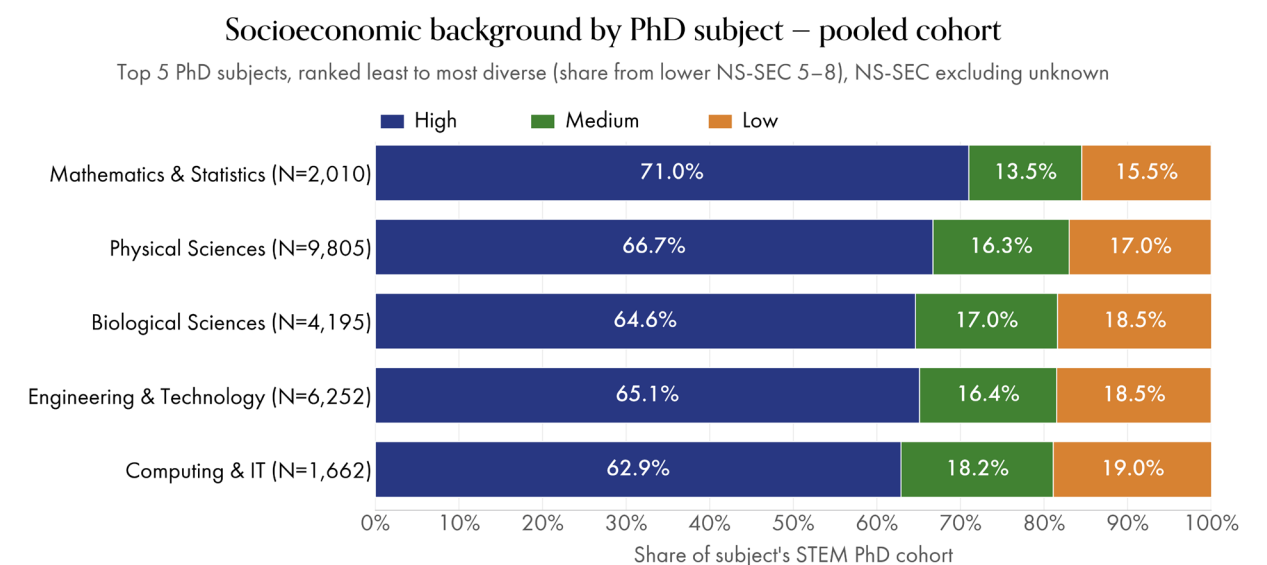
The biggest progression gaps in STEM subjects are in mathematics and statistics and physical sciences, including physics and chemistry.

For physical sciences undergraduate degrees – which includes subjects like physics and chemistry – less than a fifth (19%) of students come from low-socioeconomic backgrounds. By comparison, 32.2% of students on computing and IT undergraduate degrees come from low-socioeconomic backgrounds.

By PhD level, mathematics and statistics PhDs are the least socioeconomically diverse STEM degree programmes. Students from low-socioeconomic backgrounds represent just 15.5% of PhD students in mathematics and statistics, and 17% of PhD students in physical sciences.



Even subjects which are more socioeconomically diverse at undergraduate level see a growing progression gap in postgraduate study. For instance, while 32.2% of computing and IT undergraduates come from low-socioeconomic backgrounds, this drops to 19% of computing and IT PhD students.



Base: STEM undergraduates who went on to a STEM PhD. Subject is the PhD's subject, not the undergraduate subject.



Chapter 2

Attainment, Institution Type and the STEM Progression Gap

Attainment, Institution Type and the STEM Progression Gap

A student's path to a STEM PhD should be dictated by their talent and motivation, not circumstances beyond their control. But even where two students have the same strong academic record, the data shows students from a low-socioeconomic background are still less likely to progress.

To explore the progression gap between students from high and low-socioeconomic backgrounds, we use two different measures of attainment: (a) whether a student achieved a first-class degree; and (b) whether they entered university with a high UCAS tariff based on their previous attainment (performance in A levels or equivalent). We also explored progression rates by institution type: if students attended a 'Golden Triangle', 'research intensive', 'pre-1992' and 'post-1992' institution for undergraduate study.¹⁵

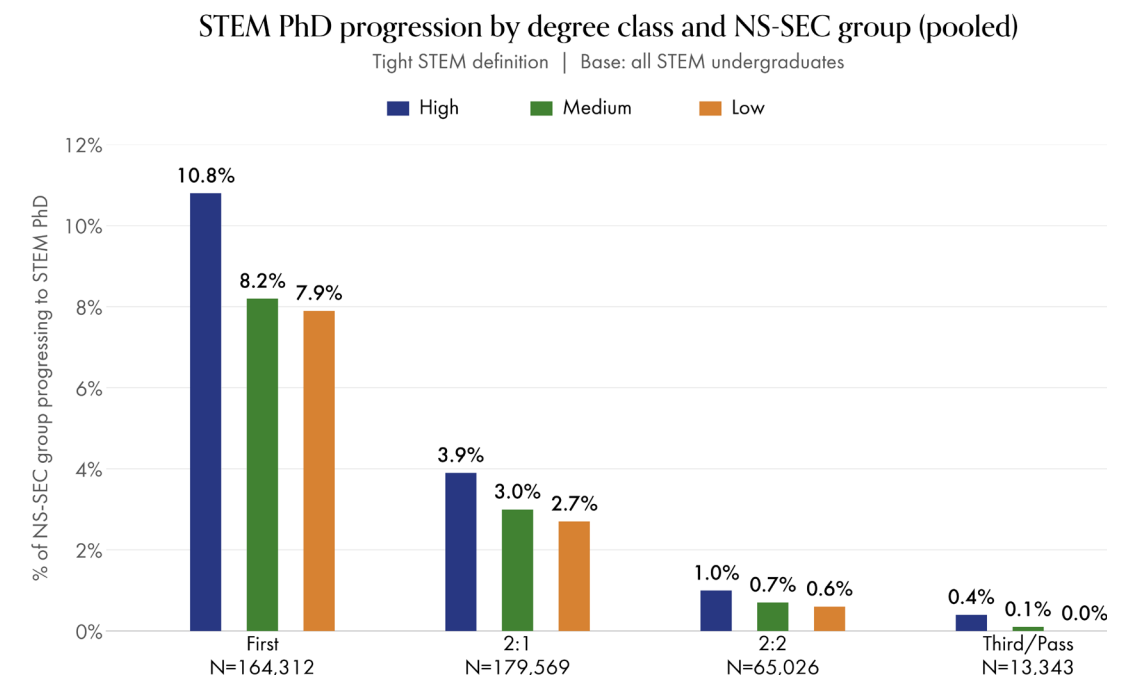
We also explored the progression gap through regression analysis. Imagine two students identical in every way: the same attainment, institution, subject studied, school history, as well as their gender and ethnicity. The only thing that is different about them is their socioeconomic background. How likely is each to progress to a STEM PhD?

'I knew that I couldn't afford to do a masters degree, so therefore I assumed that I would never get a PhD... It didn't occur to me that I could be a researcher.'

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Attainment by degree classification

Unsurprisingly, students with lower degree performance (2:2 or a third/pass) have low progression rates to PhD, regardless of background. But for students with 2:1s and firsts, we see a noticeable difference in progression rates between students from higher and lower socioeconomic backgrounds.



10.8% of students from high-socioeconomic backgrounds with firsts progress to PhD. But for students from low-socioeconomic backgrounds with firsts, only **7.9%** progress to PhD.

The most noticeable gap is for students with first-class degrees. Students from low-socioeconomic backgrounds with 2:1s progress at slightly lower rates than students from high-socioeconomic backgrounds with the same degree classification (a 1.2 percentage point gap).

Attainment by UCAS tariff

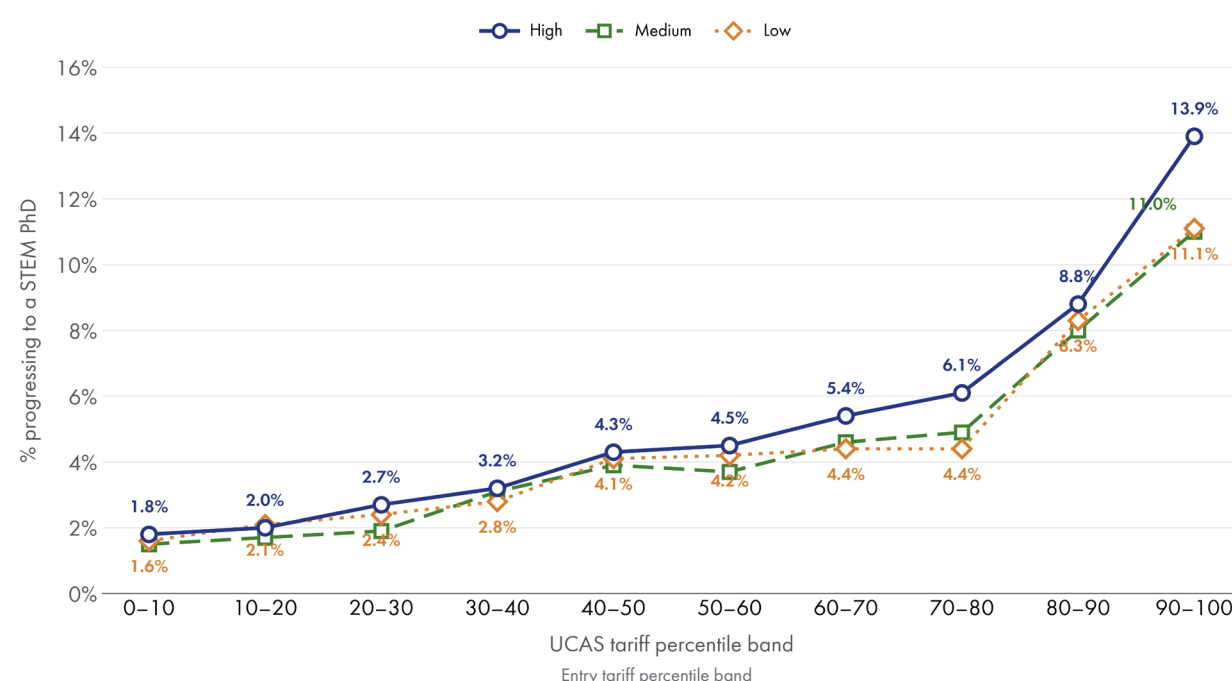
When considering attainment by UCAS tariff, we see a similar trend.

- 11.1% of students from low-socioeconomic backgrounds with the highest possible A level or equivalent grades progress to PhD.
- For students from high-socioeconomic backgrounds with the same grades, 13.9% progress to PhD, a percentage point gap of 2.8.

The data for UCAS tariff is suggestive only. This is because not all students enter undergraduate study with qualifications which count towards the UCAS tariff, including many mature students and students accessing higher education through further education (FE) colleges or, in the Scottish context, through articulation routes.

