Brexit impact on UK's engineering education sector

Exploring EU students and staff experiences

Summary Report

April 2021

UCL Centre for Engineering Education & Engineering Professors' Council

Funding by the Royal Academy of Engineering

UCL Centre for Engineering Education

Engineering Professors COUNCIL

The voice of engineering academics

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Executive Summary

Introduction

In April 2019, the Royal Academy of Engineering funded the project "Brexit impact on UK's engineering education sector: Exploring EU students and staff experiences", a collaboration between the UCL Centre for Engineering Education (CEE) and the Engineering Professors' Council (EPC) in the UK. This project aimed to contribute with new and critical understanding of motivations and limitations related to studying and working in the UK.

This exploratory study presents ground-breaking data from European (EU) engineering students and academic staff on their experiences and perceptions about Brexit to provide a better understanding of the impact on engineering education of the UK's departure from the European Union. Understanding concerns and expectations held by European students and academic staff is important to support evidence-based decisions that effectively enable the recruitment and retention of European talent into UK engineering education, research and practice.

This summary report complements the full project report submitted to the Academy in October 2020.

The views expressed here were made at a particular point in time, before the EU and UK negotiators reached an agreement on 24 December 2020. The interviews were conducted before the General Election in December 2019 and due to covid-19, the surveys were delayed to June 2020.

Research aims and objectives

Prior to this study, no data on experiences and perceptions about Brexit had been collected from European (EU) engineering students and academic staff, to understand better the impact of the UK's departure from the European Union on engineering education. Understanding concerns and expectations held by European students and academic staff is important to support evidence-based decisions that effectively support the recruitment and retention of European talent into UK engineering education, research and practice. The study reported here has collected and analysed data regarding the impact of leaving the European Union on mobility, funding, skills development, future study and career prospects of European nationals involved in engineering education in the UK.

Research Methodology

This report presents data and findings from interviews with and a survey of EU engineering students and academics. The concentrated interviews (conducted in 2019, before the General Election on 12 December 2019) were targeted at EU citizens currently studying or working in engineering higher education institutions in the UK. Nine students and 15 academics were interviewed in the first phase of the study. In the second phase of the study, together with the latest sector statistics (HESA Staff and Student data, 2018/19), data collected in the interviews helped to inform the focus of a larger survey sample (conducted

between 23 June and 13 September 2020). A total of 89 students (22 nationalities and 13 institutions) and 104 academics (18 nationalities and 37 institutions) completed the survey.

The vast majority of the students in the survey were based in Russell Group universities (96%) and 48.3% were in London, whereas in 2018/19 the proportion of EU nationals studying engineering at these universities is 42%, and the proportion of EU nationals studying in London is 21%. This limits data representation and interpretation – we are reporting only the views of those students who came to highly regarded UK universities who did so after they knew the UK would be leaving Europe.

Two-thirds of the academics who completed the survey worked in a Russell Group university, whereas the proportion of EU nationals working in these universities across the UK in 2018/19 is 58.9%.

Key findings

Financial barriers threaten the future of engineering EU student recruitment

The UK's engineering education is still attractive to a majority of EU students, at different levels of study. However, interview and survey data support the idea that EU undergraduate students who started their degrees after June 2016 were indeed taking the opportunity to study engineering in the UK as a 'last chance' before changes to fees, funding, and visa requirements. Being eligible for home fee status and financial support from Student Finance were among the most important factors when making the decision to study engineering in the UK.

Of our survey sample, only 8% undergraduate, 23.8% Integrated Masters, 16.7% postgraduate and 28.6% PhD would have applied to a UK university today if not eligible for a student loan or full scholarship. According to these findings, the announced changes in tuition fees, access to student finance, and visa requirements for courses starting in academic year 2021/22 might be expected to have a severe impact on the recruitment of EU engineering students.

EU engineering academics herald an engineering "brain drain"

Brexit consequences for EU engineering academic staff are far-reaching. Four years of uncertainty around a UK-EU deal already damaged collaboration with European partners and access to funding: since the Brexit referendum outcome, UK partners were excluded from EU-funded research proposals with well-established and new EU partners. Moreover, Brexit has exacerbated perceptions of hostility towards EU nationals.

Whereas EU engineering academics agree that the UK's universities provide the resources and opportunities for career progression and research leadership, only one third of survey respondents would have come to the UK if they had had to make that decision today. Freedom of movement, access to research funding and being granted the same rights as British citizens will be key to informing their decision to remain in the UK, or leave, in the near future. Discouraged by research funding difficulties and worried by uncertainties in

securing their rights to live and work in the UK, EU engineering academics said they may consider leaving the UK and seek jobs on the Continent, mainly in their home countries or in Switzerland, Germany and France, as they believe “all the engineering opportunities are in the EU”. As supported by our HESA data analysis, this “brain-drain” could be particularly damaging for engineering research: one in four research-only engineering academics is European, of which 75% are on fixed-term contracts.

Leaving a fractured pipeline for the UK engineering workforce

One third of EU academics surveyed came to the UK as undergraduate and/or postgraduate engineering students. Many EU students plan to stay in the UK after graduation to work as engineers. However, changes to study conditions and the UK’s points-based immigration system are seen as heavy barriers to EU nationals and are likely to have a negative impact not only on student and academic staff recruitment, but also on the UK’s engineering research and innovation base, and on its much-needed, diverse and talented workforce.

1. Introduction

Background

The United Kingdom has a long tradition of excellence in higher education and is recognised as being an important player in global engineering education and research. Regarding higher education, the UK attracts a far higher number of international academics of all disciplines, from all over the world, who teach and do research, than almost any other country in continental Europe, being only surpassed by Switzerland (ETER, 2019). The engineering education sector relies on international mobility more than most sectors of society in terms of attracting experts from all over the world to research and teach in the UK and attracting international students.

The impact of the United Kingdom European Union membership referendum of June 2016, commonly referenced as the Brexit referendum, is still unfolding and under continuing analysis (Fowler, Direito, Mitchell, & Rich, 2018). However, amid all the uncertainty around a future EU-UK deal, it is clear that Brexit means major losses to the HE sector: loss of EU research funding and networks; loss of EU students and EU academic staff; loss of mobility of UK students and ability to study abroad (Mayhew 2017) – all with negative repercussions for education, research and innovation.

Following the referendum, Mayhew (2017) reflected on the implications of Brexit for the HE sector and identified three major areas – the impact on students, the impact on staff, and the impact on research funding. Mayhew also highlighted the freedom of movement for the sector as being critical in future EU-UK negotiations. The role of student and staff mobility, as a means to support UK universities research connections and competitiveness is also mentioned by Highman (2019). According to Highman, "(…) future EU-UK relationships in research and science can only be properly implemented with the support and input of both academic and professional staff, while also including the student voice." (p.51).

To date, some studies have explored students' voices and, in particular, their career aspirations following Brexit. The study by McCroy and Thomson (2019) focussed on UK undergraduates, and the study of Dodourova, Clarkin, and Lenkei, (2020), included both British and non-British students. However, there is a lack of research on European students, as well as European academic staff, currently studying or working in UK universities.

In March 2019, the Royal Academy of Engineering (RAEng) launched a Call for Proposals for research projects that aimed to address issues in engineering education and skills. The RAEng was particularly interested in "research projects that seek to address and understand the challenges of migration (including the potential impact from restrictions on freedom of movement for EU citizens) to engineering skills supply" (RAEng Call for Proposals – Research projects in engineering education, 2019, p.3).

Building on previous collaborative work in the analysis of sector data of European engineering staff and students in the UK, the UCL Centre for Engineering Education (CEE) and the Engineering Professors' Council (EPC) submitted the collaborative project entitled:

"*Brexit impact on UK's engineering educations sector: Exploring EU students and staff experiences*.

Aims and objectives

This project aimed to contribute with new and critical understanding of EU nationals' motivations, experiences and expectations related to studying and teaching/researching engineering in the UK.

The broad research questions of the project, in consultation with the project advisory board, are:

- *What does Brexit mean for European engineering students and European engineering academic staff currently studying and working in UK universities?*
- *What impact will Brexit have on the UK's attractiveness as a destination for both European engineering students and European engineering academic staff?*

With the following sub-questions:

- *Why have European students decided to study engineering in the UK, despite Brexit? What skills do they expect to develop in their UK engineering programme? Do they expect to progress their studies or start a career in the UK?*
- *What attracted European engineering academic staff to work in UK universities? What has changed since the Brexit referendum in June 2016? What impact will Brexit have on their careers (more specifically on teaching, research and access to funding)?*

Methodology

The study adopted an exploratory mixed methods design (Borrego, Douglas, & Amelink, 2009), beginning with a qualitative phase (interviews – phase 1), followed by a quantitative phase (online surveys – phase 2). This approach is usually employed to develop a standardised (quantitative) instrument in a relatively unstudied area. The qualitative phase identifies important factors, while the quantitative phase applies them to a larger and/or more diverse sample.

Thematic analysis (Boyatzis, 1998) of the interview was chosen as a methodological approach as there was an interest in finding themes in order to answer the research questions. The open-ended approach of the interviews was suitable for this methodology as thematic analysis "is not wedded to any pre-existing theoretical framework" (Braun & Clarke, 2006, p. 81).

The transcripts of semi-structured Interviews were coded thematically to identify: (1) participants' motivations to come to study or work in engineering in the UK, (2) their experiences and future career plans, and (3) whether all of these were impacted by Brexit. The key issues identified in this phase were used to inform the design of online surveys for students and staff – phase 2 of the project.

In parallel to this approach HESA Data, for both students and staff, were analysed.

Interviews – Phase 1

All interviews were conducted online between 22nd of October and the 28th of November 2019 – before the UK General Election occurred on 12th December 2019 and well before the COVID-19 crisis, both of which would have influenced the narratives provided.

In the interviews, students and staff were asked about: factors they considered when choosing to study/work in the UK, career prospects they expected to have, and experiences and skills they were expecting to achieve; their experience in the UK overall, and what impacts they had felt as a result of Brexit; and what their career plans entail, and their preferences regarding leaving or remaining the UK. Answers provided by each interviewee were followed-up with probing questions to yield further insight. The interviewer raised the topics of mobility, funding (e.g., tuition fees and research grants), international research collaborations, career development, institutional support and legal advice.

The first phase of the project comprised interviews with a group of 9 European engineering students and 15 European engineering academic staff, currently studying or working in the UK.

European students' sample overview (interview):

- 6 female and 3 male students
- 5 undergraduate and 4 PhD Students
- 5 European Nationalities: Danish, Dutch, Italian, Portuguese, and Romanian
- 5 Universities: Middlesex University, Queen Mary University, Ulster University, University of Glasgow and University of Warwick.
- Engineering disciplines: Environmental, Biomedical, Bioengineering, Materials, EEE and Computing, Robotics, Aerospace, Materials

European academics' sample overview (interview):

- 3 female and 12 male academics
- 4 research-focussed staff
- 9 European Nationalities: Belgian, Bulgarian, Dutch, French, German, Italian, Portuguese, Romanian, Spanish.
- 8 Universities: Oxford Brookes University, Middlesex University, Swansea University, Ulster University, University of Birmingham, University of Cambridge, University of Glasgow, University of Strathclyde.
- Engineering disciplines: Chemical, Civil, Electrical, Electronic, Environmental, Design, Industrial, Mechanical, Nanotechnology, Petroleum, Robotics.

Surveys – Phase 2

Following analysis of the interviews, the surveys were designed and piloted with a convenience sample of six participants from University College London: three engineering students (two 4th year MEng, and one 1st year MEng) and three engineering academics (two 'teaching only' and one 'teaching and research'). Following the 'think aloud' methodology, participants were invited to speak their thoughts aloud as they completed the questionnaire online. The surveys were updated to incorporate the feedback received in the pilot and

launched on 23 June 2020. Due to a low response rate during summer term, the survey was kept open until 13 September 2020.

The launch of the survey coincided with the announcement by the Universities Minister that European, other EEA and Swiss nationals starting their courses in the UK in academic year 2021/22 will no longer be eligible for home fee status (at undergraduate and postgraduate levels) nor financial support from Student Finance England. The announcement reiterated that EU students starting in 2020/21 would still pay home fees for the entire duration of their course and be eligible to apply for the EU Settlement scheme if arriving in the UK before the end of the transition period in December 2020. Students arriving in 2021 will need to apply for a student visa.

Similar arrangements were confirmed by other UK governments. Scotland announced on 9 July the end of free education for new EU students from the academic year 2021/22 onwards and plans to establish scholarships for EU and international students. This was also confirmed by Wales on 10 July and Northern Ireland on 28 August. Irish nationals living and studying in the UK will have access to benefits and services preserved under the Common Travel Area Agreement.

European students' sample overview (survey):

- **Sample size:** 89 completed surveys from EU and EEA nationals
- **Nationality:** A total of 22 EU nationalities were represented in the sample. The most frequent were Italian (14.6%), French (10.1%), German and Romanian (9% each).
- **Age:** Most students were up to 21 years-old (38.2%) or between 22 and 25 years old (34.2%).
- **Gender:** Around one third of survey respondents were women (31.5%).
- **Degree:** Thirty-seven percent of all survey participants were PhD students, 29.2% were undergraduate and 25.8% were studying an Integrated Masters. A minority of respondents were studying at postgraduate level (1-2 years master's degrees).
- **Discipline:** The most represented engineering disciplines were Electrical and Electronic engineering (22.5%), Computer Science (14.6%), Mechanical engineering (11.2%) and Aerospace (9%).
- **HE Nation:** The vast majority of respondents were studying in English universities (94.4%). All students in Scottish and Northern Irish universities were studying at PhD level (5.6%). No Welsh universities were represented in this survey.
- **University group:** All except 5 participants were studying in Russell Group universities. 67.4% of all respondents were studying in one of the following three institutions: Queen Mary University of London, University College London, and University of Cambridge.
- **Funding:** One in three undergraduate students worked part-time during the academic year (34.6%). The vast majority had a student loan (84.6%), but just a few had a maintenance loan (15.4%). The figures were similar for Integrated Masters students (30.4%, 69.6% and 13%, respectively). All but two PhD students were fully funded (93.9%).

