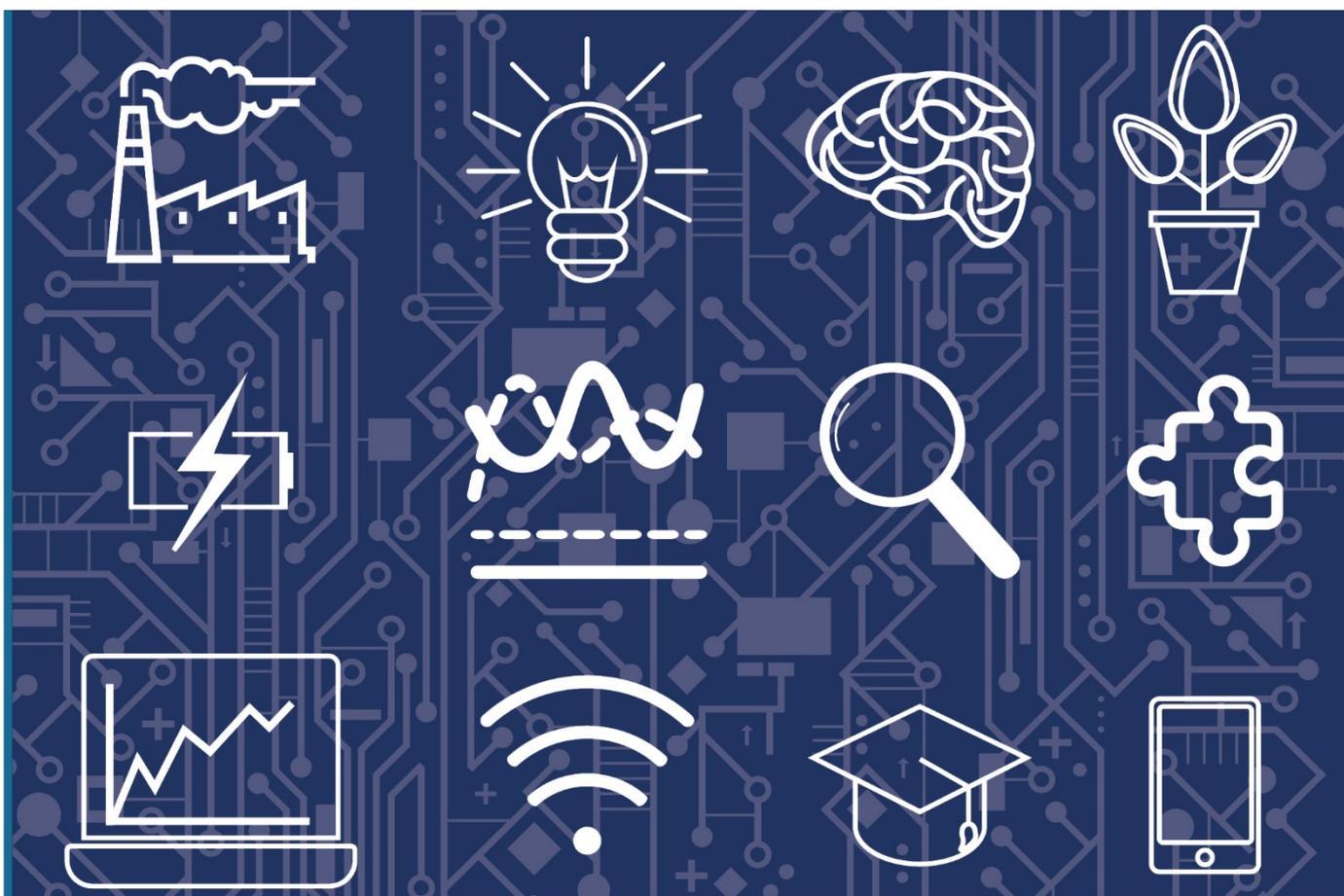




Intellectual
Property
Office

IP filing habits of UK Higher Education Institutions



Spin-out data has been provided by Beauhurst

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1. Key findings

- 1.1% of published patent applications, 0.3% of trade mark registrations, 0.1% of design registrations with the IPO during the period 1999 – 2018 have been from UK Higher Education Institutions (HEIs)¹.
- Of the 165 UK HEIs, 121 had at least one published patent application², 140 had at least one trade mark registration and 39 had at least one design registration³ during the 1999 – 2018 period.
- The number of patent collaborations between UK HEIs and businesses increased during the period 1999 – 2018. From the period 1999 – 2008 to 2009 – 2018 there was a 17% increase the number of published patent applications featuring a UK HEI and a business as co-applicants.
- International collaborations for UK HEIs have been increasing. 62% of UK HEI patents with an international collaboration during the period 1999 – 2018 occurred since 2009, with the most noticeable increase being collaborations with the USA.
- UK HEIs are increasing the rate at which they produce spin-out businesses. Of the 947 spin-outs incorporated during the period 2000 – 2016, 59% have been incorporated since 2011.

¹ There are multiple paths to gaining protection for patents, trade marks and designs in the UK. For instance, the UK is a contracting state to the European Patent Convention (EPC), so a European Patent administered by the European Patent Office (EPO) will almost always designate the UK and these have not been taken into consideration here. Similarly, it is possible to gain protection for a trade mark or design in the UK by filing it with the European Union Intellectual Property Office (EUIPO) and these have also not been taken into consideration here.

For more information on European patents: <https://www.epo.org/applying/european.html>

For more information EU trade marks and designs: <https://euipo.europa.eu/ohimportal/en/home>

² Any published patent application worldwide

³ UK registered trade marks and UK registered designs at the IPO

2. Introduction

The UK government has set the target of being the most innovative country in the world by 2030⁴, as part of the Industrial Strategy (2017); underlying this objective is the need to capture the value of science, research and creativity thus supporting innovations that drive UK productivity⁵. In particular, attention has been given to the role of Higher Education Institutions (HEIs) in helping the UK achieve this goal.

For instance, the government has increased funding that supports universities and businesses working together to innovate and commercialise research⁶. The licencing of intellectual property (IP) and the creation of spin-out businesses have been highlighted as possible approaches that universities may wish to take to commercialise their research⁷. It is evident that in addition to business collaborations, in order to maintain the UK's position as one of the world leaders in research and innovation, international collaborations will be necessary to help push scientific frontiers⁸.

This report provides an overview of intellectual property (IP) trends for UK HEIs, looking at their collaboration behaviours and the technology sectors in which they operate. The IP filing behaviour of their spin-out businesses is also examined.

⁴ Department for Business, Energy & Industrial Strategy. (2017). *Industrial Strategy: Building a Britain fit for the future* (B5 PDF). Pg.63 Retrieved from <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>

⁵ Industrial Strategy pg.72

⁶ Research England. (2019, October). *The Higher Education Innovation Fund (HEIF)*. Retrieved from <http://re.ukri.org/knowledge-exchange/the-higher-education-innovation-fund-heif/>

⁷ Industrial Strategy pg.78-9

⁸ Industrial Strategy pg.67

3. Things you need to know about this release

This report follows the Higher Education Statistics Agency's (HESA) definition of a Higher Education Institution (HEI) and uses their list of Higher Education (HE) providers for the 2017/18 academic year to identify HEIs in the UK⁹. A combination of HESA's list of HE providers, their historical data relating to mergers and name changes and a manual effort to identify technology transfer offices was used in conjunction with a fuzzy matching¹⁰ process to identify IP held by UK HEIs.

The identification of spin-out businesses is based on Spinouts UK data, courtesy of Beauhurst¹¹. It is the first survey to investigate the sector by adopting a 'bottom up' approach, compiling data company-by-company and updating it regularly.

The UK HEI patent dataset on which the patent-related aspects of this report are based was obtained using the European Patent Office's (EPO) PATSTAT¹² data product (Autumn 2019 Edition). PATSTAT contains worldwide bibliographic and legal status published patent data and has become a standard in the field of patent intelligence and statistics.