STEM PhD progression by UCAS tariff percentile and NS-SEC group

Tight STEM definition | Base: STEM undergraduate students with non-missing UCAS tariff score



Understanding progression gaps by attainment and institution

Previous research into socioeconomic background and postgraduate progression from the Institute of Fiscal Studies (IFS), based on students in the early 2000s and 2010s, found that students' prior attainment – at school and at undergraduate study – appeared to be the main driver of weak progression to postgraduate study for students from low-socioeconomic backgrounds.¹⁶

The IFS' research found that a progression gap between students from high and low-socioeconomic backgrounds may be explained by the fact that students from low-socioeconomic backgrounds typically have lower attainment, reflecting proven links between socioeconomic background and lower attainment throughout the education system in the UK and in many other education systems.¹⁷ Controlling for all other factors, a student from a low-socioeconomic background with the same attainment and institution history as a student from a high-socioeconomic background is no less likely to progress to postgraduate study. But given students from low-socioeconomic backgrounds are less likely to have high prior attainment and progress to more research-intensive universities, they ultimately overall progress at lower rates.

The IFS' research was not specific to STEM subjects, nor to progression to PhD. It also explored trends for students in an earlier cohort, those who would have started undergraduate study in 2004, when rates of progression to undergraduate study for low-socioeconomic students were lower and before the introduction of postgraduate loans (introduced in 2016).

To explore trends for STEM students in more recent cohorts, we use a binary logistic regression to see how far prior attainment can explain the progression gap for STEM. We use socioeconomic variables – such as NS-SEC used thus far in this report – to model probability of progression and to understand what makes students more or less likely to progress to STEM postgraduate study when controlling for all other factors.

Understanding selection effect

The students in our sample are those who have already progressed to undergraduate study in a STEM subject. These students may have traits or characteristics we cannot observe in the data – such as higher levels of unobserved motivation, persistence or ability – but which make students more likely to be in the sample in the first place.

To put it simply: students from low-socioeconomic backgrounds are already much less likely to study a STEM undergraduate degree, less likely to have high attainment at school, less likely to study triple science at GCSE and study STEM subjects at A level.¹⁸ The kind of student who bucks all these trends, and who goes on to study a STEM undergraduate degree from a low-socioeconomic background, may have certain characteristics – such as particularly high academic ability or motivation. These characteristics may explain both why these students make it to STEM undergraduate study and which also compensate for any potential negative impact caused by their socioeconomic background when progressing to postgraduate study.

The regression tables across the page model the likelihood of progression to STEM postgraduate study (masters and PhD) based on individual variables when controlling for all other factors. The lack of statistically significant effect for socioeconomic background likely reflects this selection effect.

Getting into a top university also does not close the progression gap for students from low-socioeconomic backgrounds.

The university that a student attends for undergraduate and/or masters study can also be used as a suggestive – though partial – indicator of student attainment.

Using this new dataset, we explore how many students from low-socioeconomic backgrounds who do attend a Golden Triangle or research intensive university for undergraduate study progress to postgraduate study, by our categorisations.

'I didn't really know what the route was... until I was actually in the application process, I had no idea.'

FEMALE PHD STUDENT, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

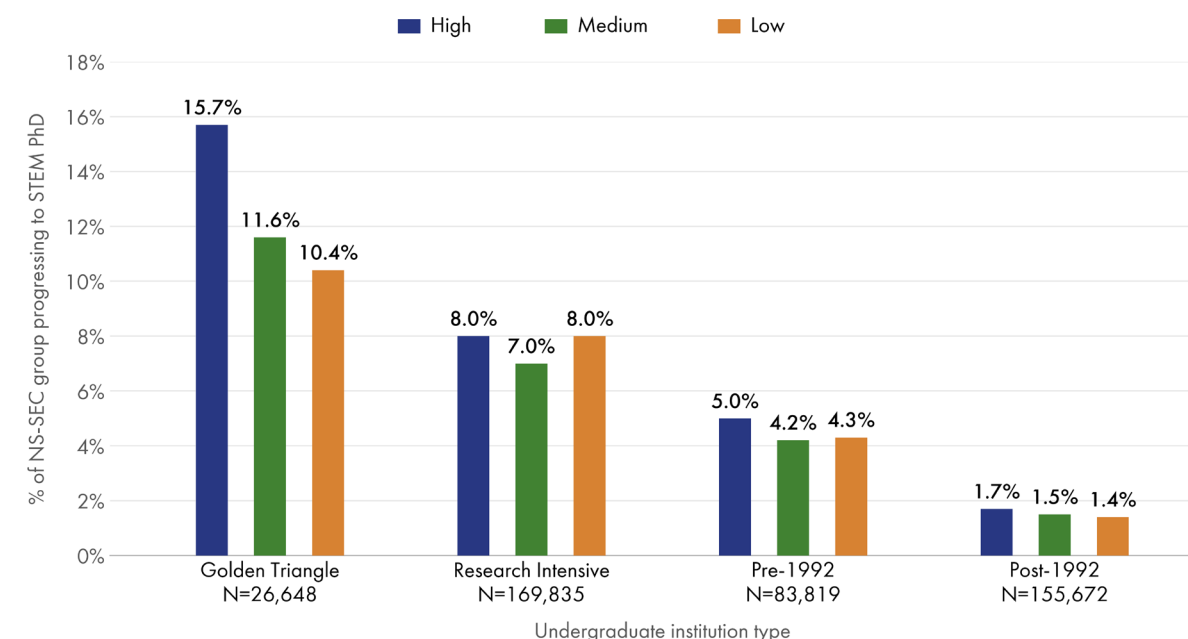
We see a significant progression gap between students from low-socioeconomic backgrounds who attended a Golden Triangle institution for undergraduate study and their peers from high-socioeconomic backgrounds.

- 15.7% of undergraduates from the highest socioeconomic backgrounds studying at Golden Triangle institutions progress to PhD.
- By comparison, only 10.4% of Golden Triangle students from the lowest socioeconomic backgrounds progress to PhD.

The progression gap for Golden Triangle institutions is striking. Given undergraduate entry requirements, students at Golden Triangle universities typically enter undergraduate study with very high prior attainment at A level or equivalent. This suggests some of the highest-achieving students from low-socioeconomic backgrounds in the UK may be exiting the postgraduate research pipeline after undergraduate study while students from high-socioeconomic backgrounds go on to further study.

STEM PhD progression by institution type and NS-SEC group (pooled)

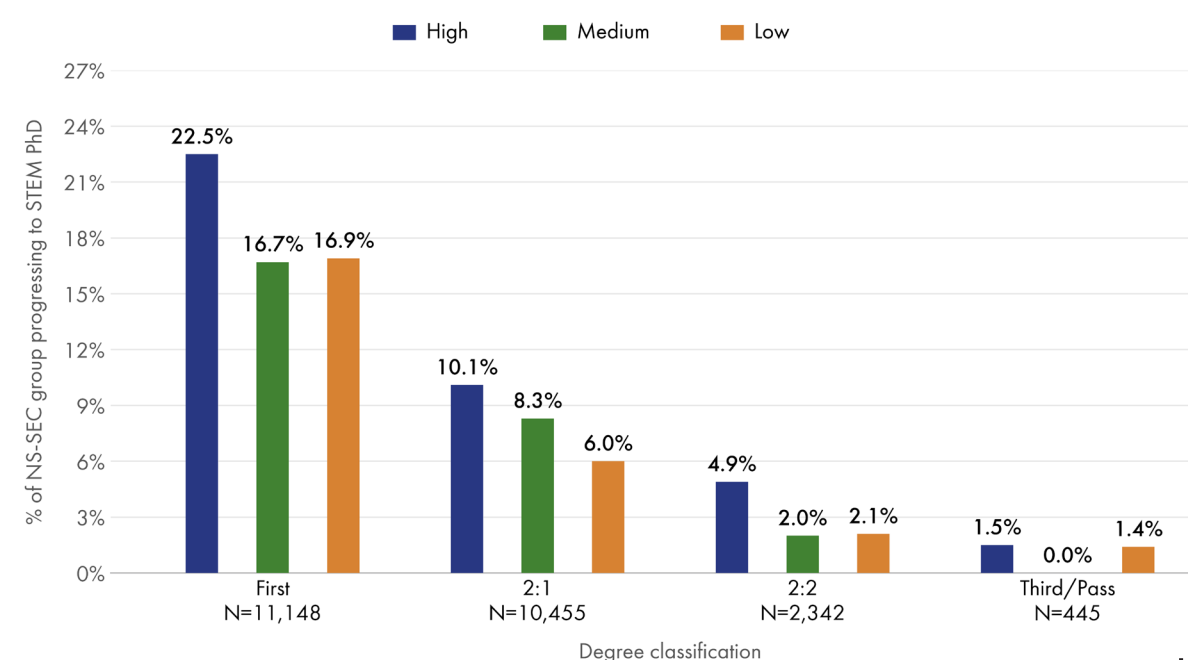
Tight STEM definition | Base: all STEM undergraduates



Significantly, we also see a progression gap between students with first class degrees at Golden Triangle institutions. 22.5% of undergraduate students from high-socioeconomic backgrounds who obtain a first at Golden Triangle institutions progress to a PhD, compared to just 16.9% of students from low-socioeconomic backgrounds with a first.

STEM PhD progression by degree class and NS-SEC group (pooled)

Tight STEM definition | Base: STEM undergraduates at Golden Triangle universities



The progression gap is widest for students who studied at Golden Triangle institutions for undergraduate study. There seems to be no progression gap between students from the highest and lowest socioeconomic backgrounds who attended research intensive institutions as undergraduates (as distinct from Golden Triangle institutions, see Appendix). While progression from pre-92 and post-92 institutions is much lower overall, the progression gap based on socioeconomic background is only small (0.1 percentage points).

The two strongest predictors of progression to STEM PhD – for any student, of any background – are prior attainment and institution type.

Regression analysis allows us to explore which variables seem to be the strongest predictors for likelihood of progression to PhD, controlling for all other factors. For any student of any background, attainment is a very strong predictor of whether a student is likely to progress to STEM PhD, controlling for all other factors. In our model, we see that, for all students no matter their socioeconomic backgrounds, the two most important predictors of likelihood to progress to a STEM PhD are:

- Having a first-class undergraduate degree.
- Attending a Golden Triangle or research intensive university for undergraduate study.

This is true for students from low-socioeconomic backgrounds. In line with the IFS’ earlier research, our model finds that socioeconomic background appears to have no statistically significant effect on likelihood of progression from undergraduate study to postgraduate study in STEM when controlling for all other factors, including attainment.

Having no statistically significant effect does not mean that socioeconomic background has no impact on progression to STEM postgraduate study. As this research shows, there are clearly far fewer students from low-socioeconomic backgrounds in STEM degree cohorts at undergraduate, masters and PhD level and that these students progress at a lower rate. Just because characteristics do not show up in a dataset does not mean they have no impact; it merely means they cannot be observed in the data when using models which try to establish causation.

This is a persistent challenge across the secondary literature when trying to track the impact of social class or socioeconomic background on learner progression. In this literature, the effect of family background on educational transitions is often constant across transitions once attainment is controlled for.¹⁹ In line with the wider secondary literature, we strongly suspect that this is a selection effect, reflecting attainment gaps based on socioeconomic background much earlier in the educational pipeline.