European academics' sample overview (survey):

- **Sample size:** 104 EU academics completed the survey.
- **Nationality:** A total of 18 EU nationalities were represented in the sample. The most frequent EU nationalities were German (18.8%), Italian (17.9%) and French (13.4%).
- **Age:** The larger group of respondents was between 31 and 40 years old (39.4%), followed by 41-50 (28.8%) and 51-60 (21.2%).
- **Gender:** 62.5% were men, 26% women and 11.5% preferred not to answer.
- **Immediate family circumstances:** The vast majority of the participants had their immediate family living with them in the UK (78.8%). Ten academics had their immediate family living outside the UK (9.6%) and 12 had no spouse/partner or children/dependents (11.5%).
- **Discipline:** The most represented disciplines were Electrical and Electronic engineering (19.2%), Mechanical engineering (19.2%), Computer Sciences (10.6%), Chemical engineering (8.7%), Medical Physics and Biomedical engineering (8.7%).
- **Job title, type of contract and role:** Almost one third of the participants reported 'Professor', 'Assistant Professor' or 'Associate Professor' as their job title (31.8%); 'Lecturer' (21.2%), 'Senior Lecturer' or 'Principal Lecturer' (13.5%); 'Research Fellow', 'Research Assistant', 'Research Associate' or 'Postdoc fellow' (10.6%). The vast majority of the participants had a permanent contract (82.7%). The remaining participants had a fixed-term (12.5%) or open-ended contract (4.8%). When asked about their current role, 80.8% said it involved 'both teaching and research', 11.6% 'research', 6.7% 'teaching' and 1.0% 'other'. Regarding participation in EU-funded projects, 12.5% were involved as Principal Investigator (PI), 14.4% as Co-Investigator (CI) and 7.7% in other capacity.
- **Route into academia:** With regard to their route into academia, 63.5% came to the UK specifically to work as academics 31.7% came to the UK initially to study before becoming academics.
- **University:** Engineering academics from 37 universities responded to the survey. The majority of them were working in England (71.2%) and in a Russell Group university (64.4%).
- **Period in the UK:** Most participants came to the UK before the June 2016 referendum (87.5%) and have been in the UK for 14 years in average (4 years minimum, 34 years maximum):
    - 61.5% were working in a Russell Group university
    - 71.4% were based in England, and 16.5% were based in Scotland
    - 80.2% had a role involving both teaching and research, 11% research, and 7.7% teaching.

  A total of 13 academics came to the UK after the June 2016 referendum. Of these, 61.7% have been in the UK for 2 years or less.
    - 84.6% were working in a Russell Group university
    - 69.2% were based in England and 23.1% in Scotland
    - 84.6% had a role involving both teaching and research, and 15.4% research only.

HESA Data

The analysis of HESA data aimed to answer the following overarching questions:

- HESA Student Data: has the number of EU engineering students decreased in the academic years after the Brexit referendum for both undergraduate and postgraduate degrees? What are the data trends by level of study, type of university, region of HE provider, and nationality?
- HESA Student Data: has the number of EU engineering academic staff decreased in the academic years after the Brexit referendum for all academic and research-only staff? What are the data trends by type of university, region of HE provider, engineering discipline, and nationality?

The figures provided by HESA for both students and academic staff are full person equivalent (FPE). FPE looks at how much of one person's studying or working time is engaged in a particular activity. Engineering includes HESA subject codes H1 to H9. More information is available on HESA website[1]. EU populations are based on nationality (and country of domicile when analysed more granularly). New students relate to first year enrolments only.

Compound annual growth rates (CAGR) were calculated to compare student and academic staff numbers over *n* academic years (from 2007/08 to 2018/19), using the formula below,

$$CAGR(t_0, t_1) = \left(\frac{V(t_n)}{V(t_0)}\right)^{\frac{1}{t_n - t_0}} - 1$$

Where, t_0 – the first year of observations; t_1 – the last year of observations; $V(t_0)$ – the start value; and $V(t_1)$ – the last value observed.

Compound Annual Growth Rates were calculated for two periods:

- Before the referendum (Pre-Brexit): from 2007/08 (or earliest academic year with available specific data) to 2015/16.
- After the referendum (Post-Brexit): from 2015/16 to 2018/19.

Structure of the report

Following the executive summary and introduction, Section 2 presents an analysis of HESA Data for both students and staff. Section 3 summarises the main findings regarding European engineering students, combining interviews and survey findings with relevant HESA Student Data. Similarly, Section 4 combines European academics data. Finally, Section 5 presents conclusions and main challenges to the UK's engineering education sector.

[1] https://www.hesa.ac.uk/support/documentation/jacs/jacs3-detailed

2. HESA Data

This section presents a descriptive analysis of Higher Education Statistics Agency (HESA) Student Data and Staff Data, to understand the changes in study and demographic distributions of EU nationals in UK's Higher Education Engineering before and after the Brexit referendum in June 2016. The analyses compare the latest annual growth rate of the student and academic staff numbers over time using compound annual growth rates (CAGR), following the type of data analysis that is usually adopted by the sector (UUK, 2017) and form the basis for a longer-term assessment of the impact of Brexit on UK Engineering HE. It also analyses data trends in different regions and types of HE providers, to better understand the impact of Brexit in research-led universities that are highly competitive in international rankings (Russell Group – RG) in comparison to other universities (non-members – NM).

HESA Student Data

In 2018/19, of all students enrolled in engineering degrees in the UK, all nationalities (N = 154,095) and all years of study, 11.7% were European nationals (N = 18,025). When these figures were analysed by type of degree, EU nationals accounted for 19.0% of all Postgraduate research (PGR), 14.2% of all Postgraduate taught (PGT) and 10.5% of all undergraduate (UG) engineering students in the UK. In 2018/19, the proportion of EU female engineering students in PGR and UG levels was higher than for non-EU female students (EU female students PGR = 29.8% and UG = 20.6%; non-EU female students PGR = 23.7% and UG = 16.1%).

As seen in Table 1, in the academic years after the Brexit referendum, the number of EU students in UG degrees increased more than in previous years, especially in Russell Group Universities (CAGR = 10.8%). On the other hand, the number of EU nationals in PGR studies, decreased for both types of universities. Regarding PGT, the number of EU students in Russell Group Universities increased after Brexit (CAGR = 2.4%) but decreased in other universities (CAGR = –10.0%).

Table 1. EU engineering students, all years, by degree and type of university

	2018/19	**Compound Annual Growth Rate (CAGR) EU engineering students**	
All nationalities N = 154,095	**EU nationals** N = 18,025	**% Pre-Brexit**	**% Post-Brexit**
PGR (RG) N = 8,210	19.5% N = 1,600	7.8	-1.0
PGR (NM) N = 4,880	18.1% N = 885	2.6	-4.0
PGT (RG) N = 8,810	10.0% N = 880	0.2	2.4
PGT (NM) N = 11,965	17.3% N = 2,075	4.6	-10.0
UG (RG) N = 41,570	12.1% N = 5,010	8.7	10.8
UG (NM) N = 78,660	9.6% N = 7,575	2.5	6.7

When considering all newly enrolled (first year) engineering students in 2018/19, EU nationals accounted for 17.7% of all PGR, 13.7% of all PGT and 11.1% of all UG students.

In the academic years after the Brexit referendum, the number of new UG enrolments from the EU increased at both types of universities, in particular for non-members (Figure 1).

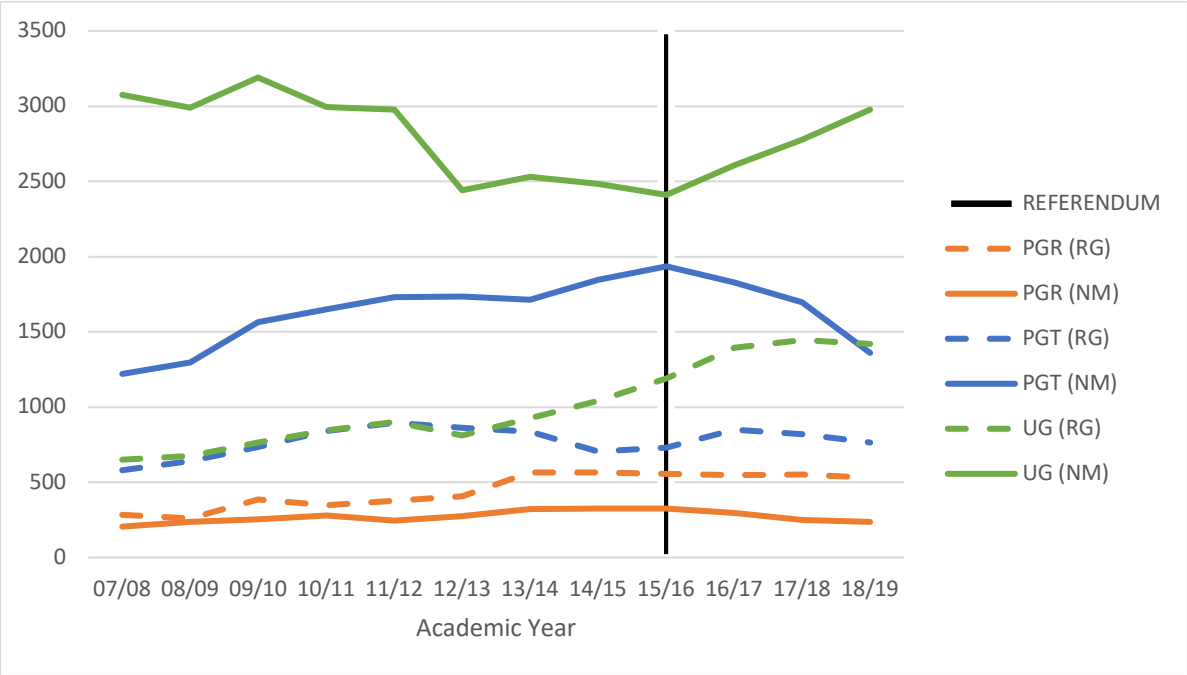

Figure 1. First year EU engineering students, by degree and type of university (2007/08 – 2018/19)

The comparison of CAGR for pre- and post-referendum academic years revealed that, before June 2016, non-member universities were attracting fewer new EU undergraduate students (CAGR = –3.0%), but that after 2015/16 these universities were able to increase the recruitment of EU nationals at this level (CAGR = 7.3%) (Table 2).

Table 2. EU engineering students, first year only, by degree and type of university

	2018/19	**Compound Annual Growth Rate (CAGR) EU engineering students**	
All nationalities N = 59,425	**EU nationals** N = 7,285	**% Pre-Brexit**	**% Post-Brexit**
PGR (RG) N = 2,850	18.6% N = 530	8.7	-1.5
PGR (NM) N = 1,480	15.9% N = 235	5.9	-10.2
PGT (RG) N = 7,930	9.6% N = 765	2.9	1.6
PGT (NM) N = 7,580	17.9% N = 1,360	5.9	-11.1
UG (RG) N = 12,370	11.5% N = 1,420	7.9	6.1
UG (NM) N = 27,215	10.9% N = 2,975	- 3.0	7.3

The number of EU nationals starting a PGR degree stagnated in Russell Group universities after June 2016 (CAGR = –1.5%) but decreased substantially in other universities (CAGR = –10.2%). The number EU nationals starting a PGT degree also decreased for other universities (CAGR = –11.1%).
These data suggest that UK's engineering undergraduate degrees were more attractive to EU nationals after the Brexit referendum. It also shows that Russell Group universities have been able to maintain a similar number of new EU nationals starting a postgraduate degree (PGT and PGR). In contrast, other HE providers have been negatively impacted in their capacity to recruit EU postgraduate students.

Nationality

In 2018/19, the most represented EU national domiciles at all levels of engineering study, all years, which are also the most represented among engineering academic staff, were: French, German, Greek, Italian and Spanish. In engineering, EU nationals living in these five countries accounted for 51.9% of all PGR EU students, 46.5% of all PGT EU students and 24.4% of all UG EU students (Table 3).

The analysis of 'first year only', revealed a stagnation in the number of new undergraduate engineering enrolments of Italian and Greek students in the academic years after Brexit, and a substantial increase of German students, followed by Spanish and French (Table 4). The number of new PGR and PGT engineering enrolments decreased for all top 5 EU nationalities. Among French and Greek nationals, this wiped-out pre-Brexit increases at PGT level.

Table 3. Top 5 EU engineering students' nationalities, all years, by degree

		2018/19	Compound Annual Growth Rate (CAGR) EU engineering students	
EU Nationality	**Degree**	**% of engineering students (EU)**	**% Pre-Brexit**	**% Post-Brexit**
France	PGR	6.6	3.4	-1.0
	PGT	13.7	0.2	-12.5
	UG	4.8	- 10.7	9.2
Germany	PGR	10.3	2.6	-1.9
	PGT	8.8	9.9	-6.7
	UG	3.8	-0.8	8.7
Greece	PGR	12.3	0.6	-4.0
	PGT	9.1	- 5.6	-12.6
	UG	5.5	- 5.3	-0.2
Italy	PGR	15.3	8.9	-4.4
	PGT	4.6	11.4	-10.8
	UG	4.1	14.7	10.8
Spain	PGR	7.4	11.3	-2.6
	PGT	10.3	8.7	-6.2
	UG	6.3	3.5	12.1

Table 4.Top 5 EU engineering students' nationalities, first year only, by degree

		2018/19	Compound Annual Growth Rate (CAGR) EU engineering students	
EU Nationality	**Degree**	**% of engineering students (EU)**	**% Pre-Brexit**	**% Post-Brexit**
France	PGR	6.5	7.0	-5.9
	PGT	18.1	3.7	-11.7
	UG	6.1	- 16.4	5.5
Germany	PGR	11.1	4.6	-5.3
	PGT	8.5	9.8	-3.5
	UG	6.9	- 2.8	12.4
Greece	PGR	13.1	4.6	-4.6
	PGT	11.1	- 3.7	-10.7
	UG	4.4	- 8.7	0.0
Italy	PGR	14.4	13.2	-6.6
	PGT	4.9	12.6	-12.2
	UG	3.3	15.7	0.0
Spain	PGR	7.2	15.6	-11.7
	PGT	12.5	11.3	-7.1
	UG	6.3	- 4.9	9.4

UK Region

In 2018/19 the highest proportion of EU nationals in PGR engineering studies (N = 2,480), all years, were studying in HE providers based in London (20.8%), followed by Scotland (17.7%), East of England (12.3%) and South East (12.1%). For PGT studies (N = 2,950), the highest proportion of EU engineering students were based in HE providers in London and East of England (25.8% and 18.0%, respectively), but also in Scotland (13.9%). Of all EU UG engineering students (N = 12,585), 20.5% were studying in HE providers based in London, followed by Scotland, South East and West Midlands (14.0%, 11.6%, and 10.1%, respectively) (Table 5).

In the academic years following the referendum, the number of EU nationals in PGR engineering studies decreased in London (CAGR = –5.7%) and stabilised in Scotland (CAGR = 0.0%). However, numbers increased in the North West (CAGR = 9.1%). The number of EU nationals in PGT studies also decreased in London HE providers (CAGR = –4.9%) and Scotland (CAGR = –10.1%). HE PGT providers based in the North East and North West were mostly affected in the academic years after the referendum (CAGR = –24.6% and CAGR = –23.0%, respectively).