Throughout this report patents are counted either as single published patent applications or as patent families, depending on the context. A 'patent application' refers to a single patent application made in one jurisdiction and published in that jurisdiction. Patent applications are counted once regardless of the number of subsequent publications¹³. A 'patent family' refers to a group of patent applications made and published in different jurisdictions. Each member of a patent family is considered to relate to the same invention. A patent family is counted once regardless of the number of family members it contains.

In the analysis of patents in this report, patent applications were restricted to those having a first publication date in the range 1999 – 2018. Patent families were also restricted to those having a first publication date of the oldest family member in the range 1999 – 2018.

The UK HEI trade mark dataset on which the trade mark related aspects of this report are based was obtained using the Intellectual Property Office's (IPO) trade mark data¹⁴. Therefore, analysis of trade marks is restricted to only those that have been registered with the IPO, as well as the further restriction of trade mark registrations having a registration date in the range 1999 – 2018.

Similarly, the UK HEI design dataset was obtained using the IPO's design data. Therefore, analysis of designs is restricted to only those that have been registered with the IPO, as well as the further restriction of design registrations having a registration date in the range 1999 – 2018.

HEI data related to IP and spin-outs is also available in the Higher Education Business & Community Interaction (HE-BCI) survey¹⁵. HE providers report spin-out activity and patenting activity to HESA who are responsible for collecting this data. In this report, only patent applications with an HEI or a technology transfer office listed as an applicant are considered. In addition, due to differences in data collection methods and possible discrepancies in definitions, there are some inconsistencies in figures relating to spin-out businesses.

⁹ HESA. (2019, July). *Higher education providers*. Retrieved from <https://www.hesa.ac.uk/support/providers>

¹⁰ Fuzzy matching is a computer-aided technique by which words or phrases are found that approximately match each other

¹¹ www.beauhurst.com

¹² <https://www.epo.org/searching-for-patents/business/patstat>

¹³ A patent application may be re-published during processing (e.g. at later search; following correction; at grant). In this dataset each application is counted once under its year of first publication

¹⁴ A snapshot of trade mark applications received by the Intellectual Property Office is available at <https://www.gov.uk/government/publications/ipo-trade-mark-data-release>

¹⁵ UKRI (2020, February). *HE-BCI Survey*. Retrieved from <https://re.ukri.org/knowledge-exchange/the-he-bci-survey/>

4. IP overview

4.1 HEIs and patents

A patent is an intellectual property right granting the owner a monopoly over the exploitation of one or more products or processes. There are many ways an HEI may use their patent, such as licensing to a third party or to help create a spin-out company¹⁶, to enable their research to have an economic and social impact.

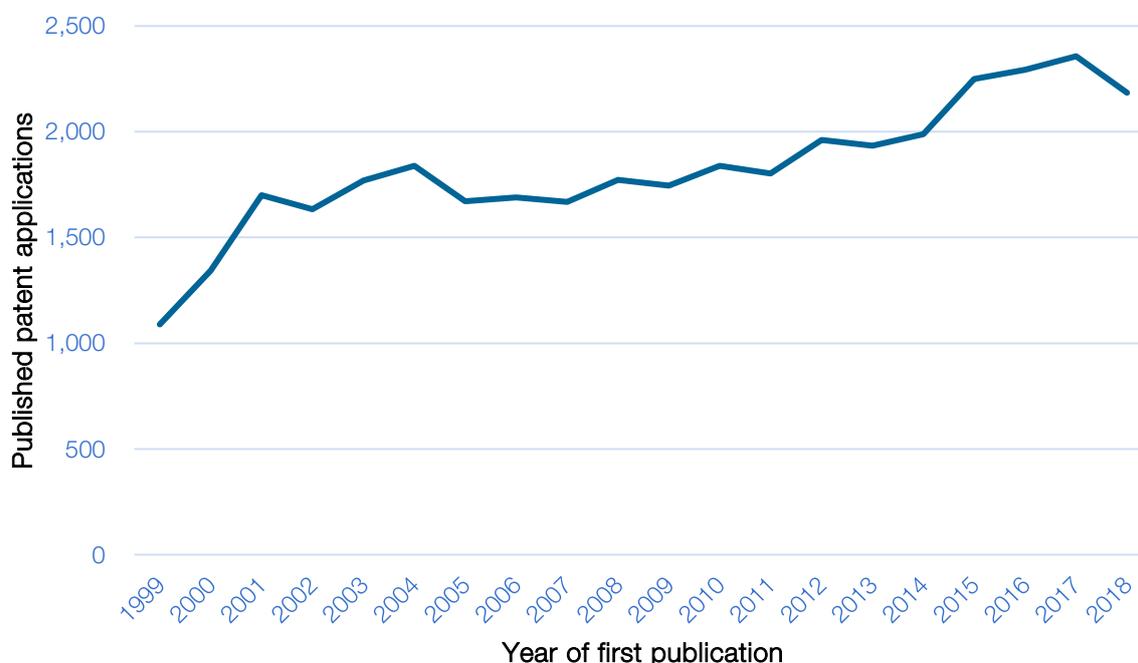
Academic patenting is a useful mechanism by which technology is transferred from universities to industry and is where some argue academic patents serve their greatest purpose¹⁷.

Whilst the use of patent counts as a proxy for innovation is questionable¹⁸, it should at least be clear that patents can be key to the successful exploitation of new ideas originating from UK HEIs.

The increase seen in patenting activity for UK HEIs (Figure 1) is roughly proportional to the global increase in patenting activity¹⁹.

Figure 1: There has been a gradual increase in the patenting activity of UK HEIs during the period 1999 – 2018

UK HEI patent applications by year of first publication from 1999 to 2018



Source: European Patent Office – PATSTAT

¹⁶ A patent will not necessarily be assigned to a spin-out company and may instead be licensed to the spin-out from the university

¹⁷ Cervantes M., (2019, October), *Academic Patenting: How universities and public research organizations are using their intellectual property to boost research and spur innovative start-ups*, WIPO. Retrieved from https://www.wipo.int/sme/en/documents/academic_patenting.html

¹⁸ The IPO has published a guide to understanding and interpreting patent data. <https://www.gov.uk/government/publications/the-patent-guide>

¹⁹ See Appendix 1

4.2 HEIs and trade marks

A trade mark is a sign which can distinguish the origin of goods and/or services from those of competitors²⁰. They can play a pivotal role in protecting the reputation of an organisation and are often associated with the commercialisation of goods.

The commercialisation of goods is not a prominent feature of the remit of universities and is perhaps why there are relatively few trade mark registrations from 1999 to 2018 with a UK HEI as the lead proprietor. Only 0.3% of trade marks registered at the IPO between 1999 and 2018 have a UK HEI as their proprietor²¹.

Though the trade mark activity of UK HEIs has increased over the 20-year period, it has fallen as a percentage of all trade marks registered with the IPO. This is due to a large increase in trade mark registrations with the IPO²² which has not been as prominent amongst UK HEIs.

Figure 2: Trade mark registrations from HEIs at the IPO have increased over the past two decades
UK HEI trade mark registrations with the IPO by year of registration from 1999 to 2018



Source: IPO – Trade mark data

²⁰ More information on the analysis of trade mark data is available in our trade mark guide <https://www.gov.uk/government/publications/the-trade-mark-guide>

²¹ It is important to note that trade mark and design data are restricted to those registered with the IPO only

²² See Appendix 2

4.3 HEIs and designs

Design registrations give the owner protection over the shape and configuration of objects, but provide no protection relating to their function. A design may already automatically have some protection without being registered as either an unregistered design²³ or under copyright law.

As there are only a small number of design registrations from UK HEIs, the peaks and troughs seen in Figure 3 tend to be a result of concentrated filing behaviour from one or two UK HEIs. For example, 30 registrations in 2004 belong to a single UK HEI and these were their only registrations in the 20-year period.

Figure 3: UK HEIs use designs sparingly
UK HEI design registrations by year of registration from 1999 to 2018



Source: IPO – Designs data

²³ IPO (Jan, 2020) *Design right*, Retrieved from: <https://www.gov.uk/design-right>

5. Collaboration trends

5.1 Who do UK HEIs collaborate with?

Patents can have multiple parties listed as named co-applicants. This means that ownership of the patent is shared between the co-applicants and that the invention was a consequence of some collaborative activity between the parties.