Variable	Progression to masters	Progression to PhD
Attending a Golden Triangle university for undergraduate study (compared to attending a post-92 institution)	Positive effect (+0.38 *)	Very strong positive effect (+11.91 ***)
Attending a research intensive university for undergraduate study (compared to attending a post-92 institution)	Positive effect (+2.51 ***)	Strong positive effect (+7.30 ***)
Having a 2:1 (compared to having a first)	Negative effect (-1.33 ***)	Strong negative effect (-7.47 ***)
Having a 2:2 (compared to having a first)	Negative effect (-1.93 ***)	Very strong negative effect (-14.26 ***)
First generation student (compared to having at least one parent/carers who went to university)	Negative effect (-0.81 ***)	Negative effect (-0.52 **)
Being from a medium-socioeconomic background (intermediate NS-SEC) (compared to high-socioeconomic background)	Negative effect (-0.28 *)	Negative effect (-0.85 **)
Being from a low-socioeconomic background (routine and manual NS-SEC) (compared to high-socioeconomic background)	No statistically significant effect^	No statistically significant effect^

Getting top grades and attending a top university make students more likely to progress to STEM postgraduate study – but the boost is smaller for students from low-socioeconomic backgrounds.

But our regression models also suggest that students from low-socioeconomic backgrounds gain less from high achievement than their more advantaged peers.

Our regression models allow us to compare progression based on combinations of different variables. Given we know that getting top grades and attending a top university makes a student more likely to progress to STEM postgraduate study, we can explore whether students from low-socioeconomic backgrounds who do have high attainment or attend Golden Triangle and research intensive institutions are as likely to progress as students with the same strong academic record but who come from high-socioeconomic backgrounds.

Here we see statistically significant results. Even when students from low-socioeconomic backgrounds get top grades or attend a top university, they are still less likely than a student from a high-socioeconomic background with the same academic track record to progress to STEM PhD.

The boost that having high prior attainment – for instance, high A level or equivalent results – or attending a Golden Triangle or research intensive university usually provides in progression is weaker for students from lower socioeconomic backgrounds. Even when controlling for other factors, the data shows that:

- **Top grades count for less for students from low-socioeconomic backgrounds.** While all students who are in the top decile of UCAS tariff are more likely to progress to postgraduate study, those from low-socioeconomic backgrounds progress at a lower rate than their peers from high-socioeconomic backgrounds.
- **Attending a top university counts for less for students from low-socioeconomic backgrounds.** Attending a Golden Triangle university is one of the strongest predictors of progression to PhD – but that premium is smaller for students from low-socioeconomic backgrounds, by 0.9 points for masters progression and 1.6 points for doctoral progression.
- **The penalty for lower academic performance is higher for students from low-socioeconomic backgrounds.** A weak degree result (third/pass) is more costly for a student from a low-socioeconomic background than for a student with the same degree from a high-socioeconomic background.

Interaction	Progression to masters	Progression to PhD
Low-socioeconomic background with the highest UCAS tariff score (compared to high-socioeconomic background and having the same UCAS tariff score)	No significant effect	Negative effect (-1.50***)
Low-socioeconomic background and attended a Golden Triangle university for undergraduate (compared to high-socioeconomic background and going to a Golden Triangle university for undergraduate)	Negative effect (-0.88*)	Negative effect (-1.59*)
Low-socioeconomic background and attended a research intensive university for undergraduate (compared to high-socioeconomic background and attended a research intensive university for undergraduate)	No statistically significant effect	No statistically significant effect
Low-socioeconomic background and attended a pre-92 university for undergraduate (compared to high-socioeconomic background and attended a pre-92 university for undergraduate)	Negative effect (-0.54**)	No statistically significant effect

Interaction	Progression to masters	Progression to PhD
Low-socioeconomic background with a 2:2 (compared to a student with the same grade from a high-socioeconomic background)	Negative effect (-0.40*)	No significant effect
Low-socioeconomic background with a third or pass (compared to a student with the same grade from a high-socioeconomic background)	No significant effect	Strong negative effect (-14.74*)

We can speculate why high-achieving students from low-socioeconomic backgrounds may be less likely to progress than high-achieving, high-socioeconomic background peers. For instance, students from higher socioeconomic backgrounds may be better able to capitalise on the advantages associated with strong university attainment and/or enrolment at a top university.

Students from high-socioeconomic backgrounds may also be in a better position to bear the risk of further time with low income or being out of the labour market, especially where there is not a guarantee of progression to desired employment. An attractive graduate job offer could be a stronger draw for students from low-socioeconomic backgrounds if they do not feel they have the luxury to decline.



Chapter 3

The Cost of the STEM Progression Gap

The Cost of the STEM Progression Gap

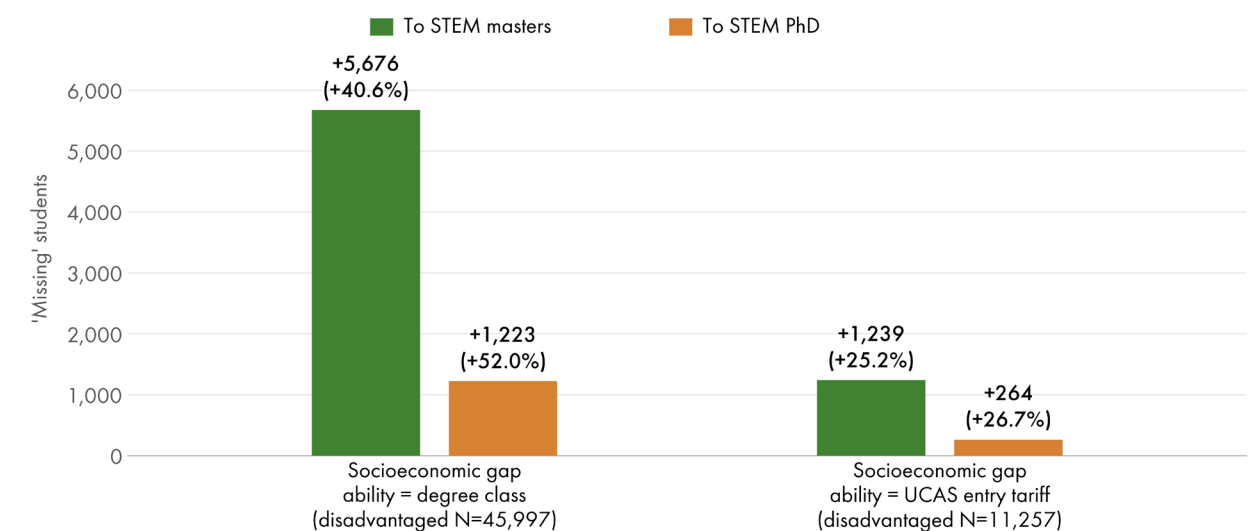
With this new data, we can both unpack the workings of the STEM progression gap based on socioeconomic background and also establish the scale of the loss to the STEM talent pool. How much potential STEM research talent is being left behind because of inequalities of access and progression?

The figures are concerning. If low-socioeconomic high achievers had progressed from undergraduate study to masters study at the same rates as advantaged high achievers, the UK could have had as many as 5,676 more STEM masters students since 2015 – an increase of 41%.

The same pattern persists at the next stage of the pipeline. Gaining a place on a STEM PhD should reflect students' hard work and potential for research excellence. It should not reflect their privilege. If high achievers from low-socioeconomic backgrounds had progressed through to PhD at the same rates as high achievers from high-socioeconomic backgrounds, the talent pool the UK draws its STEM PhDs from would look meaningfully different. The UK could have had access to as many as 1,223 more STEM PhDs since 2015 – an increase of 52%.

'Missing' STEM postgraduates among disadvantaged high achievers

High-ability students, disadvantaged vs advantaged | pooled cohort, tight STEM



'Missing' students = disadvantaged headcount x (advantaged progression rate - disadvantaged rate), high-ability students only. Gap: Low NS-SEC (5-8) + no parental HE vs High NS-SEC (1-2) + parental HE. Ability = degree class (First/2:1) or UCAS entry tariff (top 25%). Masters = standalone STEM MSc or integrated masters (MEng/MSci). % in brackets is the uplift on the group's current headcount at that stage.

To understand where high-achieving disadvantaged students may be exiting the pipeline at higher rates, and the scale of the loss to the UK's STEM talent pool, we explored the correlation between students' backgrounds and their academic achievement.

We then built two student archetypes to explore different rates of progression across socioeconomic background and academic achievement.

Archetypes by degree classification

Low-socioeconomic background, no parental HE, good degree

Low-SES background, no parental higher education and a 2:1 degree or above



High-socioeconomic background, parents with HE, good degree

High-SES background, parents with higher education and a 2:1 degree or above



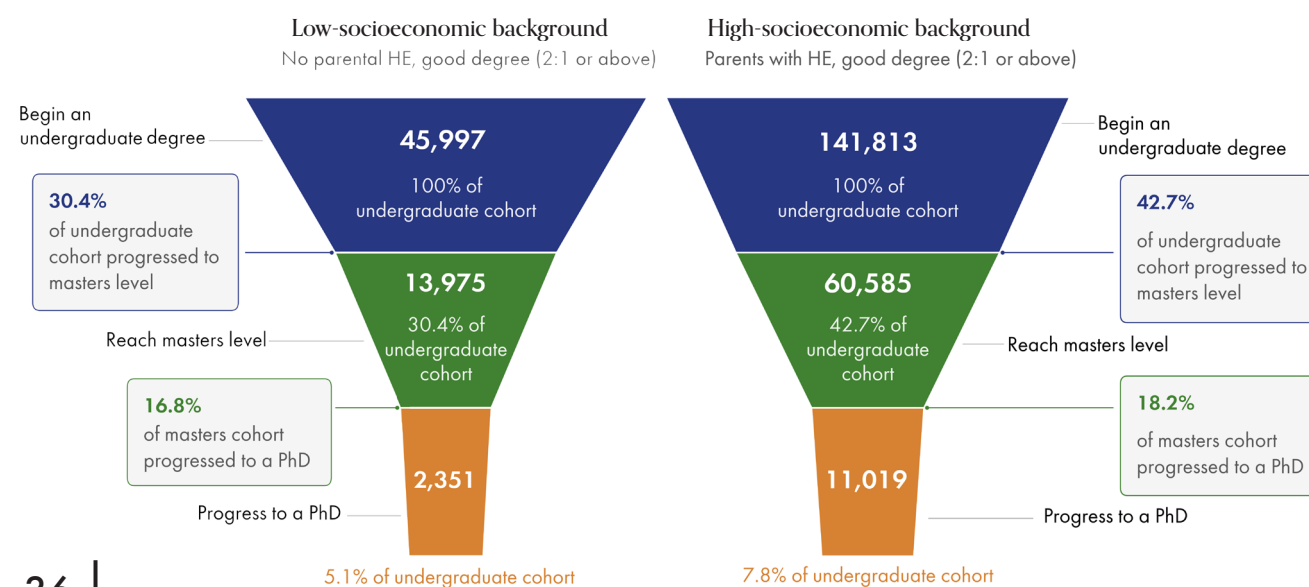
In this example, 'good degree' reflects students who have earned either a first or a 2:1 in their undergraduate degree, using degree classification as an indicator of a student's potential to progress to postgraduate study. This reflects the typical undergraduate degree classification entry requirements set as part of postgraduate admissions.

When using degree classification as an indicator of potential, we can see that:

- More than two-thirds (69.6%) of students from low-socioeconomic backgrounds with good degrees exit the pipeline after undergraduate study.
- Fewer students from high-socioeconomic backgrounds exit the pipeline at the same point. 57.3% of students from high-socioeconomic backgrounds with good degrees exit the pipeline after undergraduate study.