At undergraduate level, all regions were able to increase the number of EU nationals after the Brexit referendum. This growth was particularly significant in HE providers based in Northern Ireland, East of England, Wales and West Midlands.

Table 5. Distribution of EU engineering students, all years, by degree and region of HE provider

		2018/19	Compound Annual Growth Rate (CAGR) EU engineering students	
Level	**Region**	**% distribution of EU engineering students**	**% Pre-Brexit**	**% Post-Brexit**
PGR	East Midlands	7.3	7.1	-7.2
	East of England	12.3	1.9	-1.6
	London	20.8	5.9	-5.7
	North East	1.6	1.3	-7.2
	North West	5.2	3.7	9.1
	Northern Ireland	1.6	Insufficient data	Insufficient data
	Scotland	17.7	9.1	0.0
	South East	12.1	6.5	-6.3
	South West	6.7	2.2	2.1
	Wales	3.0	7.0	7.7
	West Midlands	5.6	11.9	-4.4
	Yorkshire and The Humber	6.0	6.2	-4.1
PGT	East Midlands	5.1	-3.4	2.3
	East of England	18.0	2.6	-9.3
	London	25.8	4.0	-4.9
	North East	2.5	4.3	-24.6
	North West	3.6	5.9	-23.0
	Northern Ireland	0.8	Insufficient data	Insufficient data
	Scotland	13.9	8.5	-10.1
	South East	6.9	- 1.5	-4.5
	South West	2.0	- 0.7	-12.6
	Wales	5.9	18.9	3.0
	West Midlands	10.2	2.4	1.7
	Yorkshire and The Humber	5.3	2.6	-6.6
UG	East Midlands	5.8	13.2	8.0
	East of England	5.4	10.7	25.1
	London	20.5	6.1	7.1
	North East	2.8	7.4	5.3
	North West	7.2	5.8	4.4
	Northern Ireland	3.2	- 31.2	200.0
	Scotland	14.0	3.5	5.0
	South East	11.6	7.0	2.9
	South West	6.6	12.4	6.9
	Wales	6.6	- 5.4	11.7
	West Midlands	10.1	2.4	11.4
	Yorkshire and The Humber	6.3	5.9	2.7

The analysis of 'first year only', revealed a more nuanced perspective on the impact of Brexit on the recruitment of EU engineering students (Table 6). After June 2016, London universities recruited fewer EU nationals at PGR (CAGR = –9.1%) and PGT levels (CAGR = –1.3%) (N EU PGR = 765; N EU PGT = 2,135). On the other hand, Welsh universities increased their EU student intake for PGR drastically in the academic years following the Brexit referendum (CAGR = 32.6%).

Regarding new undergraduate students (N EU UG = 4,400), HE providers based in Yorkshire and The Humber, and North West were the negatively affected (CAGR = –2.8% and CAGR = –1.7%, respectively). Providers in all other regions were able to attract more EU nationals. The regions with the biggest increase in the recruitment of new EU engineering undergraduate students were Northern Ireland and East of England (CAGR = 184.4%[2] and CAGR = 42.9%, respectively).

Table 6. Distribution of EU engineering students, first year only, by degree and region of HE provider

		2018/19	Compound Annual Growth Rate (CAGR) EU engineering students	
Level	**Region**	**% distribution of all EU engineering students**	**% Pre-Brexit**	**% Post-Brexit**
PGR	East Midlands	7.8	9.1	0.0
	East of England	12.4	4.9	-4.8
	London	19.6	7.2	-9.1
	North East	2.0	0.0	0.0
	North West	5.9	6.1	4.0
	Northern Ireland	1.3	insufficient data	insufficient data
	Scotland	20.3	11.5	0.0
	South East	10.5	9.1	-12.6
	South West	5.9	5.8	-6.5
	Wales	4.6	0.0	32.6
	West Midlands	4.6	13.5	-14.0
	Yorkshire and The Humber	5.2	10.4	-10.1
PGT	East Midlands	4.0	- 0.8	4.3
	East of England	22.0	7.6	-9.8
	London	23.2	1.8	-1.3
	North East	2.8	5.9	-26.3
	North West	3.5	7.8	-27.9
	Northern Ireland	0.7	insufficient data	insufficient data
	Scotland	13.1	8.1	-12.6
	South East	6.8	0.7	-6.1
	South West	2.3	0.0	-3.1
	Wales	5.4	17.4	8.5
	West Midlands	10.8	4.0	3.9
	Yorkshire and The Humber	5.4	8.6	-5.2
UG	East Midlands	6.3	10.1	10.3
	East of England	8.0	10.2	42.9
	London	19.7	4.1	2.6
	North East	2.8	7.0	1.4
	North West	6.6	1.8	-1.7
	Northern Ireland	2.6	- 29.8	184.4
	Scotland	12.3	- 3.7	5.9
	South East	10.6	4.7	3.0
	South West	5.3	7.5	4.7
	Wales	9.9	- 10.3	10.8
	West Midlands	10.9	- 4.1	6.3
	Yorkshire and The Humber	5.1	1.1	-2.8

[2] Note: From a standing start of N = 5 in 2015/16 to N = 110 in 2016/17, and insufficient data in the previous academic years.

HESA Staff Data

According to HESA Staff Data (2018/19), a total of 26,865 of academic staff, from all domiciles, were working in engineering in UK universities (Figure 2), of which 21.0% were female (N = 5,630). European nationals accounted for 20.1% (N = 5,405), of which 24.6% were female (N = 1,330).

When considering engineering academic staff in research-only contracts, with a total of 8,835 academics, 24.6% were European (N = 2,170), of whom 24.2% were female (N = 525).

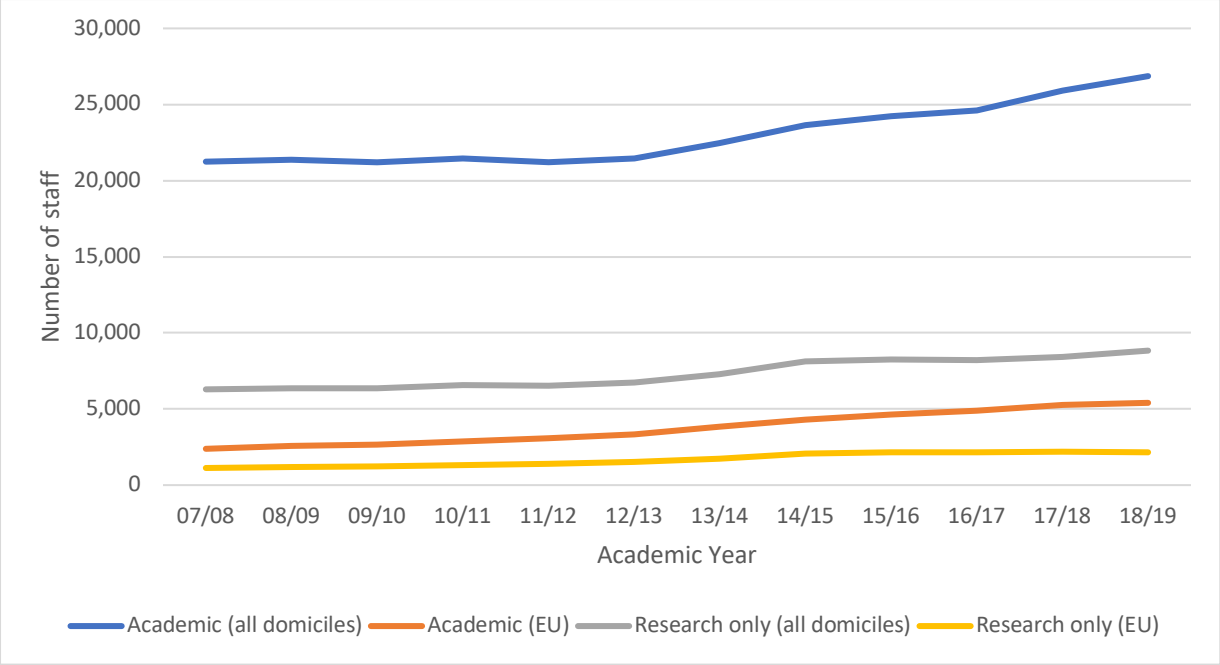

Figure 2. Engineering academic staff, all academic and research-only

In 2018/19, 58.9% of all EU engineering academics working in UK higher education were based in Russell Group universities. This represents 24.6% of all engineering academic staff in Russell Group universities. Of all female academics, all nationalities, working in Russell Group universities (N=2,650), 29.2% were European. When analysing research-only engineering staff, the proportion of all EU engineering academics working in Russell Group universities was 74.2%, representing 25.5% of all engineering research-only academics, all nationalities, in these universities (Table 7). Of all female research-only academics working in engineering in Russell Group universities (N=1,320), 30.3% were European.

Table 7. EU engineering academic staff, and research-only staff, by type of institution

	2018/19	**Compound Annual Growth Rate (CAGR) EU engineering academics**	
All academic staff (all nationalities) N = 26,865	**EU academics** N = 5,405	**% Pre-Brexit**	**% Post-Brexit**
Russell Group (N = 12,935)	24.6% N = 3,185	10.4	5.5
Non-member (N = 13,930)	15.9% N = 2,220	6.7	4.7
Research-only (all nationalities) N = 8,835	**EU academics** N = 2,170	**%Pre-Brexit**	**%Post-Brexit**
Russell Group (N = 6,305)	25.5% N = 1,610	9.6	0.0
Non-member (N = 2,530)	22.1% N = 560	6.2	-0.3

In the academic years prior to the Brexit referendum, both types of universities were increasing their number of EU academic staff in engineering (CAGR = 10.4% for Russell Group and 6.7% for other universities). Although the number of EU academics increased for both types of universities in the academic years post-Brexit, the growth was smaller for

Russell Group and other universities in comparison to previous years. Other universities maintained more similar levels of growth after Brexit.

However, when considering research-only engineering staff, the number of EU nationals stagnated in both types of universities after Brexit (CAGR = 0.0% for Russell Group and –0.3% for other universities).

Type of contract

In 2018/19, of all EU engineering academics in the UK, 8.2% were Professors and 90.7% had "other" contract levels (neither professorial nor senior management). These figures represent 16.0% of all engineering Professors of all nationalities in the UK; 9.0% of all Senior Management contracts and 20.9% of all other contract levels. The proportion of female academics in the EU engineering cohort was 15.7% Professors and 9.1% Senior Management, whereas the proportion of female academics in the non-EU engineering cohort was 12% Professors and 18.9% Senior Management.

When considering research-only staff, EU nationals represented 16.7% of Professors and 24.6% of research-only staff with other contract levels.

Terms of employment

In 2018/19, of all EU engineering academics in the UK, 56% held an open-ended or permanent position. The proportion of non-EU engineering academics with an open-ended or permanent position was 62.7%.
When considering research-only staff, only 26.3% of EU engineering academics held an open-ended or permanent position. The proportion of non-EU engineering researchers with an open-ended or permanent position was 30.1%.

Nationality

The top five EU nationalities for engineering academic staff were Italian, Greek, German, Spanish and French. In 2018/19, these 5 nationalities accounted for 64.1% of all EU nationals working as engineering academics in the UK, and 67.1% of all EU research-only academic staff (Table 8).

After June 2016, the number of Italian, Greek and Spanish engineering academics continued to grow (CAGR = 8.9%, 5.4% and 3.2% respectively). However, this growth slowed down for German nationals and stagnated for French nationals post-Brexit.

When considering research-only engineering staff, again, the number of Italian nationals continued to grow after the Brexit referendum, although not as much as in previous years. The post-referendum scenario revealed a decline in the number of French (CAGR = –6.2%), German (CAGR = –5.0%) and Spanish (CAGR = –3.5%) engineering researchers. This was particularly drastic for Spanish nationals when compared to compound annual growth rates pre-referendum (CAGR = 17.1%).

Table 8.Top 5 EU nationalities of engineering academic staff, and research-only staff

	2018/19	Compound Annual Growth Rate (CAGR) EU engineering academics	
All academic	**% of engineering academics (EU)**	**% Pre-Brexit**	**% Post-Brexit**
Italy	19.7	11.9	8.9
Greece	16.5	7.7	5.4
Germany	11.3	4.0	1.1
Spain	9.3	15.9	3.2
France	7.3	6.2	0.0
Research-only	**% of engineering academics (EU)**	**% Pre-Brexit**	**% Post-Brexit**
Italy	22.3	10.3	5.3
Greece	15.4	8.3	0.5
Spain	12.4	17.1	-3.5
France	8.7	5.5	-6.2
Germany	8.3	1.3	-5.0

UK Region

In 2018/19, the geographical distribution of half of all EU engineering academics in the UK was concentrated in London (23.6%), Scotland (16.7%) and South East (12.1%) (Table 9).

Table 9. Distribution of all EU engineering academics, and research-only staff, by region

		2018/19	Compound Annual Growth Rate (CAGR) EU engineering academics	
All academic	**Distribution of EU engineering academics in the UK (%)**	**Proportion of EU engineering academics (%)**	**% Pre-Brexit**	**% Post-Brexit**
East Midlands	6.7	16.0	11.1	3.5
East of England	8.3	24.2	5.9	5.8
London	23.6	26.9	8.9	4.6
North East	2.6	13.8	6.1	-1.2
North West	6.3	15.7	6.8	3.7
Northern Ireland	3.3	30.3	4.6	6.3
Scotland	16.7	26.1	12.7	17.1
South East	12.1	18.8	7.2	-0.5
South West	5.6	18.6	12.0	5.5
Wales	2.8	13.2	3.5	6.3
West Midlands	6.4	15.1	13.3	2.0
Yorkshire and The Humber	5.6	13.2	8.6	0.0
Research-only	**Distribution of EU engineering academics in the UK (%)**	**Proportion of EU engineering academics (%)**	**%Pre-Brexit**	**%Post-Brexit**
East Midlands	6.0	21.3	9.5	-3.6
East of England	10.4	29.0	6.6	0.0
London	27.2	34.0	10.9	2.4
North East	2.5	17.7	2.1	-5.4
North West	5.3	17.7	3.7	-1.4
Northern Ireland	2.5	25.6	1.7	11.2
Scotland	13.4	30.7	12.7	3.7
South East	12.9	25.5	7.8	-4.4
South West	5.1	21.4	14.2	-5.4
Wales	2.8	16.0	1.5	10.1
West Midlands	5.3	20.0	13.0	-1.4
Yorkshire and The Humber	6.7	14.0	5.2	-1.1

When analysing all engineering staff, the universities with the highest proportion of EU academic staff were located in Northern Ireland (30.3%), London (26.9%), Scotland (26.1%) and East of England (24.2%). Wales, Yorkshire and The Humber, and North East had the lowest proportions (13.2%, 13.2% and 13.8%, respectively). When analysing research-only staff, the same regions have the highest and the lowest proportions of EU nationals: 25%, or higher, in London, Scotland, East of England, Northern Ireland – and the South East.