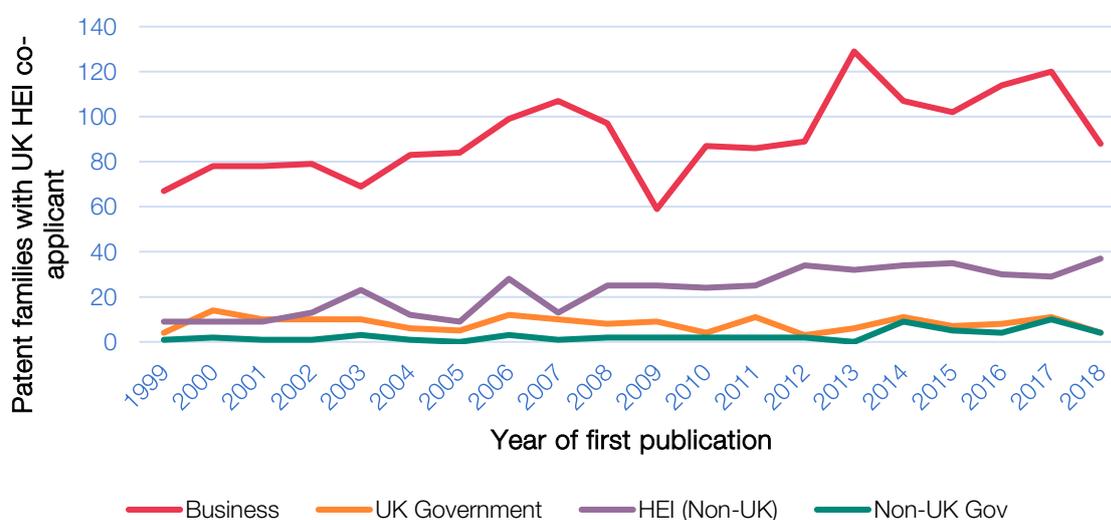
There are limitations to using co-applicant data as a proxy for collaborations. It is possible that HEIs or their collaborators will be advised against filing as a co-applicant. It is likely that the number of patent applications that involved a collaboration are higher than reported below.

As part of the Industrial Strategy, collaboration between universities and businesses has been encouraged²⁴. This is to help maximise the opportunity to exploit IP commercially and to aid the transfer of technology. In addition, international collaborations are encouraged as they potentially make it easier to open IP to a wider market and are also seen as necessary to keep research and development in the UK at the cutting edge²⁵.

Prior to the publication of the Industrial Strategy in 2017, there has been a moderate rise in collaborations between businesses and UK HEIs on patents (Figure 4), which supports the notion that UK HEIs are working more closely with businesses.

The organisations UK HEIs are most likely to collaborate with are other UK HEIs. Over 90% of the patent families from UK HEIs that featured co-applicants had another UK HEI as at least one of those co-applicants²⁶.

Figure 4: There has been increasing collaboration between businesses and UK HEIs
Count of patent families from UK HEIs with a co-applicant split by the organisation type of the co-applicant from 1999 to 2018



Source: European Patent Office – PATSTAT

Notes:

1. An application can have multiple co-applicants from a variety of organisation types, hence the sum of patent applications with co-applicants across types is greater than the total number of patent applications with co-applicants.

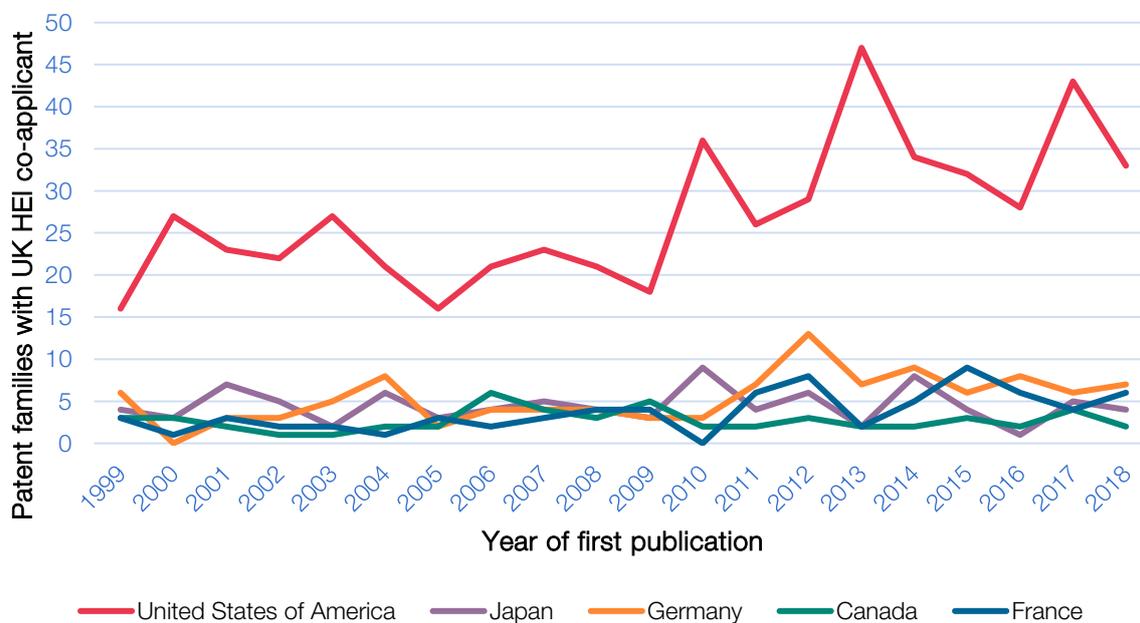
²⁴ Industrial Strategy pg.79

²⁵ Industrial Strategy pg.63

²⁶ Data for collaborations between UK HEIs is available in the accompanying Excel document for this report

On the rise are international collaborations, especially with the USA (Figure 5). In addition, patent applications to the USA from UK HEIs have shown a strong increase²⁷. This suggests UK HEIs are working more closely with the USA.

Figure 5: UK HEIs are increasingly collaborating internationally, most notably with the USA
Count of patent families from UK HEIs with a co-applicant split by co-applicant country from 1999 to 2018



Source: European Patent Office – PATSTAT

Notes:

1. Shows designated country of co-applicants, excluding those based in the UK, where the data is available in PATSTAT
2. The five countries shown are those with which UK HEIs have collaborated with the most