Only **30.4%** of students from low-socioeconomic backgrounds with good degrees progress from STEM undergraduate study to STEM masters study, compared to **42.7%** of high academic achievers from high-socioeconomic backgrounds.

PhD progression pipeline by degree classification:



By contrast, students from low-socioeconomic backgrounds with good degrees progress from masters to PhD at similar rates to those from high-socioeconomic backgrounds (between 17-18% of the cohort).

16.8% of masters students from low-socioeconomic backgrounds with good degrees go on to PhD, and 18.2% of those from high-socioeconomic backgrounds.

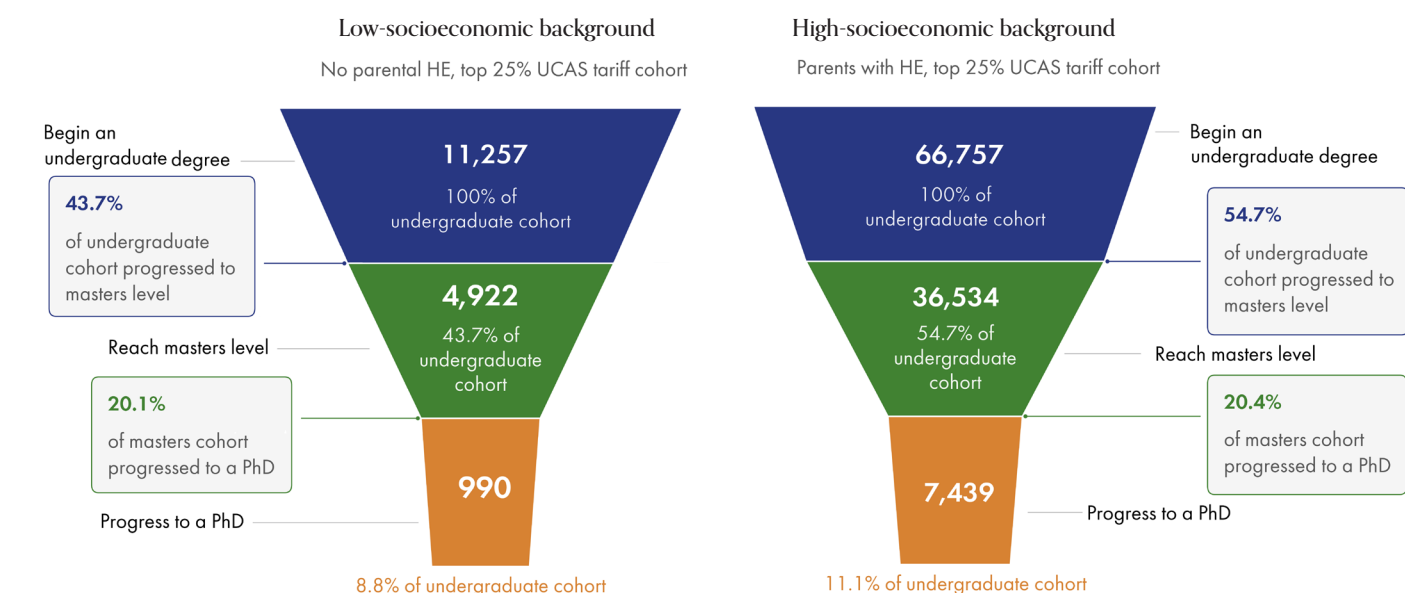
We also explored this using UCAS tariff prior to undergraduate entry as a second proxy for attainment.

Using the UCAS tariff as a suggestive measure of academic attainment, the data suggests:

- Approximately 44% of high academic achievers from low-socioeconomic backgrounds studying for STEM undergraduate degrees progress to STEM masters study, compared to 55% of high academic achievers from high-socioeconomic backgrounds.
- High academic achievers from low-socioeconomic backgrounds progress from STEM masters to PhD study at similar rates to high academic achievers from high-socioeconomic backgrounds, with 20% progressing to PhD.

As absolute numbers, more students from high-socioeconomic backgrounds with good degrees or from the top 25% of UCAS tariff exit the pipeline after undergraduate study than students from low-socioeconomic backgrounds. But more students from high-socioeconomic backgrounds enter STEM undergraduate study to start with – and students from low-socioeconomic backgrounds clearly progress at lower rates overall.

PhD progression pipeline by UCAS tariff:





Chapter 4

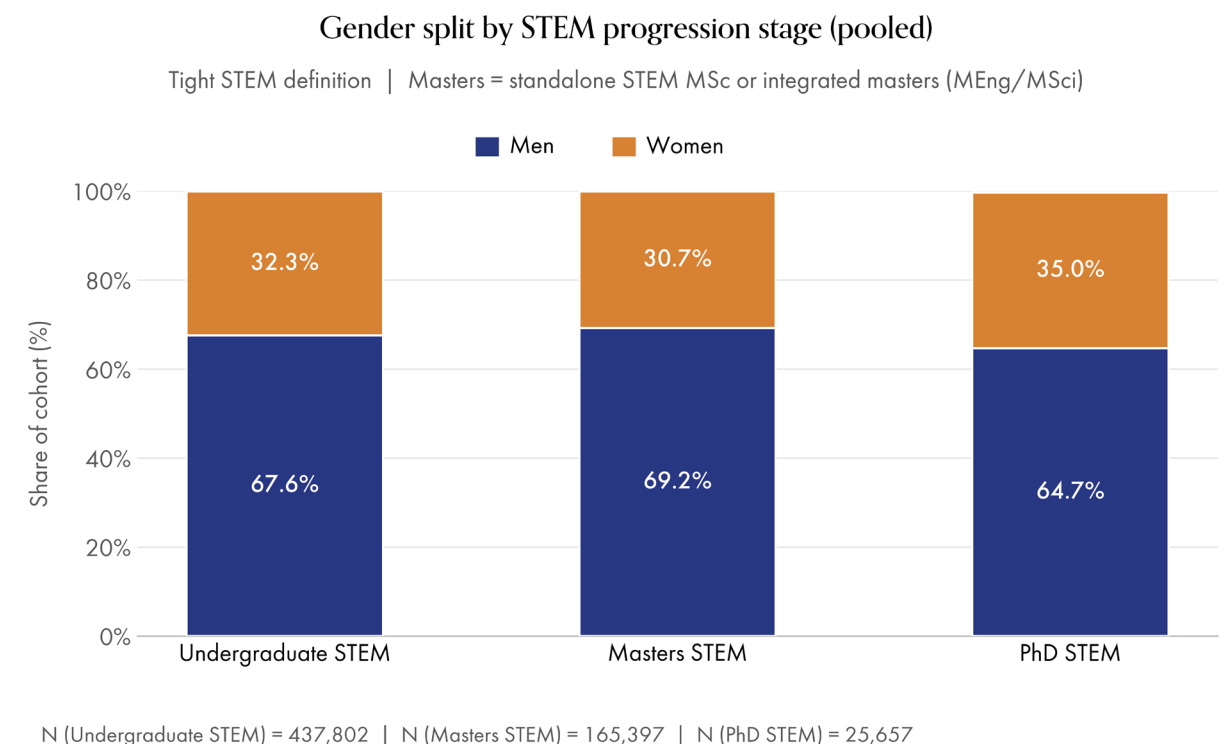
The STEM progression gap widens when looking at gender and ethnicity

The STEM progression gap widens when looking at gender and ethnicity

Previous research into progression gaps has made clear the persistent links between gender and/or ethnicity and progression to postgraduate study, as well as participation in higher education more broadly.²⁰ In light of this wider sector interest, we wanted to explore the potential intersection between gender, ethnicity and socioeconomic background and its impact on progression to STEM postgraduate study specifically.

The gender split in STEM has been documented as a persistent problem at every stage of the STEM researcher lifecycle for decades. Men outnumber women on all STEM degree programmes, from undergraduate through to PhD. Therefore, we explored whether those students from a low-socioeconomic background who are also a woman and/or an ethnic minority face an additional barrier to STEM postgraduate progression. The data shows there is a wider progression gap at certain stages of the pipeline once gender and/or ethnicity are taken into account.

'I didn't know anyone else who had undertaken a PhD.'
FEMALE, CDT, PHYSICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

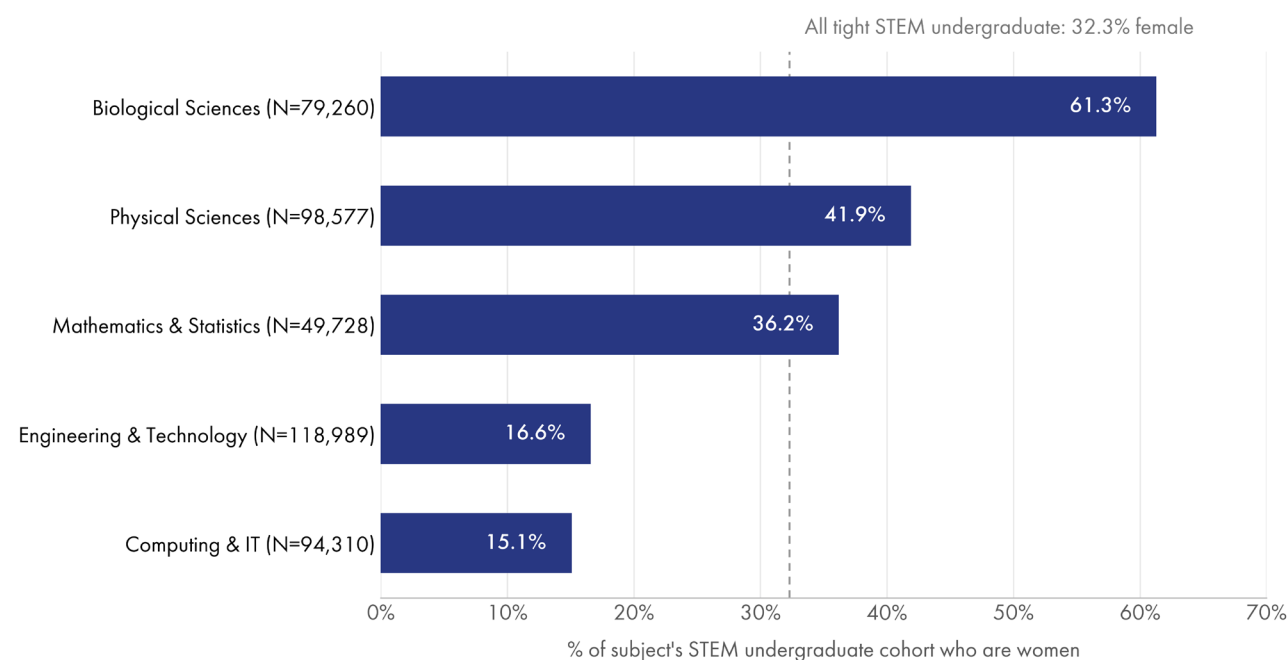


Women from low-socioeconomic backgrounds are less likely than men from low-socioeconomic backgrounds to progress to STEM postgraduate study, and particularly less likely to progress from undergraduate to masters study.

Of all STEM subjects, only biological sciences have a higher proportion of women in the cohort than men (61.3% female at undergraduate). All other subjects are majority male, with computing and IT having the fewest women in the cohort (15.1% at undergraduate).