After June 2016, the number of EU academics increased drastically in Scotland (CAGR = 17.1%), but also in the Northern Ireland (CAGR = 6.3%) and Wales (CAGR = 6.3%), compared to previous academic years. The number of EU academics decreased in HE providers based in the North East (CAGR = –1.2%) and South East (CAGR = –0.5%). Northern Ireland and Wales were the regions with the highest increase in EU research-only staff after Brexit (CAGR = 11.2% and 10.1%, respectively). London and Scotland continued to increase the number of EU engineering research staff, but not as much as in the academic years before the Brexit referendum (CAGR = 2.4% and 3.7%, respectively). The number of EU researchers stagnated in universities located in the East of England and decreased in all the remaining regions.

Discipline

The distribution of all EU engineering academics by engineering discipline is mostly aggregated in three fields, besides 'other engineering and technologies', for both 'all academic' and 'research-only' positions: electrical, electronic & computer engineering; mechanical, aero & production engineering; and general engineering (Table 10). Of all EU nationals, the proportion of female engineering academics was 36.8% for Chemical engineering, 33.3% for Mineral, metallurgy and materials engineering, 32.6% for Civil engineering, 27.2% for General engineering, 20.2% for Mechanical engineering, and 19.2% for Electrical, Electronic and Computer Science.

Table 10. Distribution of all EU engineering academic staff, and research-only staff, by engineering discipline

	2018/19	Compound Annual Growth Rate (CAGR) EU engineering academics	
EU All academic	**Distribution of EU engineering academics (%)**	**% Pre-Brexit**	**% Post-Brexit**
Chemical engineering	6.3	9.1	5.4
Civil engineering	8.8	15.3	6.8
Electrical, electronic & computer engineering	16.4	7.7	2.4
General engineering	14.1	9.1	6.5
Mechanical, aero & production engineering	16.9	11.3	2.5
Mineral, metallurgy & materials engineering	4.2	6.5	-2.1
Other engineering and technologies	33.3	7.0	8.1
EU Research-only	**Distribution of EU engineering academics (%)**	**% Pre-Brexit**	**% Post-Brexit**
Chemical engineering	6.9	6.6	0.0
Civil engineering	7.6	11.0	3.2
Electrical, electronic & computer engineering	18.9	7.8	-1.6
General engineering	18.5	9.4	3.6
Mechanical, aero & production engineering	17.6	10.6	-2.9
Mineral, metallurgy & materials engineering	6.9	7.2	-5.0
Other engineering and technologies	23.6	7.6	1.0

After June 2016 the number of EU academics decreased in mineral, metallurgy & materials engineering (CAGR = –2.1%). When analysing research-only staff, the numbers revealed a decline of EU research staff in three disciplines: mineral, metallurgy & materials engineering; mechanical, aero & production engineering; and electrical, electronic & computer engineering (CAGR = –5.0%, –2.9% and –1.6%, respectively).

3. European engineering students

Overview

According to HESA's most recent student data (Higher Education Statistics Agency, 2018/19), approximately one in nine higher education engineering students in the UK are from Europe. That increases to one in seven on postgraduate taught courses (PGT) and nearly one in five at postgraduate research (PGR) level. A third of the newly enrolled EU engineering undergraduate students are based in London or Scotland.

No students based in Welsh universities and no undergraduate students based in Scottish and Northern Irish institutions participated in the interview phase of the project. However, the group of interviewed students shared diverse backgrounds, motivations and experiences in UK's engineering education.

Despite distributed circulation, the self-selection of survey respondents led to a largely post-referendum cohort with a Russell Group focus. A large proportion of respondents were from three universities: of all undergraduate students, 57.7% were from Queen Mary University London; 52.2% of all Integrated Masters were from UCL; and 57.6% of all PhD students were from the University of Cambridge. No EU engineering undergraduate students based in Scotland and Northern Ireland participated in the survey, only at PhD level. No students based in Welsh universities completed the survey.

Motivations

The interviews revealed that the international reputation of UK's universities and the desire to live abroad and have a different learning experience were common motivations to choose studying in the UK. Undergraduate students had the expectation to be taught in a more practical/hands-on approach and develop their technical English. Data collected in the surveys confirmed the importance of these same factors and motivations.

Interviewed undergraduate students mentioned that the UK offers better job opportunities after graduation, especially at entry-level, in comparison to their home countries. For PhD students, UK universities offered more funded positions in their fields of interest and research opportunities than other European countries.

> [Italian undergraduate student] (…) comparing to my home country (…) I would have learnt more about the theory and the background. I would have only used Italian. While in England, I would have learnt better English, more technical English, I would have more practical skills, more transferable skills (…) the English system is that they want you to get out there and work as soon as possible. While if I stayed in Italy, I would probably have become more of a researcher or an expert or something.

> [Portuguese PhD student] At the time I applied to a lot of universities, even Australia for example, and the US. But I always wanted deep down to come to the UK because (…) it looks well on the CV (…) people really take into consideration if your PhD is done in the UK (…) doing a PhD in the UK was always very highly esteemed, so I wanted to come here.

> [Danish PhD student] Well, I wouldn't have minded other countries either, but I think because of the language, my preference was the UK (…). For me, the language is a clear advantage to coming to the UK, because I didn't need to worry about learning another language in order to live in the place (…). If I had to go to Spain or France

(…) it would be a real struggle for me to adapt to the society, I think, because I don't speak the language (…) When I did my master and my bachelor, I took some semesters abroad as well.

The vast majority of undergraduate and Integrated Masters students surveyed had a student loan. All but two PhD students were fully funded. The interviews also highlighted that being eligible for Home/EU tuition fees for the whole duration of their degrees, as well as being able to access student finance, were key factors for undergraduate students.

[Romanian undergraduate student] I've always had Brexit in mind when I applied to UK. I knew that maybe it could affect my way of funding my university fees (…). I was quite scared that admission fees could change, but I was then reassured that the tuition fees will stay the same (…) If the student loan didn't exist, then I wouldn't be able to afford paying the tuition, the international tuition fee on my own. If the student loan existed (…) yes, I would have still considered the UK because the student loan is made in such a way that it can be paid back, but I wouldn't be able to afford that without the student loan.

The follow-up survey confirmed that eligibility for a student loan – and being awarded a full scholarship in the case of PhD students – was one of the most important factors when deciding to come and study in the UK, for more than 50% of the respondents.

Experiences

Overall, students who were interviewed were satisfied with their decision to come and study in the UK and reported a wide range of positive experiences. Undergraduate students were particularly pleased with opportunities to engage in teamwork and problem solving. Being able to learn with international staff and students was a very positive aspect of their education and personal experiences in the UK.

[Italian undergraduate student] (…) something that they're really pushing us on which I really like right now is giving us problems which we don't really know about and try to solve them. I think this is quite important because as an engineer you don't really know in the future what you going to have to deal with. Sometimes you might have to deal with some new scenarios, something that you're not really ready for. Now what they're stressing on, which I really like and is matching my expectations, is you're given a scenario, a random scenario, try to understand what's going on and coming up with a solution, so after, of course, doing research analysis, et cetera. This is one important thing: the problem-solving part and then the team working as well. (…) Projects are made in group. The engineering environment, as far as I know, is really international, is really based on team working because most of the things we're doing right now they are so big, of course, they can't really be done by one person only. Also, my university I'm dealing every day with a lot of people which have different background from mine, and possibly from different culture, from of course different countries as well. The international environment is something that I really like.

The surveys confirmed that EU students' most valuable experiences of their time studying engineering in the UK were being part of a diverse and international university environment, quality of teaching and access to resources, as well as good links to industry.

[Polish undergraduate student] I believe the most valuable experience is the practical aspect of engineering studies, while in other countries it is common to focus mostly on its theoretical side. The reason to that is usually lack of access to engineering equipment while in my university the laboratory is fully equipped.

[German Integrated Masters student] [I benefit from] meeting international and open-minded people from around the world, as well as learning in an industry-focused environment.

[Italian PhD student] The chance of meeting people from all over Europe and the world, getting to know a variety of cultures and ways of thinking [was beneficial]. Definitely it's not the quality of lab that gives value to a place but the people who work there.

> [Latvian PhD student] [I benefit from] the diversity of student cohorts and staff, which provides a wide range of both expertise and viewpoints not only socially, but also within the field of study.

On average, students feel welcome in their universities and cities/areas of residence, but slightly less welcome 'in the UK'.

The Brexit factor

The Brexit referendum in June 2016 appeared not to reduce the attractiveness of undergraduate engineering. In fact, HESA's Student data indicated increases in EU enrolments across UK universities, particularly for institutions in Northern Ireland and East of England.

However, the number of EU nationals starting an engineering postgraduate degree after June 2016 fell, specifically among universities outside of the Russell Group.

London universities have seen a hit in postgraduate research degree enrolment numbers, while numbers at Scottish Universities appear to have plateaued.

Most of those students interviewed who came to the UK after June 2016 said that Brexit had no substantial impact on their decision to study engineering in the UK. They mentioned being well informed about their ability to study in the UK. Two thirds of undergraduates, half of PhD students and one third of those on Integrated Masters courses surveyed maintained they would have come to study engineering in a UK university if they were making that decision today (Figure 3).

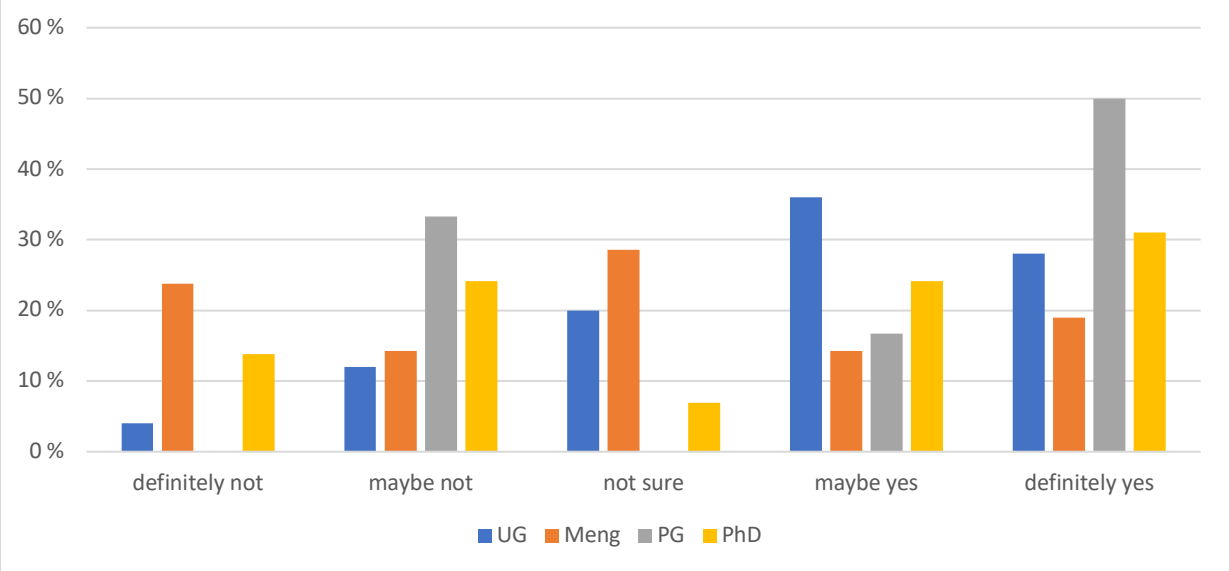

Figure 3. Question: Taking yourself back to the moment when you applied to your current engineering degree, would you have come to study engineering in a UK university if you were making that decision today?

For these students, quality of teaching and future prospects were the main reasons why. But for those who would not come to study if making that decision today, increasing costs incurred by EU students after Brexit (international fees), a potential reduction in jobs and research opportunities in the UK, and a general feeling of not being welcome, were their main concerns.

> [German Integrated Master student] Brexit will definitely make life more difficult for EU students now and could affect job prospects too. I also think I might feel unwelcome in the UK from the government, even if the people around me are welcoming.
>
> [Italian PhD student] [I fear] a general feeling of rejection, fewer funding opportunities, fewer European students.

Interviewees expressed that financial constraints would have had a negative impact on their willingness and ability to pursue their studies in the UK.

> [Romanian undergraduate student] I've always had Brexit in mind when I applied to UK. I knew that maybe it could affect my way of funding my university fees (…) I was quite scared that admission fees could change, but I was then reassured that the tuition fees will stay the same. (…) The fact that I can still access the student loan makes me feel confident that I can finish university and I won't have any money issues. (…) If the student loan didn't exist, then I wouldn't be able to afford paying the tuition, the international tuition fee on my own.

This was confirmed by the larger survey sample, with many students reporting that having to pay international fees, and not being eligible for a student loan/scholarship, would have been a major deterrent if they were making the decision to study engineering in a UK university today.

> [Hungarian Integrated Master student] I would NOT be able to pay the tuition fees. I even struggle to pay the rent in [city].
>
> [Slovenian-Croatian PhD student] As of last week, when it was announced EU students will be charged international tuition fees, my answer is no. Before I would still encourage others to apply to the UK. I received a scholarship from my home government that paid for my undergraduate tuition and maintenance, without which I would not be able to study here. However, with the increased fees, the scholarship will not cover them fully, putting the UK out of my financial reach.
>
> [Italian PhD student] I would have considered the situation here not stable enough to start my PhD. Also, I do not think I would have been able to get my scholarship, as it is completely funded by Europe.

In fact, only 8% of the surveyed undergraduate students would have come to study in the UK if *not* eligible for a student loan. The figures were 23.8% for Integrated Masters and 28.6% for PhD students (Figure 4).

> [Polish undergraduate student] Without the student loan, I would not be able to study in the UK, thus I would not even think about paying International/Non-European tuition fees.
>
> [Spanish undergraduate degree] I come from a low-income family; thus, I could never afford studying abroad in the UK with such high fees. I could only afford it if it cost around 2000 pounds max, doing a big effort. Student Finance was definitely the main factor to applying to study in the UK.
>
> [French PhD student] I would be willing to be £0 in tuition fees but could pay a few hundreds of pounds of NHS fees, for example. I would not pay tuition fees if I were in my home country, so it is out of the question to have to pay tuition fees if I study abroad. Obviously, if said tuition fees were to be paid for by a scholarship, the amount of the tuition fees would not be an issue for me.
>
> [Austrian PhD student] Without a studentship I would not study in the UK at all. My home country offers you a part-time position as a standard for PhD students, you get paid, you don't have to pay.