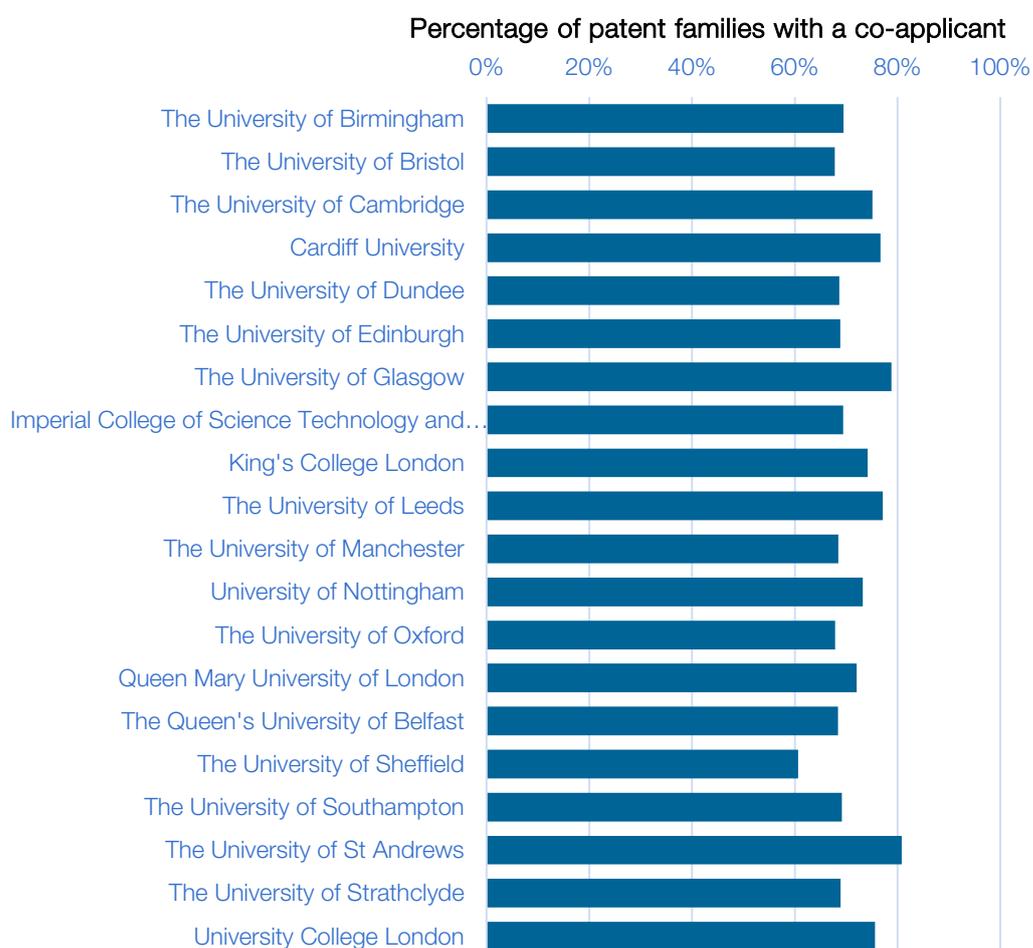
²⁷ See Appendix 3

5.2 What level of collaboration do UK HEIs exhibit?

The proportion of patents that UK HEIs collaborate on varies by institution. On average 69% of UK HEI patent families feature a collaboration, but for some this is as high as or even higher than 80%, such as The University of St Andrews, The University of Aberdeen and The University of Leicester. The Institute of Cancer Research, which is a college of The University of London, has a collaboration rate of 92%.

Each UK HEI will have their own IP strategy and policy which are not necessarily publicly available. This can potentially impact the likelihood of a collaborator being featured as a co-applicant on a patent application. Other factors such as field of research and source of funding may have an impact. Therefore, the proportion of patent applications featuring a co-applicant should not be viewed as a strict proxy for collaboration levels.

Figure 6: On average, a co-applicant features in 69% of UK HEI patent families
Percentage of patent families which feature a UK HEI as a co-applicant over the period 1999 to 2018 split by UK HEI



Source: European Patent Office – PATSTAT

Notes:

1. Only UK HEIs to have more than 130 patent applications featuring a co-applicant during the period 1999 to 2018 are featured in this chart.

6. Patent coverage

6.1 Where do UK HEIs seek protection for their inventions?

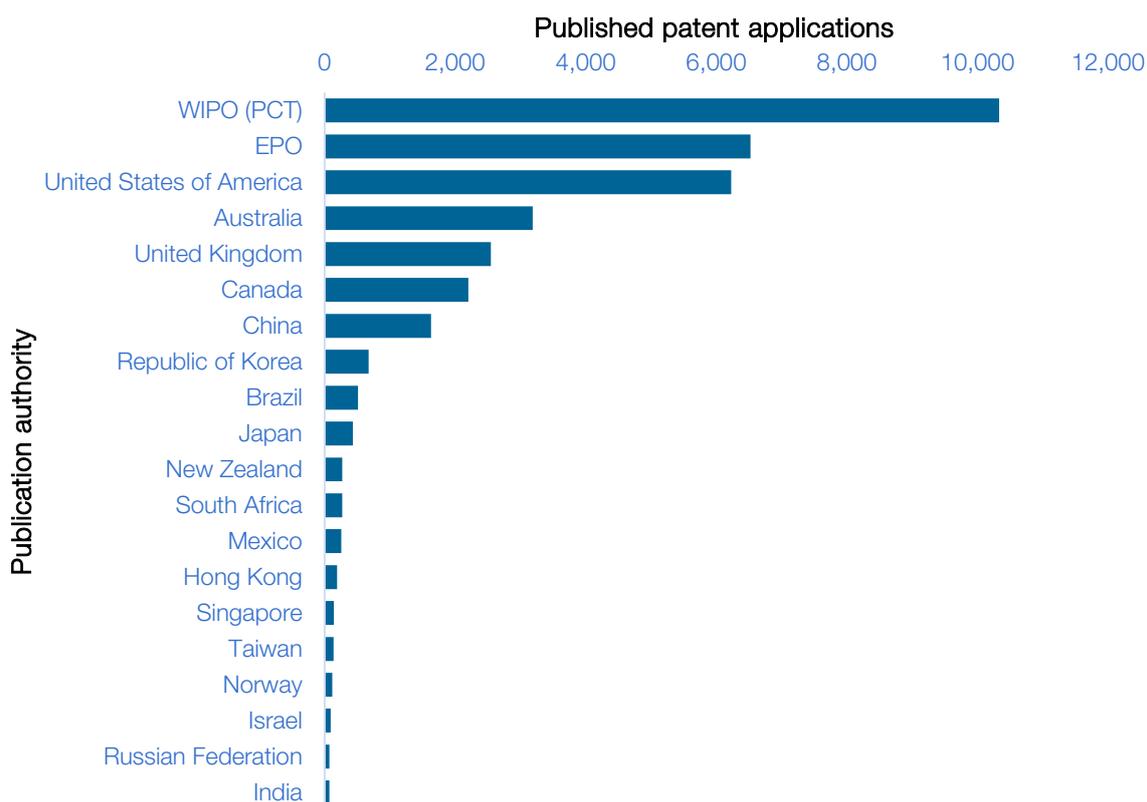
To maximise the potential of a patent, an applicant may wish to seek protection for their invention in multiple jurisdictions. UK HEIs have sought protection internationally for 91% of their patent families that were first published between 1999 and 2018. This could suggest the intention to trade internationally and an awareness of the benefit of gaining international IP protection for this.

In 2008, Prof. Paul Wellings made several recommendations to assist UK HEIs in the effective use of their IP. In his report it was remarked that UK HEIs had a poor level of US patenting relative to other economies²⁸.

Since 2008, there has been a clear rise in the number of patent applications in the USA. From 2002 to 2008 approximately 1 in 4 patent families had the USA as one of its publication authorities, whereas from 2009 to 2018, this ratio was closer to 1 in 2 patent families²⁹.

It may seem that UK HEIs seeks protection for their inventions in the UK less than one would expect. However, it is important to be aware that nearly every patent application with the European Patent Office (EPO) will be granted for all contracting states to the European Patent Convention (EPC) which includes the UK³⁰.

Figure 7: UK HEIs show a strong inclination to seek international protection for their inventions
Top 20 publication authorities by number of patent applications from UK HEIs for period 1999 to 2018



Source: European Patent Office – PATSTAT

²⁸ Wellings, P. (2008). *Intellectual Property and Research Benefits*. Lancaster University

²⁹ See Appendix 3

³⁰ There is a more detailed description of European patents and PCT patents in Appendix 4

7. Overview of spin-outs

A possible route to maximise the impact of a university's IP is to create a spin-out business. A university spin-out is a new company that is created in order to commercialise IP originating from within the university³¹. Universities often remain stakeholders in the company and the company may benefit from having access to university workspace facilities and other resources³².

There has been a rise in the number of university spin-outs since 2000 (Figure 8), though it should be noted that the volume of spin-outs is not an appropriate metric to measure their success. An examination of investment, turnover and survival rates of spin-outs would provide a more complete picture³³.

The government is committed to supporting the spin-out businesses even further, having allocated an additional £44m of grant funding in 2017/18 to Innovate UK to support, among other duties, the development of high-growth businesses³⁴.

In addition, the Higher Education Innovation Fund (HEIF)³⁵ has the aim of promoting knowledge exchange between HEIs and the wider world. This includes supporting HEIs as they spin-out businesses. As part of the Industrial Strategy, HEIF funding has increased and will reach a total of £250m a year by 2020-21³⁶.

Spin-out businesses can add value to and generate jobs in their local economies³⁷, which are often in the same locality as their parent university (Figure 9).

Approximately half of the spin-outs with a registered office in London are from UK HEIs that are not based in London. The University of Oxford and The University of Cambridge have a greater tendency than other non-London based universities to produce spin-outs with a registered office address in London.