Gender composition by STEM subject – pooled cohort

Tight STEM definition | Base: STEM undergraduates in that subject (incl. integrated masters)



There are also fewer women overall on integrated masters degrees. Men make up nearly three quarters (74.2%) of all integrated masters students. This largely reflects the subjects which typically offer integrated masters programmes, including engineering, physics, computer science and mathematics, which are typically male-dominated.

In our regression analysis, we find that gender is a significant predictor for progression to STEM postgraduate study. Women are 3.5 percentage points less likely than men to progress to a STEM masters, and 1.1 points less likely to progress to a doctorate, when controlling for all other factors.²¹

Variable	Progression to masters	Progression to PhD
Being female (compared to being male)	Strong negative effect (-3.46 ***)	Negative effect (-1.11 ***)
Being female and from a low-socioeconomic background (compared to being male and from a low-socioeconomic background)	Negative effect (-0.78 ***)	No statistically significant effect

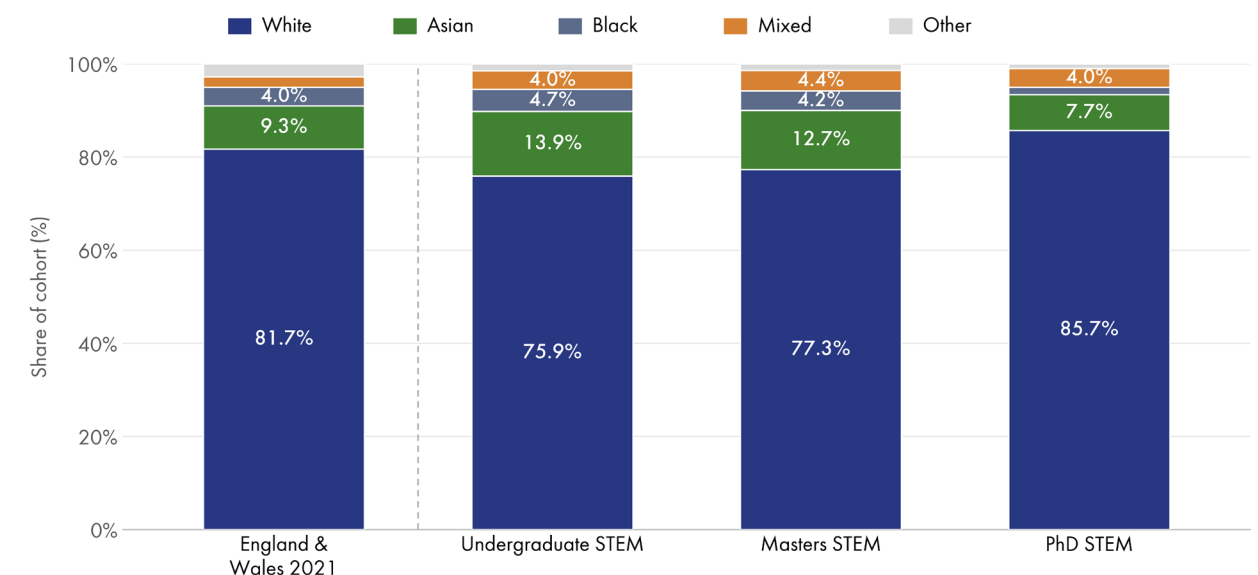
Being a woman – from any socioeconomic background – is still associated with lower likelihood of progressing to STEM postgraduate study and is particularly acute at the first rung on the ladder, masters study. But regression analysis also shows that, when looking at the intersection of gender and socioeconomic background, there is an additional penalty with women from low-socioeconomic backgrounds even less likely to progress, even when controlling for other factors.

Non-white students from low-socioeconomic backgrounds are 1.88 percentage points less likely to progress to PhD than non-white students from high-socioeconomic backgrounds.

Ethnicity shows a different pattern to gender. At undergraduate and masters level, STEM degree cohorts have a higher proportion of non-white students, and a lower proportion of white students, than in the wider population of England and Wales. At doctoral level, this trend reverses. STEM PhDs have a lower proportion of non-white students, and higher proportion of white students, than in the population of England and Wales as a whole.

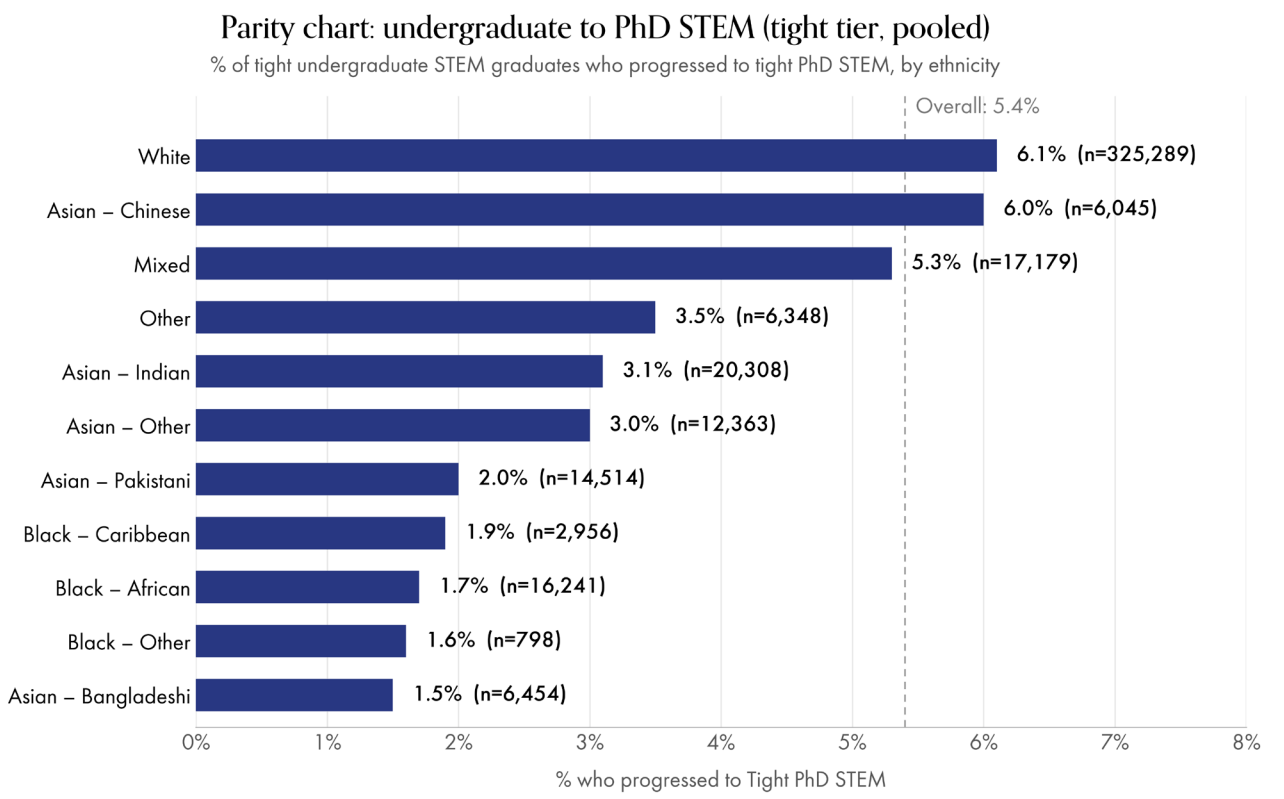
Ethnicity by STEM progression stage vs England & Wales population (pooled)

National 2021 Census baseline | Masters = standalone STEM MSc or integrated masters (MEng/MSci)



N (England & Wales 2021) = 59.6m | N (Undergraduate STEM) = 428,495 | N (Masters STEM) = 162,459 | N (PhD STEM) = 25,308. Cohort columns exclude unknown ethnicity. Baseline: ONS 2021 Census, all ages.

Progression rates to PhD vary significantly by ethnic background. White students and British Chinese students progress at similar rates (6.1% and 6% respectively). But British Asian students and Black British students progress at much lower rates, with only 1.5% of British Bangladeshi STEM undergraduates progressing to PhD.



When considering our regression model, ethnicity works in opposite directions in the transition from undergraduate to masters and in the transition from masters to PhD.

In our regression model, almost every minority ethnic group is more likely than white students to progress to a STEM masters, by between 0.5 and 3.5 percentage points, with the largest effects for Black African, Chinese and Other Asian students. At doctoral level this trend reverses: British Bangladeshi students are 9.3 points less likely to progress, British Pakistani students 6.1 points, British Indian students 5.8 points and British African students 4.7 points.

Variable	Progression to masters	Progression to PhD
Being British Asian - Bangladeshi (compared to being white)	Positive effect (+1.19 ***)	Strong negative effect (-9.27 ***)
Being British Asian - Indian (compared to being white)	Positive effect (+0.52 **)	Strong negative effect (-5.75 ***)
Being British Asian - Pakistani (compared to being white)	Positive effect (+1.44 ***)	Strong negative effect (-6.09 ***)
Being British Asian - Chinese (compared to being white)	Positive effect (+2.90 ***)	No statistically significant effect
Being British Black - African (compared to being white)	Strong positive effect (+3.22 ***)	Strong negative effect (-4.74 ***)
Being mixed (compared to being white)	Positive effect (+0.97 ***)	Negative effect (-1.33 **)

We also see the same overall trend for non-white students from low-socioeconomic backgrounds when considering the effect of the interaction between socioeconomic class and ethnicity. Non-white students from low-socioeconomic backgrounds are even more likely to progress to masters than non-white students from high-socioeconomic backgrounds.²² Conversely, this effect flips at progression to PhD, with low-socioeconomic backgrounds being associated with a stronger negative impact on progression from being non-white. This suggests that the transition from masters level study to doctoral study may represent a distinct bottleneck for some minority ethnic groups, particularly for those from low-socioeconomic backgrounds.

Variable	Progression to masters	Progression to PhD
Low-socioeconomic background and non-white (compared to non-white students from high-socioeconomic backgrounds)	Positive effect (+0.73 ***)	Negative effect (-1.88 ***)



Chapter 5

Student Reflections on the Path to PhD

Student Reflections on the Path to PhD

The data tells us that the STEM progression gap exists, where in the university pipeline it widens and how many talented STEM researchers it has cost the UK over the past decade. But what the data cannot show are the voices of students themselves: their reflections on the barriers they face on the path through postgraduate study and what would make navigating that path easier.

That is what our qualitative research sets out to do. We conducted three roundtables with current PhD students from lower socioeconomic backgrounds, studying a range of subjects at a range of institutions, including both Centre for Doctoral Training (CDT)-funded and non-CDT students.²³ We asked students how they came to apply for a PhD, what nearly stopped them, what their experience of navigating the STEM postgraduate pathway has been like and what has shaped these experiences throughout their path to the PhD.

STEM PhD students are problem solvers. In our focus groups, students shared their ideas about what would help make their path to doctoral study easier, and how they could be better supported to thrive and succeed throughout the course of their PhD. While not all the challenges they described are unique to students from low-socioeconomic backgrounds, many were compounded by financial circumstances and precarity that stemmed directly from students' socioeconomic background.

What they described was not a lack of ability or ambition, but a series of practical barriers that fall unevenly: a pathway that is difficult to navigate without inherited knowledge, a funding landscape that is hard to find your way around and slow to pay out and a reliance on individual supervisors to fill gaps which degree programmes and university support systems leave open.