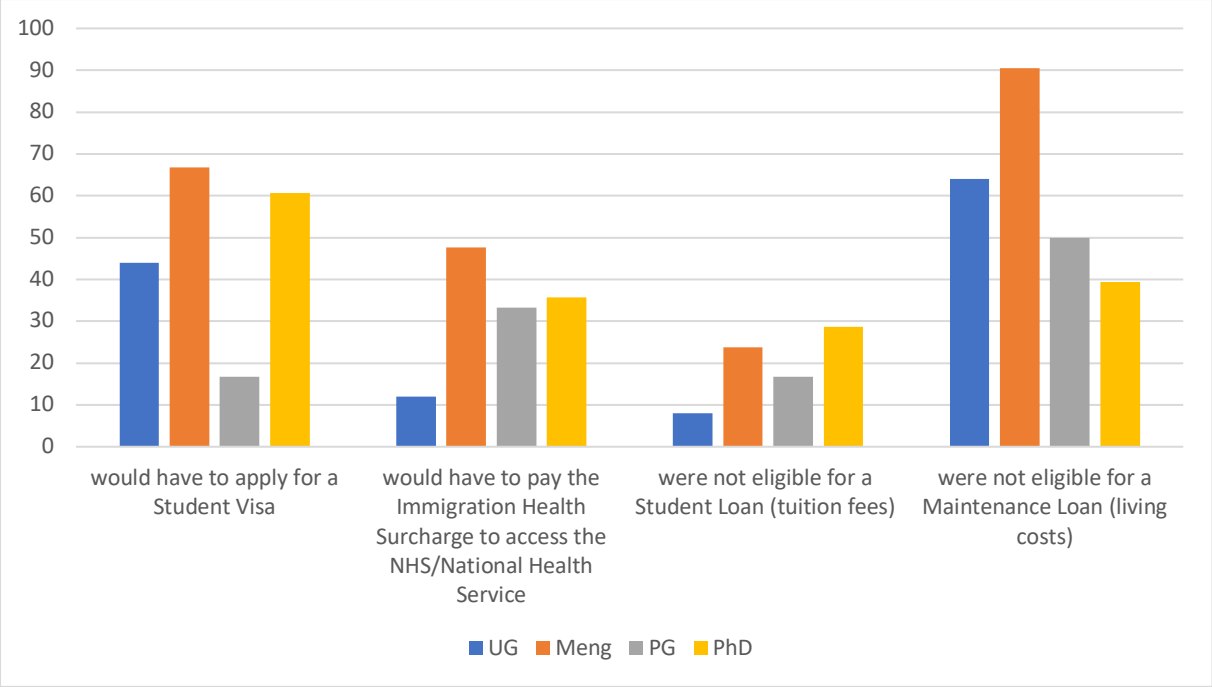

Figure 4. Question: If you were applying to a UK university today, would you do it if you…

What next?

The top priorities for EU engineering students were continuing provision of financial support and maintaining eligibility to work in the UK without the need of a visa. Although feeling reassured about the unchanged conditions to remain and complete their studies in the UK, EU students were particularly worried about the future impact of Brexit on freedom of movement, work and research collaborations between the UK and the EU.

The interviews and surveys revealed that undergraduate and PhD students alike were concerned about the potential negative impacts of Brexit on the state of the economy, on their rights as EU citizens, and on their future plans in the UK.

> [Spanish undergraduate student] The top priority should be to continue providing Student Finance Loans to EU students, since many students could never afford international fees or even home fees, leaving them out from taking a degree in the UK.
>
> [Italian Integrated Masters student] I would like to ask them to make sure that EU students can still have the same opportunities when searching for jobs. Meaning, that unlike students coming in with Tier-4 visas, the EU students can find jobs as easily as UK citizens. I believe this is what makes the UK such a strong country, especially in the Engineering firms and also in the universities (staff, PhD students). Lots of the talent comes from the EU and excluding them would be a shame for the UK universities.
>
> [Portuguese Integrated Masters student] I believe that job security is the most important subject for graduate students. I would like to see the negotiations covering the visa issue seen in international (non-Europeans) students, it would be unfair if visas became the norm for European students, especially when their decision to move to the UK was taken before the referendum.
>
> [German PhD student] Any rise in costs of studying will decrease the number of international students in the UK. Especially at the top universities e.g., Cambridge and Oxford, this would lead to a deterioration of the quality of the education and research output.

[Greek PhD student] To maintain EU fees the same as UK fees and to allow EU engineering graduates to search for jobs after graduation without stringent visa impositions and time limits.

[Italian PhD student] The most important thing it to find a way to keep the European fellowships such as Marie Curie. Many students are attracted to them because of many benefits. If there are no more fellowships as attractive as the European ones, people will prefer going elsewhere in Europe.

[Dutch PhD student] Research is international, current plans cut both the talent off by introducing hefty fees and introduces uncertainties with regards to collaboration within the EU e.g., cross-border ERC funding.

[Romanian PhD student] [The priority should be] to keep funding high for research and education. It would be really sad if the UK would lose its research and development drive due to the lack of funding in these fields.

Despite this, more than half of those surveyed planned to stay in the UK after graduation, while some of those interviewed were particularly keen to stay in the UK for further studies, with undergraduate students particularly wanting to stay and develop their engineering careers in the UK. For the PhD students we spoke to, the willingness to stay in the UK was dependent on having access to job opportunities and research funds, as the UK was seen as an attractive place to pursue their future career plans as engineering academics. They made more references to the importance of feeling welcome and having family plans as important factors to consider in their decision to stay or leave the UK after Brexit.

[Portuguese PhD] I would like to stay here. Like I said, I feel like at home, so that's fine (…) But if I don't see any opportunity, I have no problem moving, but maybe if at the time Brexit will be a thing, I will have to re-evaluate if I would rather go to [European country] (…) No funding, if there is no funding there is no job, because postdoc positions are based on funding of projects. If the EU cuts the funding in the UK there will be no jobs.

[Italian PhD] I will consider staying as a first option but then (…) my boyfriend doesn't think it's worth to stay here. He doesn't feel really welcome and (…) It's not a place he would like to stay long term. Certainly, the constant uncertainty doesn't make anyone's life easier (…) I've never had that kind of impression before but then that [referendum outcome] made me think… It gives you that kind of feeling that perhaps it's better to find your home elsewhere (…) feeling welcome or not feeling welcome in an environment, it has an impact on the daily life.

[Austrian PhD student] The climate in the UK towards EU citizen does not feel welcome at all, I disagree with a lot of things that are happening in the UK regarding Brexit negotiations and the only reason I agreed to move to the UK was that the UK was part of the EU and I would not need to worry about visas right to work and being able to live here/have a family without worrying if I will be able to stay forever.

[Finnish PhD student] It made [me] more hesitant to remain in the UK for my PhD after my undergraduate studies because it felt like I was not welcome here any longer.

The survey revealed that British citizenship was considered to be important if staying in the UK for further work or study, particularly for undergraduate students, of whom 52% intend to apply for citizenship in the future.

[Romanian undergraduate student] I do consider applying for a UK citizenship, especially since I want to work here, especially since I want to continue my education here (…) I think it would be an advantage for me because I would be considered as a citizen.

[Italian Integrated Masters student] In order to live and work in the UK, I feel like it is better to have the citizenship as a safety options since Brexit seems to be changing the rights of EU citizens in the UK. I think having the citizenship after all these years of studying and living in the UK will be beneficial.

4. European engineering academics

Overview

The latest HESA data shows that one in five engineering academics working in a UK Higher Education Institution are EU nationals, increasing to one in four of those whose focus is research-only. Italian, Greek, German, Spanish and French nationals accounted for around two-thirds of these. At professorial appointment overall, one in six were EU nationals, although almost one third of the survey participants reported 'Professor', 'Assistant Professor' or 'Associate Professor' as their job title.

Regionally, universities in Northern Ireland (30.3%), London (26.9%), Scotland (26.1%), and East of England (24.2%) had, in engineering, the highest proportions of EU academic staff. Wales, Yorkshire and The Humber, and North East were least dependent on academics from the EU. The majority of those surveyed worked in England, mostly in London (25.9%), Yorkshire and The Humber (14.4%), and Scotland (17.4%).

According to HESA data, while half of all EU academics held an open-ended or permanent position, only around one quarter of the more prevalent 'research-only' staff have this stability. Around three quarters of EU staff on research-only contracts in 2018/19 were based in Russell Group universities. The vast majority of the academics who completed the survey had a permanent contract, and only 11.6% were working exclusively as researchers.

Two-thirds of those surveyed worked in a Russell Group university, whereas the proportion of EU nationals working in these universities across the UK in 2018/19 was 58.9%. Besides other *engineering and technologies*, EU academics surveyed were mostly concentrated in electrical, electronic & computer engineering; mechanical, aero & production engineering; and general engineering.

Motivations

The interviews revealed three 'entry routes' into the UK for EU engineering academics: academic route, study route, and industry route. The largest group of the interviewed academics came to the UK as their job here "ticketed all the boxes", and opportunities were offered in their specific area of interest (academic route).

> [Dutch academic] it was just the position. My field was very small, and this university had an opening in this specific research field area.
>
> [German academic] It was exactly what I wanted to do. I had never before had this opportunity. It's very much specific to the job, not so specific to the UK, not so specific to [University]. It was more or less of a coincidence that exactly this position was open exactly at this time in [University].
>
> [French academic] When I was doing my PhD at [University outside the UK], I randomly, but luckily, met Professor [name] and Professor [name] in two conferences, just at the end of my PhD. The topic of research that they were going to develop in the new research centre was exactly what I was aiming for (…) That was direct a natural continuation from my PhD project (…). I was a student and really worried that I might not find a job, so any first opportunity that came was a good opportunity, but this one happened to be just gold because it ticked all the boxes for me.

A few academics came to the UK to study (whether at undergraduate, master's and or PhD level), and ended up staying in academia, even though this was not initially planned, but an opportunity that emerged and they have decided to embrace (study route).

> [Bulgarian academic] First of all the discipline that I wanted to study wasn't available in my country. (…) I didn't expect to stay in academia. My idea was to start studying and then as soon as I graduate to go to that part of the industry, but the university offered me this [teaching] position (…) and a free masters which I couldn't refuse at the time. And after that, first I really enjoy teaching, so I stuck up. It wasn't something planned or expected.

> [Portuguese academic] I came here, did my masters in this institution, stayed for the PhD, ended up staying for the lecturing position after that. (…) I was offered a scholarship to do the PhD. It was never the plan initially to stay for research or anything. Staying for work was being considered, but then, yes, the scholarship-- I thought this is the opportunity to attempt taking a PhD, it will be now. Later would be much harder. Teaching commitment started soon after as well. It was just having the opportunity for doing that, if that makes sense.

Only one participant came to work in industry, but later transitioned to academia (industry route). One third of the EU academics who completed the survey came to the UK to study.

From a professional point of view, the UK engineering higher education sector was described as the "perfect environment" to develop both research and academic careers, offering good job opportunities, career progression and leadership positions. On a personal level, staying in Europe, or coming back to Europe after an experience abroad, was important to EU academics, as they would be able to stay at a short distance to their home countries and families. The English language was a key factor to choose the UK to pursue their academic careers – speaking the language was essential to be able to fit into the UK's society.

> [Spanish academic] In the UK you have the perfect environment to develop a normal engineering professional career or academic career (…) Apart from that, I speak some English, so maybe it was a work opportunity. It's not easy to move to a country. I do know the language; I know the culture. When I worked in [non-EU country], I worked there, had a good job, good salary but my [foreign language] was very limited. Plus, the idea that we can go to a place that is not your home country and start to live like a local, it is something that was important.

> [Belgian academic] My second reason was linked to the fact that I was already for eight months in the United States. I loved working there, but that convinced me that I was very much a European at heart. I wanted to come back to Europe, for the European mindset. An environment which was well founded in history. Because to be honest, it's something only when you step out, you really experience how much history is behind everything here in Europe and the lack of history, how much of it influences cultural life and in general. When I was in the States, I made a very conscious decision, for the rest of my career, I want to spend that in Europe, wherever in Europe, it didn't really matter. The opportunity and the projects here in [University] just inspired me, and hence why I ended up in the UK (…) Well, speaking the native language always helps!

> [Romanian academic] I also didn't want to go too far away from home. I wanted to be on a quite short flying range from [home country] so that has taken me to Europe (…) I had done my undergraduate degree in [home country] in English, so I had already studied engineering in English. For me, it was easy because I had all the specific language that you need to use, was already there, so I thought it would be quite easy to adapt from the language point of view.

The survey confirmed that easy travel between the UK and home country, more research and job opportunities in the UK than in other countries and being able to work and live in an English-speaking environment were the most important motivations to come to work in the UK engineering education sector regardless of whether academics had come to the UK prior or after the Brexit referendum (Figure 5).