³¹ Ulrichsen, T. C. (2019). *Developing University Spinouts in the UK: Key Trends in Spinout Activity, Investments and Investor Involvement*

³² Beauhurst. (2018, September). *UK University Spinouts: who are they and their investors?*. Retrieved from <https://about.beauhurst.com/blog/uk-university-spinouts-investors/>

³³ The Rees Review features a detailed analysis of HEI spin-outs and a comprehensive data annex. In this report Beauhurst data is used to examine spin-out behaviour, whilst The Rees Review uses a master data set that combines data from Beauhurst, HE-BCI and Gateway to Research.

<https://re.ukri.org/sector-guidance/publications/independent-advice-on-university-investor-links-mike-rees-report/>

³⁴ *Industrial Strategy* pg.69

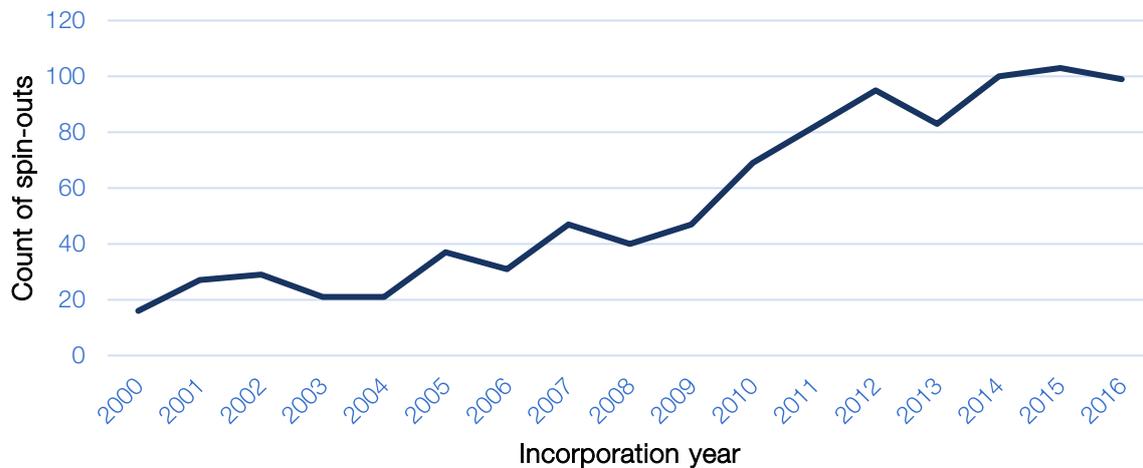
³⁵ UKRI. *Higher Education Innovation Fund*. Retrieved from <https://re.ukri.org/knowledge-exchange/the-higher-education-innovation-fund-heif/>

³⁶ *Industrial Strategy* pg.80

³⁷ Cebr, (2018), *High Growth Small Business Report 2018: Rebalancing the economy: Unlocking the potential of the fastest growing smaller companies in the UK*, Octopus pg.9

Figure 8: There has been a rise in the incorporation rate of UK HEI spin-out businesses from 2000 to 2016

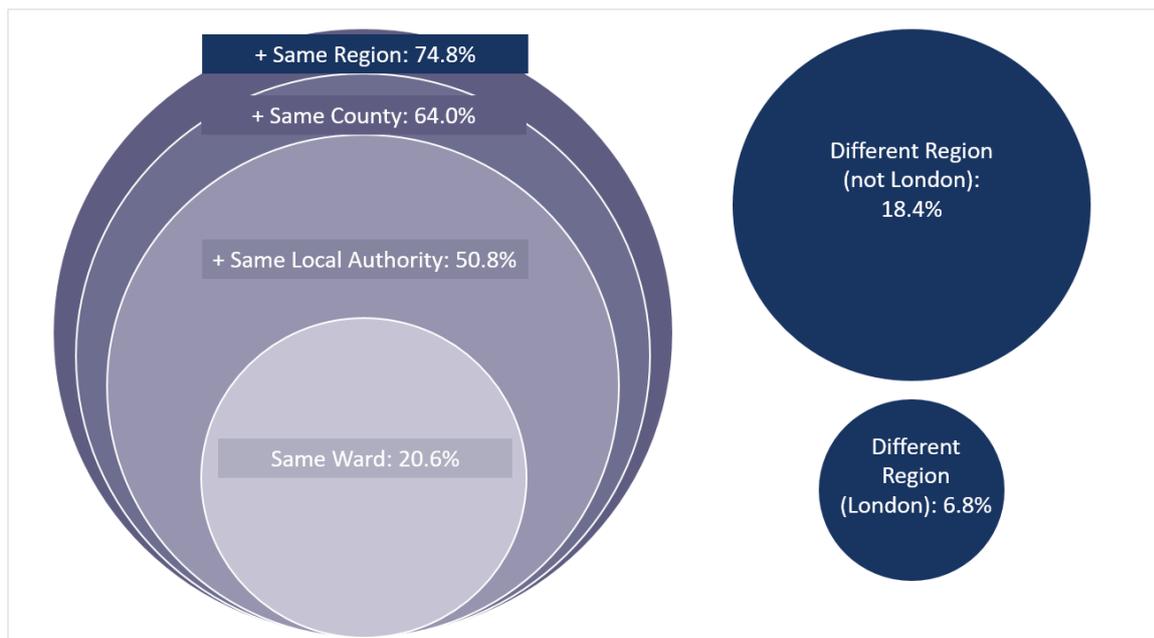
Count of UK HEI spin-outs by incorporation year from 2000 to 2016³⁸



Source: Beauhurst – Spinouts UK

Figure 9: UK HEI spin-outs tend to stay close to their parent university

Venn diagram showing the proximity of spin-outs to their parent university from 2000 to 2018



Source: Beauhurst – Spinouts UK, Companies House – Free Company Data Product (May 2019)

Notes:

1. The data set is restricted to those companies that were still live as of May 2019
2. In cases where the spin-out has multiple parent HEIs the address of the first listed HEI is used.
3. For HEIs with multiple campuses, the address of the main point of contact is used.
4. Diagram is not to scale. The size of circles does not represent the proportion of spin-outs that fall into a particular region.

³⁸ Data has been limited to end of 2016 for Figure 8. Current data suggests that in recent years there has been a fall in the output of spin-outs. However, this may be due to a lag in the data. This is because the legal entity of the spinout is sometimes incorporated before the company actually spins out; some academics have existing companies that become the spinouts vehicle

7.1 Overview of UK HEI spin-outs' interaction with IP

Of the 1095 UK HEI spin-outs incorporated since 2000, 421 have at least one patent application. 102 of those 421 spin-outs have had a patent application before their incorporation date and an additional 135 spin-outs have had their first patent application within 2 years of their incorporation. It generally takes 18 months before a patent application is first published, which suggests that the decision to pursue a patent is made early in the life of a spin-out business or that the university assigns its patent to the spin-out. Alternatively, a university may license their patent to the spin-out business.

Trade marks are more prevalent among spin-outs than their parent UK HEIs. UK HEIs have 18 patent applications for every trade mark registration, whereas their spin-outs only have 10. Trade marks are often associated with the commercialisation of goods and given the differing roles of UK HEIs and spin-outs this may go some way to explaining why trade marks tend to form a larger portion of a spin-out's IP portfolio.

As with UK HEIs, spin-outs tend to have very few design registrations. Only 9 of the 1095 UK HEI spin-outs have a design registration.

8. Areas of specialism

8.1 In which technology fields do UK HEIs and their spin-outs apply for patents?

In 2008, WIPO defined³⁹ five technology sectors, subdivided into 35 broad technology fields, to categorise all patents depending on where they are classified under the International Patent Classification (IPC) scheme⁴⁰.

47% of UK HEI patent publications are in the Chemistry sector, compared with 21% of all patent applications globally. This tendency to publish in the Chemistry sector is largely accounted for by UK HEIs patenting heavily in the Pharmaceuticals and Biotechnology fields (Figure 10).