Students often discover a love of research early as undergraduates - but struggle to navigate complex application and funding systems alone. Students describe having little prior knowledge and limited understanding from family and friends.

'I really love the work and the people that I work with, and you get the flexibility to research what you want for four years... I find it extremely motivating to feel like I'm contributing even a tiny bit to something that could help people.'

FEMALE, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

In focus groups, students described real joy in scientific discovery and the sense that they were doing meaningful and useful work. For many, this was the main motivator for why they first chose to study a STEM subject as undergraduates and why they entered postgraduate study in the first place.

In many cases, students described having to explain their love of research and interest in postgraduate study to family and friends who struggled to grasp their interests and choices. Many described coming from families with low or no participation in higher education: several said their family members had left formal education at a young age.

'Coming from a very conservative background, leaving home was already another hurdle... they still don't understand what I do.'

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

For many students, the path to PhD had not been easy. Students described having to be highly motivated and self-sufficient to translate what was often an early love of research into a clear pathway ahead to further study. Compared to undergraduate and masters degree programmes, students felt PhD applications were more opaque and information much more diffuse.

Financial pressures during PhD study are the single biggest challenge faced by STEM PhD students from low-socioeconomic backgrounds. Students in our focus groups, many of whom held stipends, reported constant financial stress and fear financial and professional precarity throughout doctoral study.

'I don't have any luxury of family members being able to support me.'

MALE, CDT, BIOLOGICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

Even after successfully enrolling on a PhD, and securing a funding package, new pressures for these students – and financial challenges – quickly emerge. The vast majority of PhD students in our sample said they did not have enough money to live comfortably and felt under constant financial stress, including not being able to afford sufficient food, housing and basic health care.

'Cost [is the single hardest barrier for starting a PhD]. In terms of just being able to make the decision to know that you have the funding, know that you're going to be able to afford rent, know that you're going to be able to afford to move in.'

MALE, CDT, ENGINEERING AND TECHNOLOGY, RESEARCH INTENSIVE UNIVERSITY

'My supervisor offered to lend me the money [to pay for a doctor's note], which I turned down, but that was very sweet that he offered. My parents couldn't offer me the money [either] and I just didn't know what to do.'

FEMALE, CDT, BIOLOGICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

Students discussed the need to supplement stipends with part-time work which took time away from their studies, even hiding the fact that they were seeking other employment from their university or funder in order to supplement their low income.

'I've resorted to going back and doing other consultancy part-time but not really declaring it with my university, just doing kind of ad hoc because that's the only way I find I can live.'

MALE, CDT, ENGINEERING AND TECHNOLOGY, RESEARCH INTENSIVE UNIVERSITY

In addition to facing considerable financial pressures, low-socioeconomic STEM PhD students also described patchy and highly uneven experiences of guidance and support.

'I actually went through my PhD feeling very isolated... I just think PhDs as a whole, as a format, can be really isolating instead of independent, which is what they should be.'

FEMALE, NON-CDT, MEDICINE AND DENTISTRY, RESEARCH INTENSIVE UNIVERSITY

Many students found induction to doctoral study lacking and would have appreciated more active onboarding to their new PhD life. Students described the process of finding a strong supervisor as an applicant as a high-stakes, high-risk endeavour; sometimes working well, but often meaning students receive insufficient advice and support from application through to graduation. Students described feeling as though the limited onboarding into doctoral life and little on-course support exacerbated feelings of isolation and fostered a sense of imposter syndrome.

It was just me and my supervisor and she was a professor. There was very little induction, and it was kind of like, 'Hey, off you go. This is your project... find your way through the lab... That really contributes to that feeling of isolation and can either amplify or help manage the imposter syndrome a lot.'

FEMALE, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Students from low-socioeconomic backgrounds strongly value mentorship. Some students had experienced highly positive supervisor and postdoc relationships who modelled strong academic and professional mentorship. For students who had experienced this, it was clear how much of a difference this made to their positive experience of doctoral study.

'Mine was my masters supervisor... he is just somebody who was like, 'Yeah, don't worry. We can teach you anything you don't know... Just as long as you're enthusiastic, you can come do whatever you like.' He basically showed me a lot of the steps in terms of actually getting set up in the first place.'

MALE, NON-CDT, MATHEMATICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

Almost every disadvantaged STEM PhD student we spoke to loves their research. It means a great deal to these students to do something they are passionate about and good at, which they feel makes a real contribution to knowledge and to tackling the world's greatest problems.

But that passion has to compete with other considerations. Low-socioeconomic STEM PhD students describe doctoral study as a route taken despite barriers caused or worsened by their socioeconomic background. They were acutely aware of other routes offering what a PhD often doesn't: financial security, less professional precarity, clearer guidance on applications and funding, easier access to housing and employment protections and less pressure to justify their choice to family and friends. Many felt there were almost as many reasons against a PhD as for one.

This raises an important question. Is a STEM PhD a route that talented students from low-socioeconomic backgrounds – without family money or experience of higher education – feel they can justify taking? What would it take to make it so?

'Treat [PhDs] more like actual jobs. Just make it more like actual work.'

MALE, CDT, COMPUTER SCIENCE, RESEARCH INTENSIVE UNIVERSITY





Chapter 6

Tackling the STEM Progression Gap

Tackling the STEM Progression Gap

Recommendations

The UK can strengthen its research excellence by ensuring that talented STEM students from all socioeconomic backgrounds can fulfil their potential. The findings in this report show that, while ability and ambition are widely distributed, progression to postgraduate study is not.

Doctoral study is competing for talent in a crowded graduate labour market. A talented STEM undergraduate isn't choosing between a PhD and nothing, but between a PhD and graduate schemes in consultancy, finance, defence, pharmaceuticals or technology, all of which are actively recruiting and may pay more in year one than even the most generous stipend. However, postgraduate study remains a worthwhile and distinct endeavour. It offers the freedom, depth and specialist training to pursue difficult questions, generate new knowledge and develop research expertise upon which future innovation, including that in industry, is dependent.

Better financial support is essential but pay is only part of what makes an opportunity attractive. Graduate schemes usually offer a clear application process, transparency on pay, a structured induction, an accountable manager and clear next steps for a long-term career. Postgraduate programmes should offer the same basic clarity and security.

At present, doctoral study often falls short. Students find pathways hard to locate and the funding harder still; they face up-front costs before start dates and stipend payments; inductions are patchy or absent; support too often rests on a single supervisory relationship; and the end of funding is a sudden drop-off rather than a smooth transition.

The recommendations that follow set out practical changes. Delivering them will require funders, universities, higher education mission groups, government and regulators to work together. These are changes that would make STEM PhDs more accessible for students from low-socioeconomic backgrounds, help to close the progression gap and strengthen the UK's STEM talent pipeline for the challenging decades ahead.



1. Engage prospective researchers earlier

- a. **Outreach: Funders and universities should support targeted outreach and recruitment interventions at undergraduate level, modelled on industry graduate schemes, and engage undergraduate students in research career pathways from their first year.**

In industry, graduate recruiters connect students to opportunities and guidance that establish clear pathways; this is often done early and explicitly. Alternatively, the journey towards a PhD may be a solely independent endeavour, with the few available resources known mainly to those with inherited knowledge of how academia works. The most damaging effect is not that students receive bad advice but that they do not know what to ask.

“You don’t know what you don’t know, so you don’t know who to ask.”

FEMALE, NON-CDT, MEDICINE AND DENTISTRY, RESEARCH INTENSIVE UNIVERSITY

Universities increasingly deliver, and students increasingly expect, career support and guidance throughout undergraduate and masters level study, yet PhD routes typically surface late in that provision, if at all. This means universities have a responsibility to signpost, and build clarity on, PhD opportunities as rewarding career routes, and to do so early in a student’s university experience. Universities and mission groups have an important part to play in elevating PhDs as professional training routes and worthwhile career pathways for low-socioeconomic background STEM students.

‘Having that clarity for someone who is from an underrepresented background will allow them to have the confidence to apply to it.’

FEMALE, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

The model for this already exists. Graduate schemes, such as law vacation schemes and training contracts, run both formal and informal information sessions, drop-ins and ‘get to know us’ events on campuses for undergraduate students. These are done through formal university channels as well as relevant active student societies. Funders, individually or collectively, could shoulder greater responsibility for signposting PhD opportunities to prospective students at both undergraduate and masters level, and ensure thorough and ongoing advice and clarity for applicants throughout the process.

Postgraduate application summer schools, loosely modelled on undergraduate equivalents, are another useful way to showcase PhD routes and research careers to students less familiar with the pathway. This includes programmes such as UNIQplus, In2research, Research Ready and Generation Research, among others.

These programmes give prospective postgraduate students valuable research experience and clear guidance on research careers, helping them understand the pathways available and prepare strong applications. They also enable students to build informal mentoring relationships with current PhD students and postdoctoral researchers that can continue beyond the programme.

Funders can and should support the expansion and scale-up of stronger provision of information, advice and guidance, particularly where there is clear evidence through monitoring and evaluation of their success.

Being able to try out research [would help] before you start a PhD, because there’s often the opportunity for perhaps richer students to not be earning during internships, as opposed to lower income students who would need financial support to take that opportunity.’

MALE, CDT, ENGINEERING AND TECHNOLOGY, RESEARCH INTENSIVE UNIVERSITY

b. Research readiness: Funders should fund targeted masters provision as part of PhD programmes, structured as one masters year plus three or four PhD years, to increase the research ability of students from low-socioeconomic backgrounds.

The masters year is where the STEM pipeline narrows most sharply. Students from low-socioeconomic backgrounds make up 23.8% of STEM undergraduates but only 19.9% of STEM masters students. 14% of students from medium and lower socioeconomic backgrounds progress from a STEM undergraduate degree to a STEM masters, against 16.6% of those from the highest backgrounds. They are even more underrepresented on integrated masters programmes such as MEng and MSci, making up only 17% of those cohorts.

The decline between undergraduate and masters progression occurs when the funding disappears. A masters sits between a funded undergraduate degree and funded PhD opportunities. Students from low-socioeconomic backgrounds face challenges overcoming these financial barriers, impacting their progression to doctoral study.

‘I knew that I couldn’t afford to do a masters degree, so therefore I assumed that I would never get a PhD... It didn’t occur to me that I could be a researcher.’

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Folding a funded masters year into a PhD removes this barrier. Entering a single funded programme removes financial constraints and eases the transition to doctoral study. Closing the masters gap could have produced 41% more STEM masters students over the period studied – nearly 700 students every year – if the number of places had also kept pace with the talent available.



2. Clear access and fairness towards PG students

a. Terms and conditions: Funders’ terms and conditions should recognise and treat PhD students as ‘researchers in training’, including, but not limited to, standardised access to parental and carers’ leave, part-time living-cost support, and sickness and return-to-work policies.

Funders set the terms and conditions attached to doctoral awards and these are where a PhD student’s status is defined. At present that status is neither student nor staff, and PhD students fall through the gap, despite their importance to the research and innovation pipeline. PhD students described patchy or minimal induction and onboarding to doctoral study, often being rolled in to other postgraduate inductions instead.

Students said they would welcome help from dedicated professional staff but felt there was a lack of support, and financial pressures at their institution meant support roles had disappeared. With this lack of formal responsibility, support for PhD students often falls on individual supervisors, welcoming students, signposting them to resources, offering a professional community and answering their questions and queries.