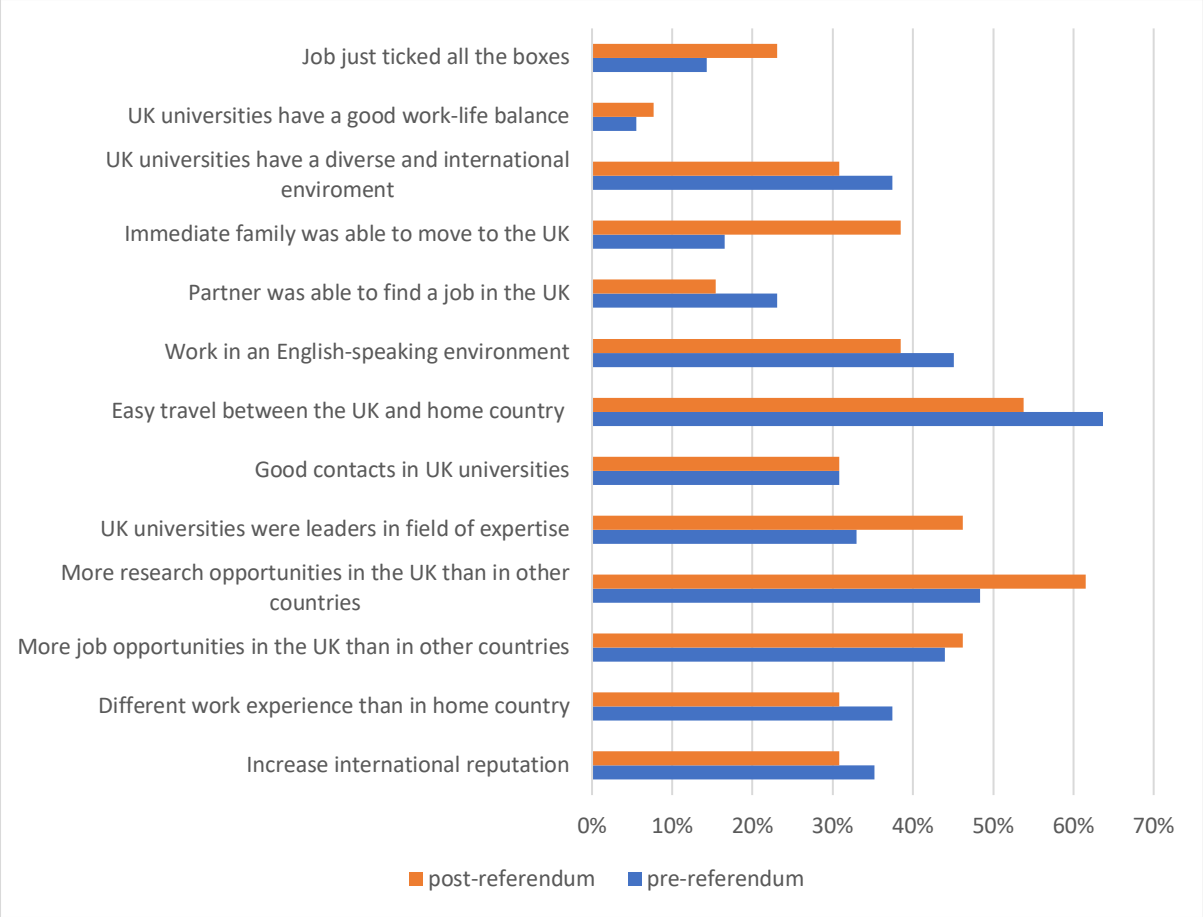

Figure 5. EU engineering academics motivations to work in the UK

Three in four academics surveyed were considering job opportunities in countries other than the UK. Most of them had in mind their home country and other EU countries (mostly Germany) but also the USA.

Experiences

The interviews revealed that, overall, academics were pleased with their experiences in the UK, citing good work conditions and being part of an international and collaborative environment as two of the most positive aspects. Universities were described as safe, supportive, and welcoming to EU and international staff.

> [Spanish academic] I think it's been good. Certainly, I have access to a lot of opportunities which I'm sure wouldn't have happened. But at the same time, they weren't planned (…) ending up teaching wasn't the plan coming here. It's been interesting and rewarding, for the most part.

> [German academic] In the University, very positive because [University] is a very diverse university, very international, and [UK city] itself is very international, that's different to other places in the UK. If we talk to EPSRC or whatever on panels, it's always about white male panels and we just don't have that problem, we just don't.

> [Belgian academic] I really, really enjoy the UK, working over here. In an academic setting, the institutions I worked so far, both of them and then contacts with other academic institutions – I always had the feeling that the general approach to research is a collaborative approach, where within the same institutes you're considered to be colleagues, working towards a bigger goal of striving and pushing the boundaries of what we know, and advance with research. Whereas in Canada and the States it was much more of a competitive environment amongst colleagues within the same department, which was something that I didn't really feel comfortable with.

I really enjoy being part of a team, and so finding that attitude here in the UK, really fitted with my personal opinion.

[French academic] (…) I'm still very happy in the UK, I have to say. I'm very sheltered and protected. (…) It hasn't changed anything in my professional life. Three years ago, I got promoted as well. It hasn't affected my career pathway. I still feel supported by the university to the same level as any of my UK peers.

In the survey, academics were positive about their career progression and access to resources, and less positive about their ability to secure EU research funding. Academics in Russell Group rated their experiences in the UK as more positive than academics in other universities. In particular, academics working in Russell Group universities were more likely to agree that their departments have been able to recruit European students, and more likely to agree that their university has been providing useful information regarding Brexit, than other colleagues.

When interviewed about institutional support, the general feeling was that, due to political uncertainties, universities were reacting instead of acting. In some cases, universities were late in providing the most updated and useful information to EU academic staff. Financial support for ongoing research projects and purchase of equipment (e.g. import tariffs) were only mentioned by two interviewees working closely in institutional research centres.

[Spanish academic] At the university level there was very little information. I can understand now that everything has passed. The political uncertainty was very high. (…) They couldn't deliver sure or secure information because that information wasn't available even from the government at the beginning because it was still under negotiation. (…) They run some briefing seminars and things, but they are always running late (…). they didn't even take any action until we demonstrated that the rest of the universities in the UK were doing it. (…) They try their best. I think that in a personal level they tried their best, but it's like they're always reacting a bit late.

[Belgian academic] The university has always provided quite a lot of updates on the current situation, although most of the emails end up with, "We didn't know either. We're just sharing the information we have, which is basically nothing".

[German academic] I would have thought the university was on the phone every single week telling the Secretary of Education (…) That's something universities could have insisted on. All the universities together they could have said, "Look, all of our staff 10% are from the EU and we just want to secure this (…) We want to guarantee that they can stay. You get the settled status in place no matter what's happening apart from that". And they can do that every day of the week and they can just insist until they got this guarantee. (…) there is the problem that there's no real support for the EU citizens in the UK, and the universities could change that. (…) I think they think they're doing enough by sending around information, which is non-information really because nobody knows what's happening. Instead of thinking they're doing a lot, they should actually have thought about what could they effectively do? It starts with looking into the salaries and how people have taken a hit from the exchange rates changes. Up to mental health problems. Up to actually exerting political influence to get guarantee for the EU citizens (…) Let's put it this way, they would need to enter a proper dialogue. There is no proper dialogue going on. They're not actually talking to the people, they're just giving them information thinking that they're supporting them, but they're not really entering a dialogue to understand what's going on. (…) I understand that universities aren't really very political but, in this case, they would just have to take a stand because it impacts on their fundamentals, (…) "open to the world" it's just a headline, it's not true anymore. It's "open to the world minus the EU". I think they just think they don't know what's happening just like anybody else. (…) I don't really expect much neither from the university nor from the government. But the universities as a whole, the Russell Group or whatever, they could have made a tremendous fuss. As a group, there's nothing the government can do against them. They could have been in the papers every single week with this and that (…) you just don't see the universities in the papers.

[Belgian academic] On a few very large items, we had quite a bit of contingency put aside, just in case that, if the UK would have left the EU back in March, when the original date was, and we would have had import tariffs, that we had the money put aside to cover those import tariffs. Luckily, it didn't happen, moved to the end of October. We were able to release part of the contingency because equipment started to come in, but now we still have a

> few big-ticket items. To some degree, the extension of us leaving the EU is quite positive for us because we can use a contingency to actually get equipment in rather than cover our import tariffs.

The most valuable experiences of their time working as an engineering academic in the UK, among those surveyed, were the opportunity to work in an international, multicultural and multidisciplinary environment. Collaboration with national and international partners and access to research funding, as well as opportunities for career progression and good links to industry were also seen as very valuable. Asked about benefits, academics responded:

> [Austrian academic] Intercultural experiences, working in a position that does not exist in this form in my home country, extending my network.

> [French academic] The multicultural/multidisciplinary culture is fantastic - there is a lot more links with industry as well.

> [Italian academic] The ability to develop my research vision thanks to a unique combination of funding instruments.

> [Dutch academic] Promotion to chair has been easier in the UK.

> [Swiss academic] The broad field of engineering and close relationship with relevant applications (e.g. industry).

Many academics perceived these experiences as being already beginning to change negatively due to Brexit.

> [Italian academic] Being able to pursue my research interests. I feel this is likely going to change in the near future as a consequence of Brexit.

Less positive aspects among those interviewed were associated with an increased burden in academic administration, as well as unexpected teaching commitments by research staff, but this was not associated with Brexit or the UK.

The Brexit factor

Since the UK's decision to leave the EU, the number of EU academic staff has increased at UK universities while the number of EU research-only staff has generally stagnated. However, the number of EU academics increased drastically in Scotland following the referendum and also increased in the other devolved UK nations, particularly for research-only staff. Scotland (and London) continued to increase their number of EU engineering research-only staff, but not as much as in the academic years preceding the referendum.

When asked at interview about what changed in the last three years, many references were made about the negative impact of Brexit, immediate and future, on research capacity, collaborations, and access to funding and equipment.

> [French academic] It feels it will become more difficult to get grant applications to work with our direct geographical neighbours. My line manager always says, "where there are difficulties, we must try and create new opportunities and so that we can develop new partnerships with other countries". We're looking at a lot of partnerships with India at the moment, with Mexico. This is really good but traveling to India and Mexico is by far more difficult than interacting with people from Europe. For me, a young [parent], for instance, traveling to India and Mexico has become something difficult. I don't like to be away from home for more than two, three days. It makes these kinds of collaborations very difficult, actually. Because at the end of the day, it's all about people and unless you interact in person, at least every once in a while, with researchers, things just don't happen. It makes things much more difficult.

[Italian academic] I find it have been a bit difficult these last two or three years. It's becoming very difficult to get grants. I was usually collaborating through European network and since Brexit, I noticed everything slowed down. If you are UK based to get EU moneys is getting very, very difficult, essentially. (…) I applied for two proposals. I was the coordinator. Then it was virtually impossible to coordinate any potential proposal because of the uncertainty. (…) I drop the application. There are some colleagues interested but then it's very difficult to partner up with other European institutions.

[Bulgarian academic] Industry partners are severing links to the UK. Things that were previously easy to find and easy to find sponsorship for are now suddenly very difficult and the logistics are very difficult because of the fact that we have to import a lot more of the resources that we need for teaching and research. We use a lot of [equipment] (…) it's very difficult to get it from outside and it's very difficult to get the funding for it from outside Europe (…) Since Brexit started happening, the [EU] distributor has been less willing to sell and the price has increased for selling to the UK. So, right now, the [equipment] isn't being used because we don't have the capacity to utilise it properly and that seems to be to me because the [EU] distributors are refusing to trade with the UK, as they used to do years before.

[Belgian academic] We are very concerned about future purchases of equipment. A lot of our equipment is coming from mainland Europe, so prices will go up. They will definitely have an impact on the amount of equipment we can buy and provide our researchers with.

A few EU engineering academics reported being excluded from research proposals with European institutions.

[German academic] Well, I was kicked out of two proposals because they thought we were a risk, which was not really legal but now, of course, we're in the midst of that so now we're done. (…) we just couldn't participate in the proposal. We'd co-written it and then we were told we couldn't participate because there would be the risk that our part of the funding wasn't secured, which wasn't really true, but whatever. Several other colleagues of mine have experienced across the UK, that there was a hesitancy in EU projects to take on UK partners and especially UK led.

[Italian academic] Partners in Europe are very weary of accepting proposals including British universities these days. (…) They say, "*Look, at this stage I'm afraid that we must leave you out substantially, from the proposal*". That's what happened in the latest months. We are at least, right now, cut out from any proposals. We might get back in if Brexit happens, according to how it happens. But for the moment, there's just this feeling that it's not convenient to have a British university in the proposals. (…) I had a [past] proposal with a colleague and they are now submitting the proposal again without us! Of course, that's not good because we participated, we contributed, and on the other hand, I cannot blame them because the case is that [having a UK partner] reduces the likelihood of your proposal getting accepted. (…) even if I know the guidelines say that it shouldn't be [the case], we actually had reviewers somehow, more or less, overtly suggesting that we should consider a contingency plan because there were British universities. The consequence is that we are specially cut out from funds, and from advancements, and from partnerships that would be more likely to happen. (…) we are in a bit of a limbo now in which things are somehow suspended.

There were also mentions to the potential impact of Brexit on teaching and recruitment of EU students and staff. Some participants noticed a decrease in the number of EU applicants, particularly at postgraduate level.

[Italian academic] I never had a problem to attract European students to do PhD in the UK and now I find it very difficult.

[German academic] I don't get any applications from the EU anymore. That's over. I have a master's student just now, but he came via the US. We've one or two Italians and French people on visits. But apart from that, everybody's from Asia, South America, Africa. Not from European countries.

[French academic] I would like to recruit people from abroad because they have different types of training, different types of education, and it's been really important in supporting my research. For instance, I have a PhD student right now who's from Italy. He's had a completely different training, which worked really well with the scope of his PhD. For this reason, it was really interesting to have him. If it wasn't for him, I wouldn't have had any serious or good enough candidates.

One senior academic was particularly worried about the lack of information regarding potential changes in EU regulations in his engineering discipline/industry, and the future recognition of UK qualifications.

> [Italian academic] The day UK leaves [the EU], will the PhD title be recognised in another EU country? Probably yes but we don't know. Will the UK be part of Horizon or the next main research programme from the EU? They say yes but we don't know. It's a mixed sort of thing. Even [engineering discipline], we have a lot of regulations that come from the EU but do they want to diverge?

Interviewed academics with links to the industrial sector acknowledged that some industries were already struggling to recruit highly skilled workers from EU countries but were optimistic about being able to secure future deals with the sector. To them, Brexit could be seen as an opportunity to establish new partnerships between UK's academia and industry, and open new research funding avenues.

> [German academic] Engineering used to be very strong, and after Brexit there will just not be that strength anymore because there's no link to Europe anymore. There's no engineering you can do with India, or China or the US because they have all that themselves. They don't need the UK. On the strength of the UK, just look at Airbus and its reintegration into Europe, and the car industry. Once that's gone, there's nothing left. I predict that within the next five to 10 years, there will be a brain drain because all the engineering opportunities are in the EU. Maybe in the US, a lot in China, a lot in India, and people will just be leaving in droves. There won't be any car industry. There's not much of the other industry left anyway (…). The good thing is that we're getting a lot of industry interest and these industry projects are easier to navigate, because that's not EPSRC, it is BEIS and Innovate UK. Seems to be a bit easier there, so we're generating income from that side.
>
> [Belgian academic] For us, we're currently focusing a lot on the big players in the construction industry. We're looking at UK contractors (…) and trying to get them on board emphasizing the need for innovation and making sure that the UK is on the forefront of technology in the construction industry. Then, hopefully, get to the more industrial roots funding in because quite often, if you can talk to them, they are quite concerned about Brexit as well. Working with universities to strengthen their position on a more global scale and securing their position helps. To some degree, the insecurity surrounding Brexit sometimes opens opportunities as well, because university and the contractors are all concerned so want to join forces to strengthen themselves and be more resilient to whatever might happen in the future.