It is believed that the technology field of an invention will likely impact the choice of how best to transfer that technology to the marketplace⁴¹. For instance, an HEI may decide that for a given technology the skill set of the researchers involved would make the commercialisation of the invention via a spin-out a viable option. Alternatively, the HEI may decide that, when factoring in the marketplace and access to venture capital, licensing their patent would be a better option.

If there were a particular technology field that lends itself to the creation of spin-outs over others, one might expect to see a marked difference in the patenting trends of HEIs and their spin-outs. However, this is not the case. The IPC fields spin-outs tend to publish patents in is very similar to that of the UK HEIs (Figure 10). Hence, the existence of a technology area bias for university spin-outs is not apparent from the patent data.

³⁹ See https://www.wipo.int/export/sites/www/ipstats/en/statistics/patents/pdf/wipo_ipc_technology.pdf for the methodology used

⁴⁰ The WIPO IPC Technology Concordance table is available at https://www.wipo.int/meetings/en/doc_details.jsp?doc_id=117672

⁴¹ Cervantes M., (October 2019), *Academic Patenting: How universities and public research organizations are using their intellectual property to boost research and spur innovative start-ups* Retrieved from: https://www.wipo.int/sme/en/documents/academic_patenting.html

Figure 10: Pharmaceuticals and biotechnology are the most used IPC technology field for UK HEIs and spin-outs

UK HEIs' and spin-outs' patent applications from 1999 to 2018 split by WIPO technology field

| Rank | WIPO technology field | Published patent applications | | |
|------------------|---|-------------------------------|-------------|--------|
| | | 1999 - 2008 | 2009 - 2018 | Total |
| UK HEIs | | | | |
| 1 | (C) Pharmaceuticals | 4,804 | 5,382 | 10,186 |
| 2 | (C) Biotechnology | 4,890 | 4,845 | 9,735 |
| 3 | (I) Analysis of biological materials | 2,213 | 2,051 | 4,264 |
| 4 | (C) Organic fine chemistry | 1,837 | 2,413 | 4,250 |
| 5 | (I) Medical technology | 1,716 | 2,372 | 4,088 |
| 6 | (I) Measurement | 1,815 | 2,202 | 4,017 |
| 7 | (C) Chemical engineering | 1,064 | 1,361 | 2,425 |
| 8 | (E) Computer technology | 1,007 | 1,185 | 2,192 |
| 9 | (I) Optics | 1,012 | 961 | 1,973 |
| 10 | (C) Basic materials chemistry | 751 | 1,099 | 1,850 |
| Spin-outs | | | | |
| 1 | (C) Pharmaceuticals | 260 | 2,283 | 2,543 |
| 2 | (C) Biotechnology | 352 | 1,928 | 2,280 |
| 3 | (I) Measurement | 252 | 1,064 | 1,316 |
| 4 | (C) Organic fine chemistry | 113 | 1,189 | 1,302 |
| 5 | (I) Medical technology | 176 | 872 | 1,048 |
| 6 | (E) Computer technology | 154 | 797 | 951 |
| 7 | (C) Chemical engineering | 88 | 721 | 809 |
| 8 | (E) Electrical machinery, apparatus, energy | 67 | 738 | 805 |
| 9 | (I) Analysis of biological materials | 166 | 625 | 791 |
| 10 | (C) Basic materials chemistry | 75 | 509 | 584 |

Source: European Patent Office – PATSTAT

Notes:

1. WIPO technology sector indicator: (C) Chemistry, (I) Instruments, (E) Electrical Engineering, (M) Mechanical Engineering, (O) Other Fields – this is comprised of Process Engineering and Consumption

8.2 What are the classifications of trade marks belonging to UK HEIs?

The Nice Classification (NCL) scheme⁴² is the most commonly used classification scheme by most national and regional IP offices⁴³. Here it is used to show the difference in focus of UK HEIs and their spin-outs. For instance, 'Education...' is the most used classification for UK HEI trade marks but falls to the 9th most used for spin-outs. In addition, there are four times more 'Pharmaceutical...' classifications for spin-out trade marks than there are for their parent UK HEIs. This is perhaps a reflection of a spin-out's commercialisation focus and an HEI's education focus.

Figure 11: There are four times as many 'Pharmaceutical...' classifications for spin-out trade marks than there are for UK HEIs⁴⁴

UK HEIs' and spin-outs' trade mark registrations from 1999 to 2018 split by top 10 most used Nice classification fields

| Class | Class heading | Total classes registered | | |
|------------------|--|--------------------------|-------------|-------|
| | | 1999 - 2008 | 2009 - 2018 | Total |
| UK HEIs | | | | |
| 41 | Education... | 560 | 947 | 1,507 |
| 42 | Scientific and technological services and research and design relating thereto | 413 | 691 | 1,104 |
| 16 | Paper, cardboard and goods made from these materials... | 326 | 515 | 841 |
| 9 | Scientific, nautical, surveying, photographic, cinematographic, optical... | 297 | 532 | 829 |
| 35 | Advertising; business management; business administration; office functions | 279 | 546 | 825 |
| 25 | Clothing, footwear, headgear. | 132 | 283 | 415 |
| 43 | Services for providing food and drink; temporary accommodation. | 113 | 279 | 392 |
| 44 | Medical services... | 66 | 219 | 285 |
| 36 | Insurance; financial affairs; monetary affairs; real estate affairs. | 83 | 156 | 239 |
| 45 | Legal services... | 45 | 189 | 234 |
| Spin-outs | | | | |
| 9 | Scientific, nautical, surveying, photographic, cinematographic, optical... | 78 | 458 | 536 |
| 42 | Scientific and technological services and research and design relating thereto | 54 | 451 | 505 |
| 5 | Pharmaceutical and veterinary preparations | 16 | 218 | 234 |
| 10 | Surgical, medical, dental and veterinary apparatus... | 13 | 182 | 195 |
| 1 | Chemicals used in industry, science, photography, agriculture... | 24 | 138 | 162 |
| 44 | Medical services... | 8 | 115 | 123 |
| 35 | Advertising; business management; business administration; office functions | 9 | 87 | 96 |
| 7 | Machines and machine tools | 9 | 66 | 75 |
| 41 | Education... | 8 | 58 | 66 |
| 38 | Telecommunications | 4 | 60 | 64 |

Source: IPO – Trade mark data, Beauhurst – Spin-outs UK

⁴² For more information see <http://www.wipo.int/classifications/nice/en/>

⁴³ Full details of the Nice classification scheme are available via <https://www.wipo.int/classifications/nice/nclpub/en/fr/>

⁴⁴ There were 52 trade mark registrations with a 'Pharmaceutical and veterinary preparations' classification for UK HEIs from 1999 to 2018 compared to 234 for spin-outs over the same period.

9. Top applicants

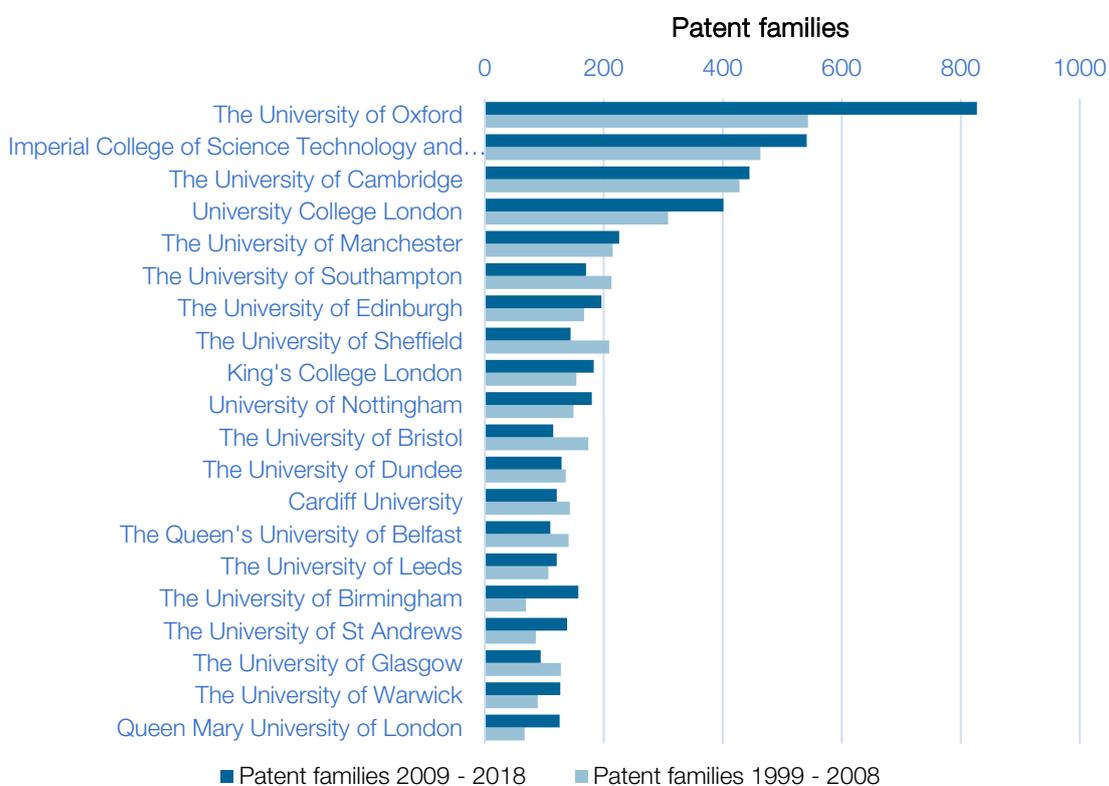
9.1 Which UK HEIs apply for patents?