'[I receive] slightly less support than I would've wanted to have... I have to go on my own initiative to get access to things and find out information about things that probably should have been included in some sort of induction.'

MALE, CDT, ENGINEERING AND TECHNOLOGY, RESEARCH INTENSIVE UNIVERSITY

The consequence of their ambiguous status means that PhD students do not receive support from student services, which typically target undergraduate populations, nor the protections they would gain as staff. Sector-wide recognition of PhDs as researchers-in-training would serve as an important correction to this challenge.

'We did have a similar person with our PhD programme who was great because they would signpost you towards things... They just got rid of the position. There's actually no one managing our PhD and no one to turn to. And the one person that is, is really, really overloaded.'

FEMALE, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Students in our focus groups were acutely aware that other routes offered employment protections a PhD does not, and several asked for doctoral study to be treated more like a job. Setting this in funders' terms and conditions, with standardised access to parental and carers' leave, part-time living-cost support, and sickness and return-to-work policies, would mean students no longer have to negotiate their own position.

'It was very frustrating to be in-between the employee-student boundary... having to justify your existence to these people was the most stressful part.'

FEMALE, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

'I know if I was staff, I would have workers' rights. I would have rights to be accommodated in my workplace. Getting access to accommodations as a student, as a postgraduate researcher, is extremely difficult because student support services, disability support services, are geared towards undergrads. When I've asked for support, they'll be like, 'Okay, you can record your lectures.' And I was like, 'but I don't have lectures! I'm doing a PhD!'

FEMALE, CDT, BIOLOGICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

Recent initiatives, including part of UKRI's terms and conditions through the New Deal for Postgraduate Research, have begun to highlight best practice for postgraduate support.²⁴ Continued sector-wide coordination across all Universities and funders and relevant sector bodies, highlighting and championing best practice will be essential to build on this early progress.

- b. Finances: Universities and funders should provide access to an advance on funding to cover moving costs, extend guarantor schemes to students from low-socioeconomic backgrounds, operate prompt stipend payment schedules and pay for travel, accommodation and conference costs up front rather than relying on reimbursement.**

Financial pressure remains the biggest challenge described by STEM PhD students from low-socioeconomic backgrounds. Many students also described challenges with the timing of stipends, with the most expensive months of a PhD often being ones before programmes begin, when the deposit, first month's rent and moving costs are due. Students moving directly from a masters, or out of employment, often described entering their doctorate already in debt.

'I have had to choose between paying for a doctor's note – which cost £30 – and buying food.'

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Students proposed adjusting the timing of stipends, rather than sourcing new funding. Universities and funders should, together, offer an advance on the stipend, targeted at students facing financial hardship, in the summer between finishing a masters or leaving employment and starting a PhD.

Another financial stressor for students from low-socioeconomic backgrounds is reimbursement culture. Students repeatedly described paying for conference travel, accommodation and research visits up front then waiting several months before being repaid.

'My PhD is in London and none of my supervisors have even, I think, rented in the last 10 years... It's really tight on a stipend in London.'

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Universities should re-allocate funding to cover doctoral travel and accommodation directly. Funders providing conference grants should require that grant budgets include a specified allocation for PhD student travel and accommodation.

'An advanced payment to help with moving costs [would have helped]... an advanced kind of payment on the stipend that you get a few months earlier before starting.'

FEMALE, CDT, PHYSICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY

Getting universities to disburse stipends (where relevant) and pay students promptly for part-time work on campus is also a persistent challenge. Participants described waiting weeks or months to be paid, and in one case, a full calendar year.

'The worst bit is the financing, just trying to constantly be applying for tiny little pots of money. £200, £100, £500. You have to wait for the money to actually come in because sometimes you have to spend the money first and then it's a reimbursement... Paying for flights [to a research visit] before you've got the money and then you wait four months to get reimbursed!'

FEMALE, NON-CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

Chasing universities to pay for part-time work, or even to disburse stipends, is a considerable administrative burden for students without financial support. Institutions should pay stipends and teaching payments on time, reduce the administrative burden on these students.

'The most stressful thing is the money. As a PhD student, even though you're paid, you're not technically staff. So the way that we got paid [for teaching], it got delayed for a year even though we'd worked all of the hours.'

FEMALE, CDT, BIOLOGICAL SCIENCES, GOLDEN TRIANGLE UNIVERSITY

- c. **Transparency: PhD adverts should contain standardised information – stipend level, duration of funding, details of the project, the key requirements to apply including skills and experience, the application process and where applicants can ask questions. This would equip students to approach supervisors, gather information and put forward the strongest possible application.**

Students consistently describe PhD applications as opaque in comparison with undergraduate and masters admissions, with funding being the most significant unknown.

Students requested clear information, advice and guidance offered through existing channels, combined with in-person support delivered through targeted outreach to explain the pathways and answer questions without prejudicing the outcome of their application.

'Because there's so many different possible funding sources for PhDs, it's very confusing as an applicant [to understand] what on earth is going on.'

FEMALE, CDT, BIOLOGICAL SCIENCES, RESEARCH INTENSIVE UNIVERSITY



3. Data tracking and accountability

Universities are also required to publish data on students as part of their annual HESA returns, some of which is published as HESA Open Data online. This does not currently include information on the demographics of PhD students, such as socioeconomic background. When students are invisible in the data, it remains challenging to understand who is and is not progressing to PhD and assess the effectiveness of interventions to increase the number of PhD students from low-socioeconomic backgrounds.

- a. **Fair access: Government regulators across the four nations should extend fair access systems to cover postgraduate study.**

Sector regulators and relevant government agencies also have a part to play in monitoring the progression of STEM students from low-socioeconomic background to PhD study, particularly when it comes to improving sector-wide data collection.

Universities in all four UK systems are typically required to report their undergraduate widening participation activity to sector regulators and relevant agencies. Failure to demonstrate commitment to widening participation targets and evidence of continued improvement typically carries regulatory consequences, including, in the English context, access to public funding. Regulators, such as the Office for Students and Medr, are increasingly taking a 'risk based' approach to sector regulation, including publishing online 'risk registers' with data on at-risk student groups.

Responsibility for fair access sits with a different body in each of the four nations, and each has a different route through which postgraduate study could be brought into scope.

Nation	Responsible body	Current mechanism	What extension would mean
England	Office for Students	Access and Participation Plans (APPs), backed by conditions of registration and access to public funding; risk-based regulation including published risk registers	Providers set and report against access and progression targets for postgraduate taught and research students alongside their undergraduate commitments in APPs
Wales	Medr (Commission for Tertiary Education and Research)	Regulates fee levels and scrutinises provider performance through its Tertiary Regulatory Framework; annual fee and access agreements; statutory duty to promote equality of opportunity	Postgraduate access and progression brought within fee and access agreements and the regulatory framework, with reporting attached
Scotland	Scottish Funding Council	Widening access duty under the Post-16 Education (Scotland) Act 2013, delivered through the funding agreements the SFC holds with institutions	Access commitments and reporting extended beyond entry to undergraduate study to cover progression into postgraduate taught and research study, including in the next Commission on Widening Access target
Northern Ireland	Department for the Economy (Higher Education Division)	Widening Access and Participation Plans, moving to an Access, Participation and Outcomes Plan framework following the 2026 review and consultation	Postgraduate progression written into the new framework as it is implemented

b. Monitoring: Socioeconomic background should be recorded and published as part of the Postgraduate Research Experience Survey.

Universities are also required to participate in the annual National Student Survey (NSS) which seeks opinions from undergraduate students on their student experience. Data from the NSS is published annually on regulators’ websites and, in some cases, poor performance can trigger regulatory penalty.

There is no formal NSS equivalent at the postgraduate level. The Postgraduate Research Experience Survey, administered by Advance HE, does not currently receive parity with the NSS; it is a voluntary exercise with many universities opting to participate at irregular intervals rather than annual. The survey also does not currently collect data on students’ socioeconomic background.

Collecting data on socioeconomic background would provide greater insight into the experience of students from low-socioeconomic backgrounds when navigating postgraduate study in STEM and other subjects, as well as allowing the sector to track trends over time.

c. Accountability: UKRI and other major postgraduate funders should consider postgraduate research fair access within the Strategy, People and Research Environment section of the Research Excellence Framework (REF).

Socioeconomic diversity is imperative for excellence in research and innovation. There can be no UK-wide success in achieving powerful, world-changing research and innovation if the UK’s domestic STEM talent pool is allowed to shrink.

Tools to foster and enable strong research culture in the higher education and research sector, including the REF, should be adapted to encourage greater outreach, access and participation in research careers for students from low-socioeconomic backgrounds.

In REF 2029, research culture is assessed through the Strategy, People and Research Environment element, weighted at 20% of a unit’s overall quality profile. That element is made up of an institution-level statement, carrying 60% of the element’s score, and a unit-level statement carrying 40%, each structured around four sections – one of which is people. Postgraduate researchers are part of the people an institution is asked to account for, and the socioeconomic composition of its doctoral intake is a legitimate part of that account that should be included.



Conclusion

Conclusion

Towards a secure domestic STEM talent pipeline

The future of research and innovation in the UK relies on the STEM PhD pipeline. The researchers who will lead our response to the climate crisis, to breakthroughs in health, to the safe development of artificial intelligence, are in that pipeline.

This report shows that too many are being lost, and not for want of talent, ambition or resilience. They are lost because the path to a PhD is harder to navigate for students without family money, or without family experience of higher education. Every student who steps off that path takes with them a contribution to knowledge that will not now be made. That is a loss the country cannot afford, and it is a loss we can choose to stop.

Martingale wants to make a STEM PhD the best possible opportunity for every student with the ability and aptitude for doctoral study. Widening participation cannot keep stopping at the undergraduate cliff-edge. By working with other funders, universities and mission groups, regulators and government to deliver the changes set out in this report, we believe we can make real progress to bridging the progression gap that is costing the UK so much talent.

That talent is already there, in every part of the country and every kind of household. It is time the path to the PhD was open to all of it.



Appendix and Endnotes

Appendix

Institutional groupings for all tight STEM subjects (excluding Engineering)

The following institutional groupings are indicative only. With no sector-wide agreed definition of institutional groupings beyond formal mission groups²⁵, these groupings reflect an informed assessment of institutions’ research intensity and teaching profile, and selectivity for undergraduate entry across the time series explored in this dataset (2015/16 – 2022/23). Alternative providers are excluded from this analysis. Inclusion in the groups does not imply all of these institutions offers any or all of the STEM subjects included in this analysis, and all institutions who did not offer a specific STEM subject, or any STEM subjects, were automatically filtered out during analysis.

Please note that all institution names reflect HESA records as of 2024/25 and may not reflect name-changes during the time series. Any differences between a university's public marketing name and the name given in the tables below reflects HESA’s use of legal corporate entities or registered names for statutory tracking.