On a more personal level, academics were concerned about the state of the economy, restrictions to freedom of movement, and a general feeling of not being welcome. In general, academics in Scottish universities felt more welcomed than academics based in other regions. Two academics were very concerned about the impact of Brexit, and the lack of certainty, on their mental health and general well-being.

> [Bulgarian academic] At that point, I think for the year after Brexit, I lost nearly 25% of my savings just because of the way the pound changed and that made me think about, "Do I really want to stay here? Can I do this anywhere else? Is this what I really want to continue doing?" (…) I will probably start actively job hunting by the end of this academic year. The two biggest impacts again are going to be ease of travel and then the value of the money that I make and how that affects my quality of life. If I'm not able to save and invest my money safely to what extent I feel the safety is, and if I'm not able to travel, literally buy a ticket today, be in [home country] tomorrow, I think that's the biggest current impact to me right now.
>
> [Spanish academic] I actually was worried about Brexit especially because of my family, because I don't know if my family will be able to come visit me when the UK leaves the European Union. That was one of the main concerns, especially, also because I don't know if they will have to apply for a visa. I'm also worried about what would happen with my pension scheme, and those kinds of things, in case I want to go back to Spain.
>
> [Italian] I think I would need to make sure that there are no differential treatments for children, for example at schools. (…) Same as, for example, for families visiting, they should be able to visit with one day notice, buy the ticket and come if needed, right? That is what happens now. That's from a personal point of view. (…) Possibly [I would leave the UK], not in practice right now but as a midterm possibility I'd say yes. I think the probability of

going back to the [home country] or [partner's EU home country] has increased. (…) We're still here for the moment, we're not moving, but we'll be thinking more seriously about the possibility of actually leaving

[German academic] I don't know if many Europeans… I'm not sure I know any, who are not saying within the next 10 years they'll be gone, just because the country has become so… not exactly xenophobic, but… unfriendly, let's say unfriendly. You don't experience much of that yourself, but if you read the newspapers, it's just not welcoming anymore. It might be buffered a little because [city in England] is somewhat different, it's so diverse and international. Anybody you ask just says you don't feel welcome anymore. But that's more about what's in the papers, it's less about personal contact. (…) It's not in the personal encounter with anybody in the street or whatever, it's the moment it goes a step further and people start generalizing (…) You just don't want to listen to the news anymore, but you just have to (…) You're speechless, you don't know what to say (…) It gets more than on just on your nerves, it's nerve racking and it influences your mental health because you keep worrying all the time. (…) They have a political stance that they don't see the impact on personal things. They just ignore that. It's just having impacts and most Europeans are just thinking of, "When will I leave," and not, "How will I stay?"

[Italian academic] When the Brexit vote happened, I said, "Okay, fair enough. I'm a permanent resident anyway, so this shouldn't affect me, really." I had already the right to be here. But then I realised that Brexit itself had an impact on me psychologically (…) this was targeted to people like me, to people like Italian, Spanish, French, German, Polish, whatever, people that decided to come here and to work here, study here, make a life here. I knew that I had a permanent resident, I could say there was no problem. But at the same time, that made me feel it made me feel like a second-class citizen, an unwanted person. Somebody who should look at his back because basically, you are not a normal citizen; you are here and you need to be thankful to be kept here because, otherwise, the normality is that you should go away (…) Things have changed quite a lot in 11 years though. I have this feeling that… I don't know if it is my impression or if it is a general feeling, but I feel that if I had known how things had progressed in this country in the last five or six years, probably after my PhD, I would have taken a different path, to be honest.

Most of those surveyed felt welcome in their own institution and in the broader engineering higher education community, but not particularly welcome in the UK (Figure 6). Academics based in Scotland felt more welcome in their area of residence than academics based in England.

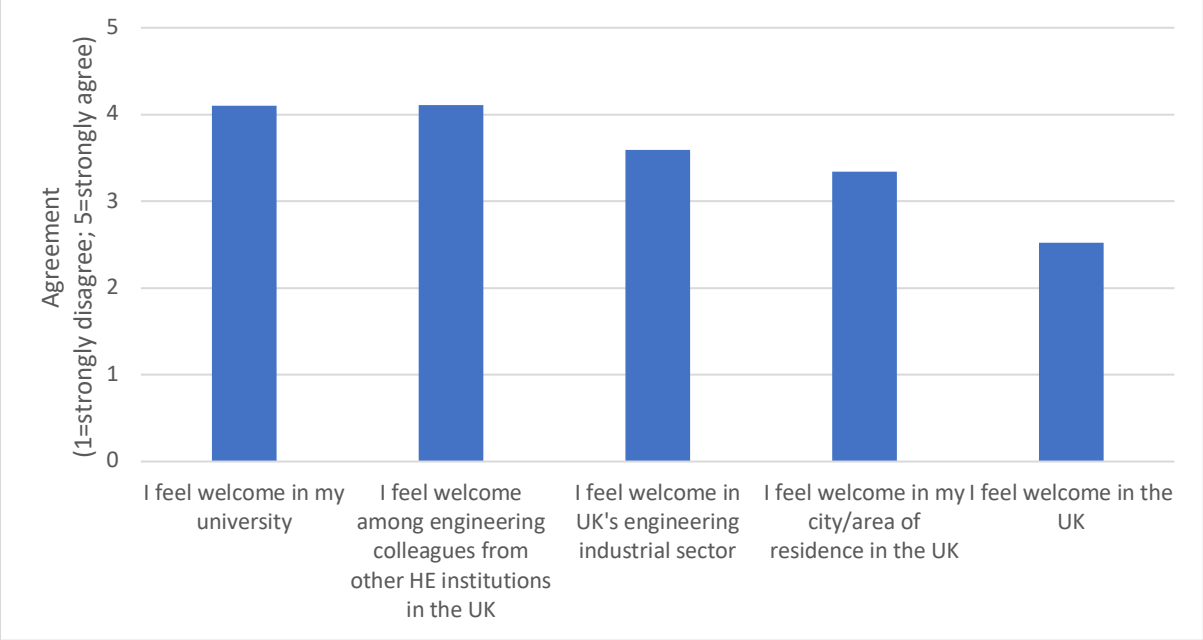

Figure 6. How welcome EU engineering academic staff feel in different contexts

To guarantee his rights and access to opportunities, one interviewed EU academic applied for British Citizenship to put his "mind at peace". Other two academics were considering applying in the future, since their plans were to remain in the UK indefinitely. However, personal factors would play an important role in their final decision.

[Italian academic] I've been here for 11 years, and last year, mostly due to the events following Brexit, I decided to acquire British nationality. Basically, I'm now dual national, which has put my mind at peace with all the things that you're hearing on the news and the uncertainty. I thought it was the right thing to do. (…) At that point, I thought that I didn't want to feel like that, and probably becoming a full-fledged citizen the way the passport and so on would have, which I actually did. Then I discovered that actually after I got my citizenship that there were some opportunities that I couldn't even get by being a European citizen. For example, for research, I started working in fields which were related to military and there were some institutions that I couldn't even visit as a European, that I needed a British passport. Understandably, that means that actually my choice was the right one to move to acquire a citizenship and a piece of paper. The passport is a piece of paper that actually states that I can be here. I have all the rights here. Actually, it's relieving for me.

[Romanian academic] I'm thinking maybe early next year, I might apply, but I'm not a hundred percent sure. (…) I think there's an element of 'why not?'. If I'm here and if it gives me a sense of stability... I'm not sure yet, I have to investigate, but university might also provide support in the application process, which would make it easier for me to apply while affiliated with the university, than later. So, I think if it's easier and if there's a more straightforward way of applying and if there's financial support around applying, then that would make me lean even more towards applying. (…) Just because I have been here for so many years that if I think about buying a house or if I want to settle here for good is just easier. Yes. Maybe you're probably right, I would have probably done it either way [regardless of Brexit]. But now I feel like it has to be sooner than later.

Senior and highly experienced members of the academic staff, with permanent positions, expressed more concerns about the idea of having to relocate somewhere else. They feel they are in a stage of their careers where they need more stability and certainty about the future.

[Italian academic] I got a permanent position and [area] engineering is a good thing; we have a lot of students. Now we expect it will drop but [engineering subject] is quite a popular subject. (…) we have a lot of students and they tend to give us a lot of teaching but at least, in a way, your permanent position is secure because you know that there are students, they can cover the gap that is not coming from research, in a way. I don't know. I think it is a year to think about it purposefully, try to apply to an ERC grant with another European institution. But I want to see what will happen with Brexit, let's say, for one year, two years. Because now... I've got an age that I'm not too young so...

[German academic] Well, I have [considered moving out], but I'm too old to get another job. (…) so there's no chance of getting another job. I've been actively pursuing that but there's no point, it's not possible.

All those surveyed who had British citizenship, a total of 9 academics, said that Brexit was the "major driver" to apply for it. These were mostly senior academics who were not considering moving out of the UK before retirement.

[French Professor. More than 25 years in the UK] Without Brexit I would not have applied, not having British Citizenship would mean being a second-class citizen with very limited rights in just about all aspects of life.

[German Professor. More than 25 years in the UK] I applied after Brexit for pragmatic reasons. I don't feel British and I resent to have been forced into it.

The academics who did not intend to apply described themselves as having a strong European identity and did not see value on being a citizen of a non-EU nation. In fact, for this group of academics, Brexit was the main reason not to apply for a British citizenship.

[Italian academic] I feel I am a European citizen and so I found the idea of applying for British citizenship, or any other one from EU, against this European spirit. Even more after Brexit.

[German academic] Following the referendum/Brexit I finally decided not to apply for British citizenship. I am strongly pro-European, and I thought that it would not be logical for me to apply for citizenship of a country that has decided to leave Europe.

What next?

Access to EU research funding and collaboration (such as H2020, ERC, and Erasmus programmes), freedom of movement for staff and students, and Home fees for EU students, were frequently mentioned as being top priorities to be addressed by the Government and UK's engineering education sector.

> [Belgian academic] Thinking about the engineering sector, then from a research point of view, it would be great if we can stay within some European funding schemes. Coming out of the EU doesn't necessarily mean we need to come out of Horizon or Erasmus programmes, because we do have a lot of students here in universities who are coming from mainland Europe. We need that, according to me, that influx and the influence of people coming in with slightly different backgrounds and ideas to strengthen the courses here by adding that aspect of variety. As we're making sure that we do keep those opportunities would be very beneficial. This is especially because nowadays, most of the research going back from teaching to research now is interdisciplinary, or collaboration between different teams with different strengths, and having to limit that in just the UK might reduce our impact and ability to push the boundaries of research.

> [French academic] What's going to happen with Brexit? Are we going to have to now ask our staff and students to apply for visas? What about the students? Are the fees going to be tripled, suddenly, because of Brexit? This is a real concern and it's surely making things a lot less attractive to international students and staff, I think, to come to the UK. Those who would have to apply for visas, it doesn't really make any difference, but all European potential candidates must be thinking that it's less attractive, it's harder and, "What's the future that we have in the UK after all this?" Yes, it is affecting our research and our recruitment, I would say (…) I would like them to discuss policies that enable an easy visa process application for Europeans who want to come to the UK, and similarly for UK people who want to come to Europe. I cannot imagine that there will ever be a completely free exchange without any form of visas. I would hope that for research programmes and conferences and for any research exchanges or education, I would hope that movements of people will be facilitated.

> [Italian academic] That definitely would be very important (…) freedom of movement at least for families. Parity of access to resources, that is what we would ask and access to international grant proposals and agreements in general, not only grants but also interchange. The easiness of moving around, visiting, receiving visits and any type of interchange really on staff or students' level. I don't know how easy that would be to implement that in that sense.

> [Cypriot academic] European citizens' rights, safety. I would like to ask the UK government to create bridges for future collaboration with EU, including but not limited to research.

> [Italian academic] Access to EU project consortia with a granted support from UK in case of a successful proposal, like it is already happening for Norway and Switzerland.

> [Spanish academic] Top priority would be to replace all the EU funding that universities were receiving to keep up the research and collaborations with other countries.

> [Austrian academic] Clearer guidelines regarding requirements to stay, quick way to be granted settled status, ability to access European funding opportunities or enough options to access UK funding, allow for cooperation with EU companies and the ability to attract EU students for research work/placements.

There were also concerns about import tariffs and how they would negatively impact UK's engineering manufacturing industry.

> [German academic] Saving the UK manufacturing industry from import taxes.

> [Bulgarian academic] I guess the university could try and make deals with the companies directly instead of relying on distributors and that way, potentially there might be ways of getting a higher educational discount or through partnership getting sponsorship directly from that company. That will probably still be fairly expensive, but it won't be as difficult to achieve that. And I just think the university just needs to be more proactive and engaging with these companies and potentially even looking at UK based alternatives.

Many academics were worried about the future of EU citizen's rights to work, live, and access healthcare in the UK after Brexit, but also their safety in a "unwelcoming" and "unfriendly" environment.

> [French academic] I felt welcome back then, I am not sure I can say the same today.
>
> [Italian academic] Although I am 100% confident in stating that this does NOT apply to the Academic world, Brexit went a long way in making us EU citizens feel unwelcome. Also, I think the effects will be damaging for UK research and UK economy in general.
>
> [A1] At the beginning, I thought the referendum would be some political noise background that couldn't affect us really. But then when I started to receive emails, like any academic in the UK, about the settlement programme and for me that was alarming (…) But at the same time, I thought "this is happening. Now we have to register in a list, now we have to provide all documents, we're under the lens, we're under the spot". (…) I feel not wanted.

Most of the interviewees would like to remain in the UK, although many have already considered moving out. Nine out of ten EU academics surveyed have considered moving out of the UK. If deciding to leave the UK, most were planning to do it in 2 to 5 years-time, and get back to their home countries, other European country (mostly Switzerland, Germany, Netherlands and France) or Canada.

The interviewees proposed that their ability and willingness to stay in the UK will be determined by opportunities for career progression and being guaranteed the same rights that EU nationals had before Brexit: freedom of movement and access to EU research funding and being treated as UK citizens.

> [Spanish academic] If I feel that at any time not being a UK citizen will play any role, some kind of discrimination or being treated differently, then I will think seriously about moving. (…) If Brexit will prevent me to try and go for any of that [promotion] I will make a big fuss. I will try to move back because I don't want to be in a place where you have stones at your back, and you cannot progress.
>
> [Romanian academic] I should think twice about things... Probably if I felt that I didn't have the same freedom anymore (…) if the situation was that to go anywhere, I'd have to go an extra length to jump through whatever hurdles in order to be able to travel or to get access to papers, for instance, I think that would probably make me feel uncomfortable.
>
> [Dutch academic] How easy it is to find work, very practical, I think. I'm working in a very small research field, so it will be challenging to find work in the Netherlands because the research field is small, and this country is bigger. Which factors [would convince me to stay]? I think really just job opportunities.
>
> [Belgian academic] I really love my job way too much to leave this one. (…) What would influence my decision [to leave] is probably when the UK starts, and it is feasible, become really isolated. When the funding for research starts to shrink drastically, which would influence the amount of external work we get into this building as well, and hence the need for my job might just diminish.