Most UK HEIs have shown an increase in patenting activity over the period 1999 to 2018, though the upward trend seen in Figure 1 is largely reflective of the patenting activity of The University of Oxford, Imperial College London, The University of Birmingham and University College London. These universities have not only shown the largest increase in terms of magnitude, they are also among those UK HEIs showing the top proportional increase in their patent output. Other UK HEIs to show a large increase in patenting activity include The University of St Andrews and Queen Mary University of London, which would be 13th and 16th on the list respectively were the period restricted to just 2009 – 2018.

Some of the UK HEI spin-outs have also established a large patent portfolios of their own (Figure 13).

Figure 12: There is an increasing gap between the patenting activity of Oxford and London-based universities compared to other UK HEIs

Top 20 UK HEIs according to most patent families published from 1999 to 2018



Source: European Patent Office - PATSTAT

Figure 13: Some spin-outs have already established a large patent portfolio
Top 10 spin-outs according to the number of patent applications from 1999 to 2018

| Spin-out Name | Parent Higher Education Institution | Published patent applications |
|-----------------|-------------------------------------|-------------------------------|
| Oxford Nanopore | University of Oxford | 376 |
| Nexeon | Imperial College London | 361 |
| Xeros | University of Leeds | 330 |
| Heptares | Laboratory of Molecular Biology | 279 |
| P2i | Durham University | 260 |
| GT Biologics | University of Aberdeen | 223 |
| NovaBiotics | University of Aberdeen | 207 |
| Redx Pharma | University of Liverpool | 200 |
| Adaptimmune | University of Oxford | 187 |
| TeraView | University of Cambridge | 171 |

Source: European Patent Office – PATSTAT, Beauhurst – Spinouts UK

9.2 Which UK HEIs have the most trade mark registrations and design registrations?

The filing behaviour for UK HEIs for trade marks and designs registrations with the IPO tends to be sporadic. Only 6 UK HEIs have applied for a design in 2 distinct years over the 20-year period.

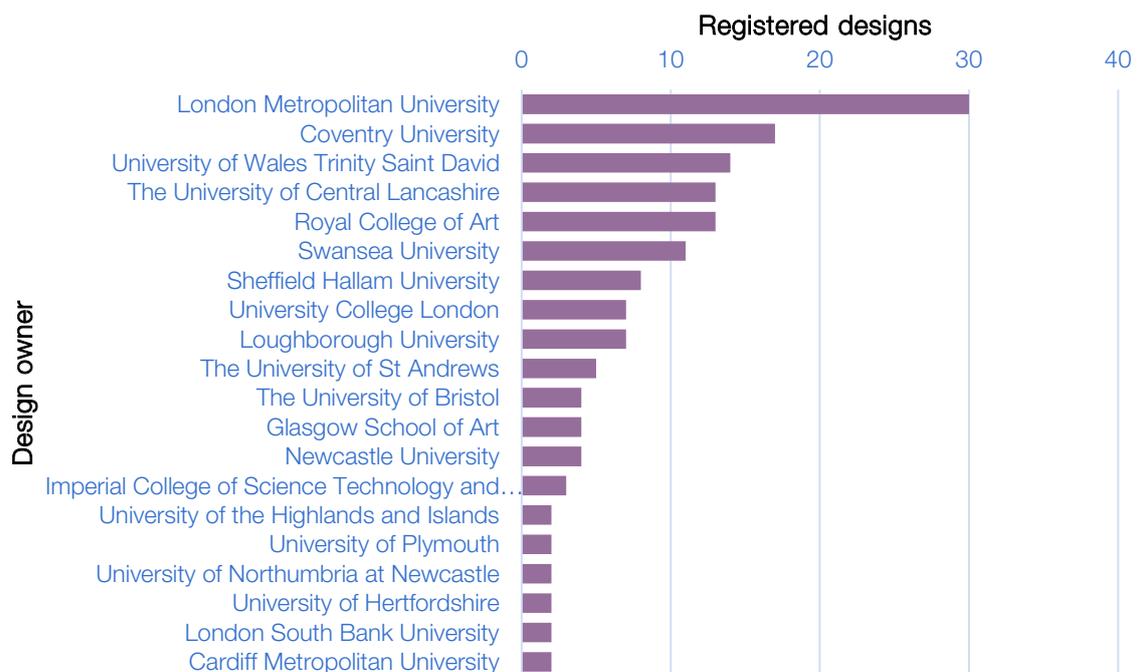
In addition, there is only a little overlap between the figures (Figure 12, 14 and 15). Only Imperial College London and University College London feature in the list of top HEI applicants across rights.

Figure 14: Top 20 UK HEIs according to the number of trade mark registrations from 1999 to 2018



Source: IPO – Trade mark data

Figure 15: Top 20 UK HEIs according to the number of design registration from 1999 to 2018



Source: IPO – Design data

Conclusions

Universities and research institutions in the UK are regarded as some of the best in the world and are set to play key roles in ambitions to make the UK the most innovative country in the world by 2030. There has been growing emphasis on maximising the economic and social impact of research conducted by universities, and the licensing of IP and the creation of spin-out businesses can contribute to this.

This report has shown that the patenting activity of HEIs in the UK has been increasing from 1999 to 2018 at approximately the same growth rate of patenting activity worldwide and that The University of Oxford, The University of Birmingham, Imperial College London and University College London are at the forefront of this increase in the UK. However, an increase in patenting activity has not been universal and some universities have seen drops in their patenting activity; further study will be required to see if there are any patterns to this behaviour.

In addition, international collaborations and collaborations between UK HEIs and businesses is seen as essential for helping the UK achieve the 2030 goal. In this study, it has been shown that the patent data supports the notion that UK HEIs are indeed increasing their collaborations with businesses on patents as well as their international collaborations.

It was shown that since 2000, UK HEIs have increasingly used spin-outs as a means of commercialising their IP. The majority of spin-outs are situated close to their founding HEI. It may be worth exploring the economic impact these businesses have on the area. This could be done by linking the data to HMRC records.

Also in this report, the extent to which UK HEIs engaged with trade marks and designs was explored. It was found that number of trade mark registrations and design registration UK HEIs had with the IPO from 1999 to 2018 was relatively low.

This is the first report of its kind conducted by IPO and the foundations provide a basis from which further analysis into the behaviour of UK HEIs in relation to their IP can be conducted. An examination of regional variations in patenting behaviour may be of interest as well as a comparison of the IP behaviours by different types of UK HEIs, such as by 'KEF' cluster⁴⁵. Additionally, the HE-BCI survey is currently being reviewed a result of which may be that a variety of new data sets can be incorporated into the analysis. In further research, analysis of international trade marks and designs originating from UK HEIs would also be of interest.