Category	Universities	
‘Golden Triangle’	Imperial College of Science, Technology and Medicine King’s College London London School of Economics and Political Science	The University of Cambridge The University of Oxford University College London
‘Research intensive’	Cardiff University Heriot-Watt University Loughborough University Newcastle University Queen Mary University of London Queen’s University Belfast The University of Bath The University of Birmingham The University of Bristol The University of Edinburgh The University of Exeter The University of Glasgow	The University of Lancaster The University of Leeds The University of Liverpool The University of Manchester The University of Sheffield The University of Southampton The University of St. Andrews The University of Warwick The University of York University of Durham University of Nottingham
‘Pre-1992’	Aberystwyth University Aston University Bangor University Birkbeck, University of London Brunel University London City St George’s, University of London Cranfield University	Grŵp NPTC Group Keele University Swansea University The Open University in England The Open University in Northern Ireland The Open University in Scotland The Open University in Wales

'Pre-1992' continued	The University of Aberdeen The University of Bradford The University of Buckingham The University of Dundee The University of East Anglia The University of Essex The University of Hull The University of Kent The University of Leicester The University of Reading The University of Salford	The University of Stirling The University of Strathclyde The University of Surrey The University of Sussex The University of Wales (central functions) Ulster University University of London (Institutes and activities) University of Wales Trinity Saint David
'Post-1992'	Abertay University Amity University [IN] London Anglia Ruskin University Arden University Arts University Plymouth BIMM University BPP University Bath Spa University Birmingham City University Birmingham Newman University Bournemouth University Buckinghamshire New University Canterbury Christ Church University Cardiff Metropolitan University Coventry University De Montfort University Edge Hill University Edinburgh Napier University Falmouth University Glasgow Caledonian University Gower College Swansea Grŵp Llandrillo Menai Harper Adams University Hartpury University Health Sciences University INTO University Partnerships Limited Kingston University Leeds Arts University Leeds Beckett University Leeds Trinity University Lincoln Bishop University Liverpool Hope University Liverpool John Moores University	London Metropolitan University London South Bank University Middlesex University Northeastern University London Norwich University of the Arts Oxford Brookes University Queen Margaret University, Edinburgh Ravensbourne University London Regent's University London Limited Richmond, The American International University in London Robert Gordon University Roehampton University Royal Agricultural University Royal Holloway and Bedford New College Sheffield Hallam University Southampton Solent University St Mary's University College St Mary's University, Twickenham Stranmillis University College Teesside University The Arts University Bournemouth The Manchester Metropolitan University The Nottingham Trent University The University of Brighton The University of Chichester The University of East London The University of Greenwich The University of Huddersfield The University of Lancashire The University of Law The University of Lincoln

'Post-1992' continued	The University of Northampton The University of Portsmouth The University of Staffordshire The University of Sunderland The University of West London The University of Westminster The University of Winchester The University of Wolverhampton The University of the West of Scotland University Academy 92 Limited University Centre Peterborough University Centre Quayside Limited University College Birmingham University for the Creative Arts University of Bedfordshire University of Chester	University of Cumbria University of Derby University of Gloucestershire University of Greater Manchester University of Hertfordshire University of Northumbria at Newcastle University of Plymouth University of South Wales University of St Mark and St John University of Suffolk University of Worcester University of the Arts, London University of the Built Environment University of the Highlands and Islands University of the West of England, Bristol York St John University
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Institutional groupings for Engineering only

We use specific institutional groupings for Engineering degrees, reflecting universities with high research intensity and income in Engineering relative to other STEM subjects. As above, inclusion in the groups does not imply all of these institutional groupings offers any or all of the STEM subjects included in this analysis, and any institution which does not offer an Engineering degree was automatically filtered out during analysis.

Category	Universities	
'Golden Triangle'	Imperial College of Science, Technology and Medicine King's College London London School of Economics and Political Science	The University of Cambridge The University of Oxford University College London
'Research intensive'	Aston University Brunel University London Cardiff University Liverpool John Moores University Loughborough University Newcastle University Queen Mary University of London Queen's University Belfast Swansea University The University of Aberdeen The University of Birmingham The University of Bristol The University of Edinburgh The University of Exeter	The University of Glasgow The University of Lancaster The University of Leeds The University of Leicester The University of Liverpool The University of Manchester The University of Sheffield The University of Southampton The University of Strathclyde The University of Warwick The University of York Ulster University University of Durham University of Nottingham

'Pre-1992'	Aberystwyth University Bangor University Birkbeck College City St George's, University of London Cranfield University Grŵp NPTC Group Heriot-Watt University Keele University The Open University in England The Open University in Northern Ireland The Open University in Scotland The Open University in Wales The University of Bath The University of Bradford The University of Buckingham The University of Dundee	The University of East Anglia The University of Essex The University of Hull The University of Kent The University of Reading The University of Salford The University of St. Andrews The University of Stirling The University of Surrey The University of Sussex The University of Wales (central functions) University of London (Institutes and activities) University of Wales Trinity Saint David
'Post-1992'	Abertay University Amity University [IN] London Anglia Ruskin University Arden University Arts University Plymouth BIMM University BPP University Bath Spa University Birmingham City University Birmingham Newman University Bournemouth University Buckinghamshire New University Canterbury Christ Church University Cardiff Metropolitan University Coventry University De Montfort University Edge Hill University Edinburgh Napier University Falmouth University Glasgow Caledonian University Gower College Swansea Grŵp Llandrillo Menai Harper Adams University Hartpury University Health Sciences University INTO University Partnerships Limited Kingston University Leeds Arts University	Leeds Beckett University Leeds Trinity University Lincoln Bishop University Liverpool Hope University London Metropolitan University London South Bank University Middlesex University Northeastern University London Norwich University of the Arts Oxford Brookes University Queen Margaret University, Edinburgh Ravensbourne University London Regent's University London Limited Richmond, The American International University in London Robert Gordon University Roehampton University Royal Agricultural University Royal Holloway and Bedford New College Sheffield Hallam University Southampton Solent University St Mary's University College St Mary's University, Twickenham Stranmillis University College Teesside University The Arts University Bournemouth The Manchester Metropolitan University

'Post-1992' continued	The Nottingham Trent University The University of Brighton The University of Chichester The University of East London The University of Greenwich The University of Huddersfield The University of Lancashire The University of Law The University of Lincoln The University of Northampton The University of Portsmouth The University of Staffordshire The University of Sunderland The University of West London The University of Westminster The University of Winchester The University of Wolverhampton The University of the West of Scotland University Academy 92 Limited University Centre Peterborough University Centre Quayside Limited	University College Birmingham University for the Creative Arts University of Bedfordshire University of Chester University of Cumbria University of Derby University of Gloucestershire University of Greater Manchester University of Hertfordshire University of Northumbria at Newcastle University of Plymouth University of South Wales University of St Mark and St John University of Suffolk University of Worcester University of the Arts, London University of the Built Environment University of the Highlands and Islands University of the West of England, Bristol York St John University
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Endnotes

- 1 'Golden Triangle' refers to the universities of Oxford, Cambridge, Imperial, UCL, KCL and LSE. A full list of institutional allocations by type is included in the Appendix.
- 2 Department for Science, Innovation and Technology (2025), [R&D skills supply and demand: long-term trends and workforce projections](#).
- 3 Department for Education (England), '[Academic year 2024/25: Widening participation in higher education](#).' See also Centre for Education Policy and Equalising Opportunities (CEPEO) (2020), [Matching in the dark: Inequalities in student to degree match](#).
- 4 Conservative estimate based on [Office for Students' figures in England reflecting spend on 'access and participation investment', including financial support for students, in 2022-23](#), Scotland, Wales and Northern Ireland do not publish sector spend on widening participation.
- 5 Paul Wakeling and José Luis Mateos-González (2021) [Inequality in the Highest Degree? Postgraduates, prices and participation](#). The Sutton Trust.
- 6 See for instance Institute for Fiscal Studies (2020), [Family background and access to postgraduate degrees](#); [Ginevra House](#) (2020), [Postgraduate Education in the UK](#), Higher Education Policy Institute (HEPI); Rebecca Lindner (2020), [Barriers to Doctoral Education: Equality, Diversity and Inclusion for Postgraduate Research Students at UCL](#); Martingale Foundation (2024), [Roundtable Report: Access to and Success in Research-Intensive Postgraduate Courses](#); Russell Group (2026) [Extending Opportunity](#).
- 7 Office for National Statistics, '[The National Statistics Socio-economic classification \(NS-SEC\)](#).'
- 8 There were 559,160 UK-domiciled first-degree entrants to undergraduate degrees in 2024/25, not including entrants for Foundation Degrees, Higher National Diplomas/Higher National Certificates (HND/HNCs), ProfGCEs and 'other' undergraduate provision. Figures from [HESA Open Data for 2024/25](#).
- 9 An integrated masters is a four-year course leading directly to a masters level qualification, without a separate application for postgraduate study.
- 10 UK Government (2025), [State of the Nation: Social Mobility Data – Entry to Higher Education](#).
- 11 See progression rates by different measures of disadvantage, Department for Education, '[Widening participation in higher education: Academic year 2024/25](#).'
- 12 Katherine Woolf, Asta Medisauskaite, Shaun Boustani and Kevin Latham (February 2025), [Unequal treatment? Access to medicine for socio-economically disadvantaged students](#). The Sutton Trust.
- 13 Technical/professional PhDs are excluded from this analysis. Emily Johnson (December 2025), '[Funding for PhDs: Shaping the Future of Science and Innovation](#).' Manchester Institute of Innovation Research Blog, University of Manchester.
- 14 An integrated masters is a four-year course leading directly to a masters level qualification, without a separate application for postgraduate study.
- 15 A full list of institutional allocations is included in the Appendix.
- 16 Institute for Fiscal Studies (2020), [Family background and access to postgraduate degrees](#).
- 17 Education Endowment Foundation (EEF) (2026). [Growing apart: The evolution of the disadvantage gap](#); OECD, '[Student socioeconomic status](#).'
- 18 Jenny Griffiths, Louis Hodge, Lorna Stevenson and Baz Ramaiah, (2024), [Progression at age 16 of young people from underrepresented backgrounds](#); The Sutton Trust (2026), [The Disadvantage Gap Explained](#).
- 19 Mateos Gonzalez, Pep and Wakeling, Paul (2022), '[Exploring socioeconomic inequalities and access to elite postgraduate education among English graduates](#).' Higher Education, 83; Holm, A. and Jæger, M.M. (2008), [Selection Bias in Educational Transition Models: Theory and Empirical Evidence](#), Working Paper 11:2008, Copenhagen: The Danish National Centre for Social Research (SFI).

- 20 See for instance P. Wakeling and G. Hampden-Thompson (2013), [Transition to higher degrees across the UK: an analysis of national, institutional and individual differences](#); C. Crawford and E. Greaves (2015), [Socio-economic, ethnic and gender differences in HE participation](#). Department for Business, Innovation and Skills; Wakeling and Gonzalez, [Inequality in the Highest Degree](#).
- 21 Asterisks (*, **, and ***) reflect statistical significance indicating how small the p-value is. A smaller p-value means it is less likely these findings occurred purely by random chance.
- 22 Different ethnic minority groups cannot be disaggregated for low-socioeconomic backgrounds due to very low sample sizes for some ethnic minority groups.
- 23 Being non-CDT funded does not necessarily imply self-funded PhDs; many PhD scholarships are non-CDT.
- 24 UKRI (September 2023), [A New Deal for Postgraduate Research: Response to the Call for Input](#).
- 25 See for instance Vicki Boliver (2015) '[Are there distinctive clusters of higher and lower status universities in the UK?](#)' Oxford Review of Education.

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