This was confirmed in the survey.

> [Italian academic] I came to the UK in part because it was easy to come and go from/to my home country and family. Also, we were part of the EU and had the same rights as EU citizens. This is not going to be the case after Brexit.
>
> [German academic] I felt welcome in the UK when I came and had opportunities I did not have in Germany. Now the situation is different. I don't think the country has a promising future.

Many academics, in both interviews and survey, expressed concerns about the validity of the EU Settlement Scheme, the impact of a no-deal on UK's economy, and not feeling welcome as before. Reflecting these worries, only one third of the surveyed EU engineering academics would have come to the UK if they had to make that decision *today* (Figure 7).

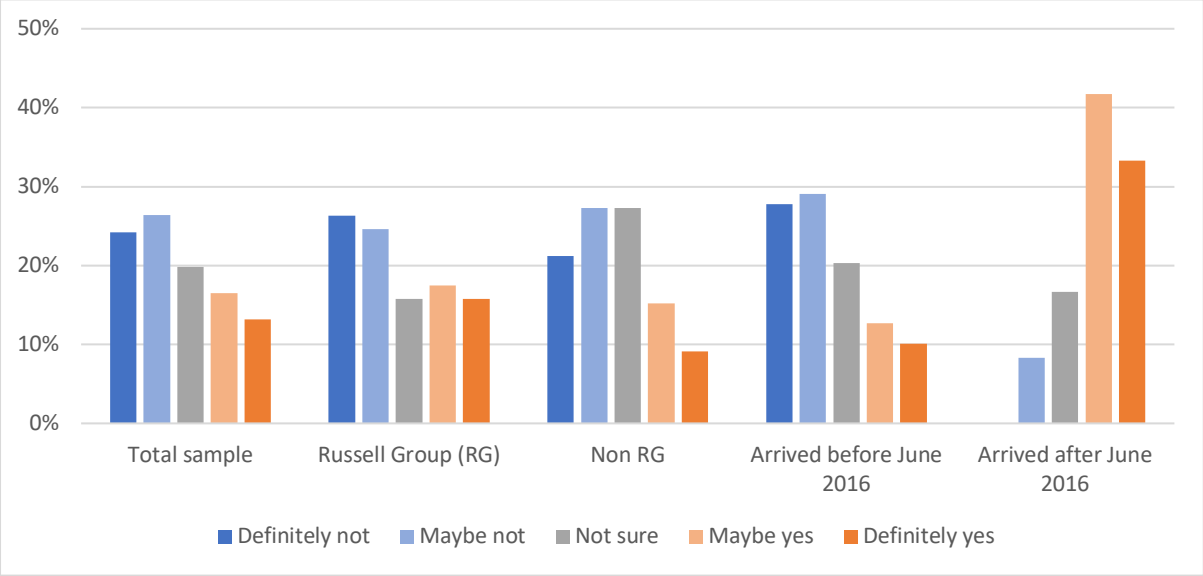

Figure 7. Question: Taking yourself back to the moment when you started working in UK academia, would you have made the same decision today?

Interviewed EU Academics who came to the UK after the 2016 referendum were not expecting imminent changes in their rights to live and work in the UK.

> [Spanish academic] I wasn't even worried. I thought that was just politics and I never expected that they would have started controlling citizens and citizenship and all of this. I never expected they could have started this control system.
>
> [Dutch academic] Overall, I wasn't too worried that it would affect my situation that much, actually. Already after the first delays, it seems very likely that this was just a very slow process. I didn't expect very imminent radical changes in my situation.

In the survey, of all academics who started working in the UK after June 2016, three in four would have made the same decision today.

EU academics interviewed would like universities to have been more active in political lobbying in favour of EU staff and students' rights to work and study in the UK. They would like to ask the UK Government to secure the status and freedom of movement of EU nationals and to secure research deals and mobility programmes with the EU. They would like to ask UK Research bodies to implement long-term research strategies that are clearer and equally supportive of all institutions across the UK; to offer more entry-level research grants for early career researchers; and to support research with European institutions and partners financially. Thinking about negotiated arrangements between the UK and the EU, academics surveyed shared the same worries and priorities.

5. Barriers, risks and opportunities

A summary of the attractions, risks and opportunities as highlighted by the research for UK engineering HE are tabled below, for a. students and b. staff. As well as a summary of the discussion in sections 3 and 4, this analysis provides a platform from which to focus they key concerns and expectations held by European students and academic staff.
This facilitates evidence-based strategies that will effectively enable the recruitment and retention of European talent into UK engineering education, research and practice.

Students

Attractions: financial

Being eligible for Home/EU tuition fees for the whole duration of their degrees, as well as being able to access student finance, were key factors for undergraduate students.	Eligibility for a student loan – and being awarded a full scholarship in the case of PhD students – was one of the most important factors when deciding to come and study in the UK.	Access to research funding was also a common consideration.

Risks: financial

Students reported that financial constraints would have had a negative impact on their willingness and ability to pursue their studies in the UK.	Many students reported that having to pay international fees, and not being eligible for a student loan/scholarship, would have been a major deterrent if they were making the decision to study engineering in a UK university today.	Potential negative impacts of Brexit on the overall state of the UK economy also featured.

Opportunities: financial

Development of local targeted financial support schemes.	Provision of national and university information and guidance for EU students.	Access to EU research funding was frequently mentioned as being a top priority to be addressed by the Government and UK's engineering education sector.

Attractions: cultural and social

Being able to learn with international staff and students was cited a very positive aspect of EU students' education.	The most valuable experiences of their time studying engineering in the UK were being part of a diverse and international university environment.	The desire to live abroad and have a different learning experience were common motivations to choose studying in the UK.

Risks: cultural and social

EU students were particularly worried about the future impact on freedom of movement. This, together with their entitlement to the same rights as British citizens will be key to inform their decision to remain in the UK, or leave, in the near future.	A general feeling of not being welcome in the UK. On average, students felt welcome in their universities and cities/areas of residence, but slightly less welcome 'in the UK'. They made references to the importance of feeling welcome and having family plans as important factors to consider in their decision to stay or leave the UK after Brexit.	Potential negative impacts of Brexit on their rights as EU citizens, and on their future plans in the UK.

Opportunities: cultural and social

Clear national guidance to EU students on their eligibility to work in the UK available at the point of HE application. Clear university guidance to EU students on their eligibility to work in the UK readily available during their studies.	Development of language and initiatives to make EU students feel welcome in the UK, both on and off campus.	Continued support to apply for new EU student visa, and British citizenship where applicable.

Attractions: professional

International reputation of UK's universities. Undergraduate students had the expectation to be taught in a more practical/hands-on approach and develop their technical English.	UK's universities provide the resources. The most valuable experiences of EU students' time studying engineering in the UK were quality of teaching and access to resources, as well as good links to industry.	UK's universities provide the opportunities for career progression and research leadership. For PhD students, UK universities offered more funded positions in their fields of interest and research opportunities than other European countries. The UK was seen as an attractive place to pursue their future career plans as engineering academics. The UK offers better job opportunities after graduation, especially at entry-level, in comparison to their home countries.

Risks: professional

EU students were particularly worried about the future impact of Brexit on work and research collaborations between the UK and the EU.	A potential lack of job offers and research opportunities, and a general feeling of not being welcome in the UK.	Potential negative impacts of Brexit on their future plans in the UK.

Opportunities: professional

UK should aim to compete with students' home countries, Switzerland, Germany or France. Areas to highlight are the quality of teaching and resources as well as opportunities incoming students will have for problem-solving, autonomous learning, and ability to work in diverse and international teams.	Promote access to job opportunities and research funds (including links with industry).	Support undergraduate students particularly wanting to stay and develop their engineering careers in the UK.

Staff

Attractions: financial

Financial support for ongoing research projects and purchase of equipment (e.g. import tariffs) were mentioned by participants working closely in institutional research centres.	Access to research funding was seen as very valuable.

Risks: financial

Academics were less positive about their ability to secure EU research funding. Many academics feared these experiences were already changing negatively due to Brexit.	Many references were made about the negative impact of Brexit, immediate and future, on research capacity (as well as access to funding).	There were also concerns about the state of the economy, including import tariffs and how they would negatively impact UK's manufacturing industry.

Opportunities: financial

Brexit could be seen as an opportunity to open new research funding avenues.	Ensure continued access to EU research funding and Horizon. EU academics ability and willingness to stay in the UK will be determined by access to this.	Academics would like to ask the UK government to secure research deals with the EU. They would like to ask UK research bodies to: implement long-term research strategies that are clearer and equally supportive of all institutions across the UK; offer more entry-level research grants for early career researchers; and support research with European institutions and partners financially.

Attractions: cultural and social

On a personal level, staying in Europe, or coming back to Europe after an experience abroad, was important to EU academics, as they would be able to stay at a short distance to their home countries and families.	The English language was a key factor to choose the UK to pursue their academic careers – speaking the language was essential to be able to fit into the UK's society.	The survey confirmed that easy travel between the UK and home country and being able to live in an English-speaking environment were the most important motivations to come to work in the UK engineering education sector.

Risks: cultural and social

On a personal level, academics were concerned about restrictions to freedom of movement, and a general feeling of not being welcome. Most of those surveyed felt welcome in their own institution and in the broader engineering higher education community, but not particularly welcome in the UK. Concerns were raised over their safety in a "hostile environment".	Some academics were very concerned about the impact of Brexit, and the lack of certainty, on their mental health and general well-being. One interviewed EU academic applied for British Citizenship to put his "mind at peace".	Many academics were worried about the future of EU citizens' rights to work, live, and access healthcare in the UK after Brexit. Some expressed concerns about the validity of the EU Settlement Scheme. Personal factors played an important role in their final decision to apply for British citizenship.

Opportunities: cultural and social

Academics based in Scotland felt more welcome in their area of residence then academics based in England.	EU academics' ability and willingness to stay in the UK will be determined by being treated as UK citizens.	Freedom of movement for staff and students were frequently mentioned as being top priorities to be addressed by the Government and UK's engineering education sector.

Attractions: professional

The UK engineering higher education sector was described as being the "perfect environment" to develop both research and academic careers, offering good job opportunities, career progression and leadership positions. Their job here "ticketed all the boxes", and opportunities were offered in their specific area of interest (academic route).	The survey confirmed that the most important motivations to come to work in the UK engineering education sector were: more research and job opportunities in the UK than in other countries, clearer career progression pathways, and being able to work in an English-speaking environment.	Universities were described as safe, supportive, and welcoming to EU and international staff. Academics were positive about their career progression and access to resources. Good work conditions in universities and being part of a multidisciplinary, international and multicultural environment were cited as the most positive aspects. Collaboration with national and international partners and good links to industry were also seen as very valuable.

Risks: professional

The general feeling was that, due to political uncertainties, universities were reacting instead of acting. In some cases, universities were late in providing the most updated and useful information to EU academic staff. One senior academic was particularly worried about the lack of information regarding potential changes in EU regulations in his engineering discipline/industry, and the future recognition of UK qualifications.	Many academics feared these experiences were already changing negatively due to Brexit. A few EU engineering academics reported being excluded from research proposals with European institutions. Some of those interviewed reported an increased burden in academic administration, as well as unexpected teaching commitments by research staff.	Senior and highly experienced members of the academic staff, with permanent positions, expressed more concerns about the idea of having to relocate somewhere else. They feel they are in a stage of their careers where they need more stability and certainty about the future.	There were also mentions of potential impact of Brexit on teaching and recruitment of EU students and staff. Some participants noticed a decrease in the number of EU applicants, particularly at postgraduate level. Interviewed academics with links to the industrial sector acknowledged that some industries were already struggling to recruit highly skilled workers from EU countries but were optimistic about being able to secure future deals with the sector.

Opportunities: professional

EU academics interviewed would have like universities to have been more active in political lobbying. Universities to speak with their feet when it comes to the importance of EU collaborations and strength of relationship.	EU academics' ability and willingness to stay in the UK will be determined by opportunities for career progression.	Access to EU research collaboration (such as H2020) was frequently mentioned as being top priorities to be addressed by the Government and UK's engineering education sector.

References

Borrego, M., Douglas, E., & Amelink, C. (2009). Quantitative, qualitative, and mixed research methods in engineering education. *Journal of Engineering Education*, *98*(1), 55–66.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage Publications.

Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, pp. 77–101 .

Dodourova, M., Clarkin, J. E., & Lenkei, B. (2020). The die is cast: Brexit's influence on student career intentions. *Studies in Higher Education*, *45*(3), 648–664.

ETER (2019). *Internationalisation of Academic Staff in European Higher Education*. European Tertiary Education Register. Retrieved from: https://www.eter-project.com/uploads/analytical-reports/ETER_AnalyticalReport_01_final.pdf

Fowler, S., Direito, I., Mitchell, J., & Rich, J. (2018). Initial impact of Brexit on European students and academic staff in UK's engineering higher education. In: Clark, R., Hussmann, P., Jarvinen, H. M., Murphy, M., and Vigild, M., (eds.) *Proceedings of the 46th SEFI Annual Conference 2018: Creativity, Innovation and Entrepreneurship for Engineering Education Excellence* (pp. 190-197). Société Européenne pour la Formation des Ingénieurs (SEFI): Brussels, Belgium.

Highman, L. (2019). Future EU-UK research and higher education cooperation at risk: what is at stake? *Tertiary Education and Management*, *25*(1), 45–52.

Mayhew, K. (2017). UK higher education and Brexit. *Oxford Review of Economic Policy*, *33*, S155–S161. https://doi.org/10.1093/oxrep/grx012

McCrory, M., & Thomson, T. (2019). The political is personal: Brexit and the career aspirations of UK undergraduates. *Journal of the National Institute for Career Education and Counselling, 42*(1), 3–8.

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Acknowledgements

The project team is grateful to all the European engineering students and academic staff based in UK universities who contributed to this study.

Special thanks to Dr Michelle Morgan, Professor Shannon Chance (TU Dublin), Dr Pilar Souto-Garcia (UCL), Dr Elton Dias (UCL), Lorenzo Molinari, Maria Miscouridou and João da Gama Paz-Dias for their help in piloting the interviews and surveys.

Front page image: https://pixabay.com/images/id-3764767/