⁴⁵ Research England. (2019, September). *Knowledge Exchange Framework Metrics: A Cluster Analysis of Higher Education Institutions*. Retrieved from <https://re.ukri.org/news-events-publications/publications/kef-metrics-cluster-analysis-hei/>

Appendices

Appendix 1. Worldwide Patenting Activity

The increase seen in patenting activity for UK HEIs (Figure 1) is roughly proportional to the global increase in patenting activity (Figure 16).

Figure 16: There has been a global increase in patenting activity

Worldwide patent applications (excluding those published in China) by year of first publication from 1999 to 2018



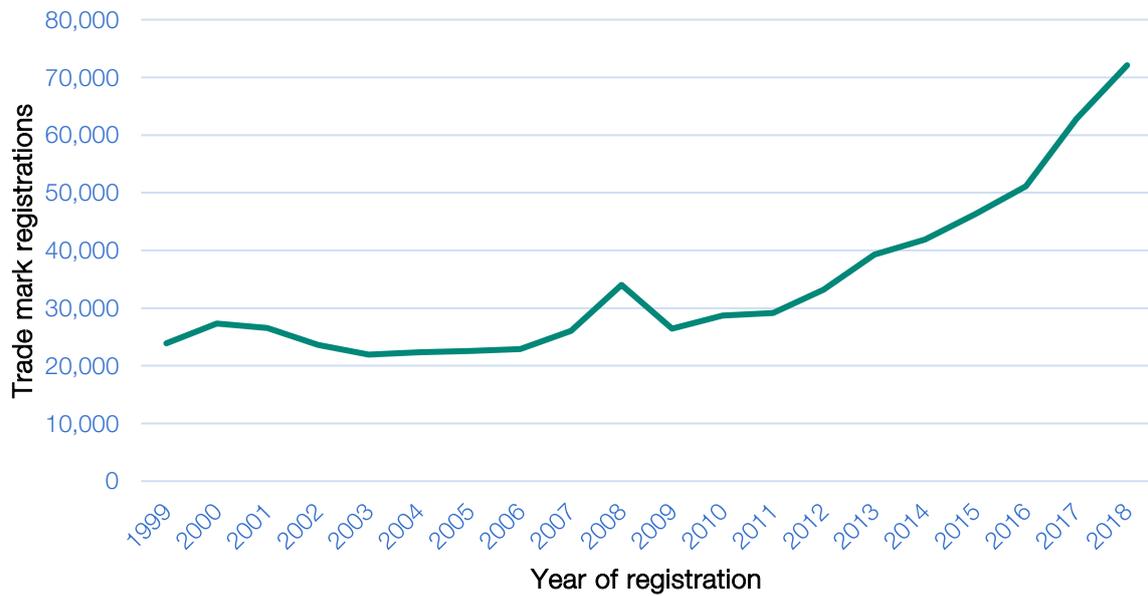
Source: European Patent Office – PATSTAT

Notes:

1. In recent years, Chinese patenting behaviour has increased to the extent that there are more publications in China than the rest of the world combined, hence their exclusion from this comparison.

Appendix 2. Trade marks with the IPO

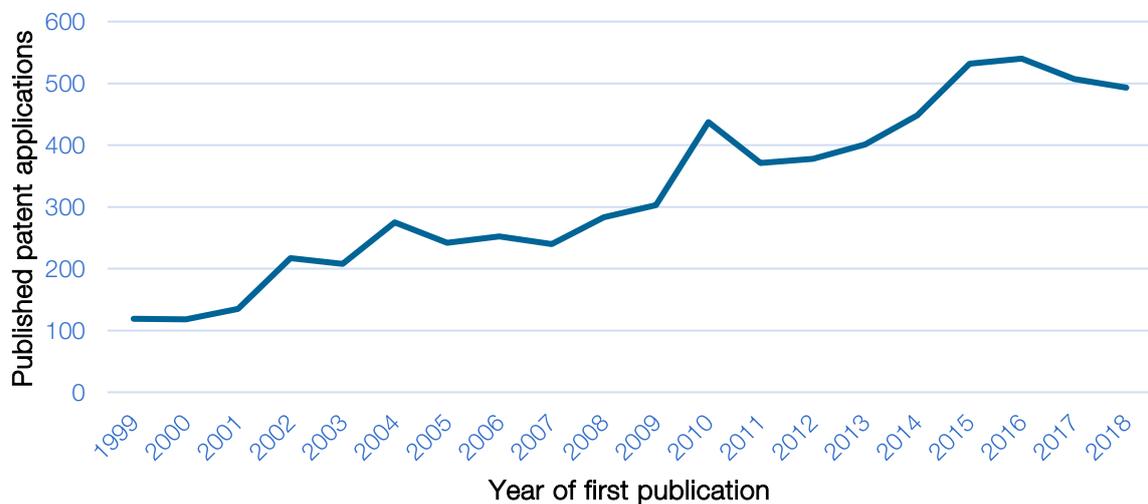
Figure 17: Since 2012 there has been a large increase in trade mark registrations with the IPO
All trade marks registered with the IPO from 1999 to 2018



Source: IPO – Trade mark data

Appendix 3. Publications in the USA

Figure 18: There has been a rise in US applications originating from UK HEIs
UK HEI patent applications in the USA by year of first publication from 1999 to 2018



Source: European Patent Office – PATSTAT

Appendix 4. WO and EP patent applications

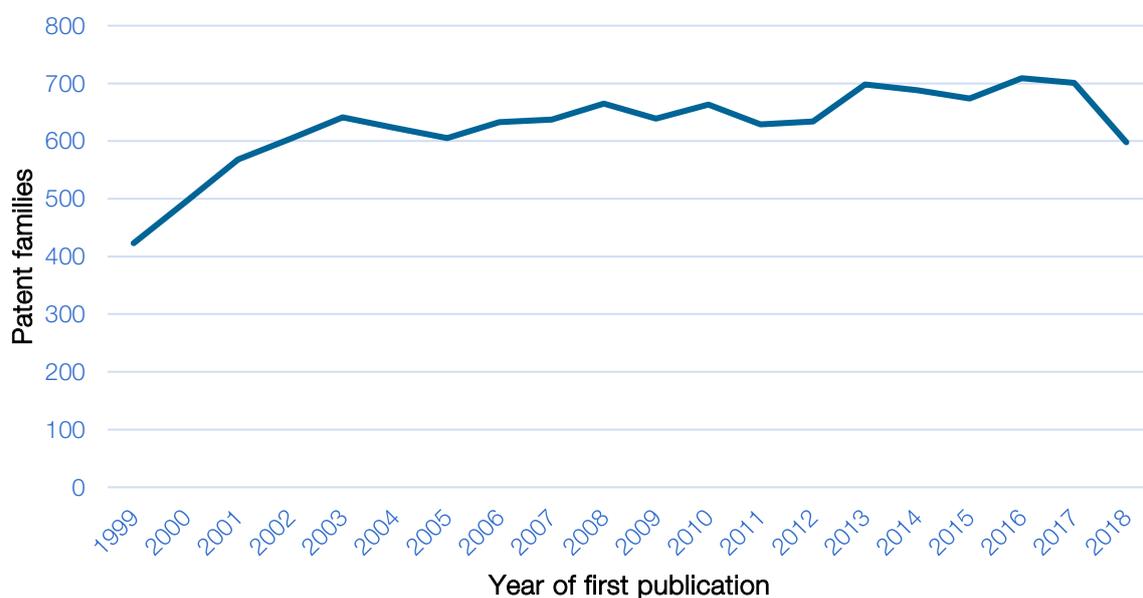
International patent applications may designate any signatory states or regions to the Patent Cooperation Treaty (PCT) and will have the same effect as national or regional patent applications in each designated state or region, leading to a granted patent in each state or region.

European patent (EP) applications are regional patent applications which may designate any signatory state to the European Patent Convention (EPC), and lead to granted patents having the same effect as a bundle of national patents for the designated states.

Appendix 5. UK HEI patent families

Figure 19: There has been an increase in patent families from UK HEIs

UK HEI patent families by year of first publication from 1999 to 2018



Source: European Patent Office – PATSTAT

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