Intellectual Property Office

Analysing the global filing activities of UK patent applicants

Supporting the innovation ecosystem: Building the evidence base on the drivers of IP

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1. Executive summary

The trends in the patenting activity of UK applicants are analysed over a twenty-year period. The UK Intellectual Property Office (IPO), US Patent and Trademark Office (USPTO) and European Patent Office (EPO) are the offices that most frequently publish applications by UK applicants, with almost all applications being pursued in at least one of these jurisdictions. Since the year 2000, there has been an increasing tendency to pursue protection in China and in the USA, and a decline in the number of applications published in Japan. The majority of applications with UK applicants fall into one of two categories; those for which broad worldwide protection is sought (and which are published by both the EPO and the USPTO, amongst other offices), and those that are published only by the UK and by no other patent-granting authority. The former category relates most frequently to chemistry-related subject matter, and are more frequently granted than those for which only UK protection is sought.

Applications filed with the IPO are often used to support a priority claim of subsequent applications pursued elsewhere, and a frequently occurring strategy is to claim priority from the UK application but to withdraw it from the IPO before they publish it, and instead pursue patent protection in other jurisdictions (including the EPO, which provides patent protection in the UK).

The majority of applications that have a UK applicant do not have any co-applicants from outside the UK, but most applications that have applicants both from the UK and from elsewhere are pursued in the USA and have an American co-applicant.

The majority of UK applicants only ever pursue one patent application, and these account for a significant proportion of patenting activity by UK applicants, though there has recently been a declining trend in the number of patent applications filed by these applicants. This contrasts with the activity of long-standing applicants with larger patent portfolios, whose activity has shown an increasing trend in recent years.

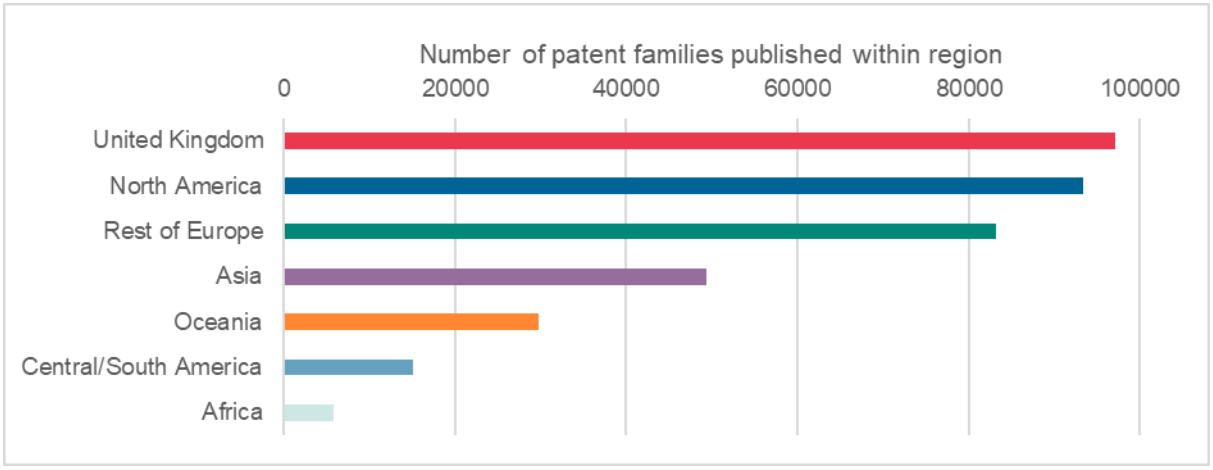
Smaller applicants are more likely to pursue protection only in the UK, and their applications are slightly more likely to relate to consumer goods, furniture, games and civil engineering. Conversely, larger applicants show a greater tendency to pursue broad patent protection and are more likely to pursue patent protection in the fields of chemistry and electrical engineering.

This research forms part of the IPO’s research programme on the Drivers of Intellectual Property, which aims to build the evidence base on what drives demand for IP rights and the strategic drivers of IP. This research contributes to building a more comprehensive picture of why and how applicants use IP.

2. Where do UK applicants protect their inventions?

2.1 UK applicants pursue protection most often in the UK and in North America

Figure 1: The majority of patent families filed by UK applicants between 2000 and 2017 were published in the UK, North America and Europe

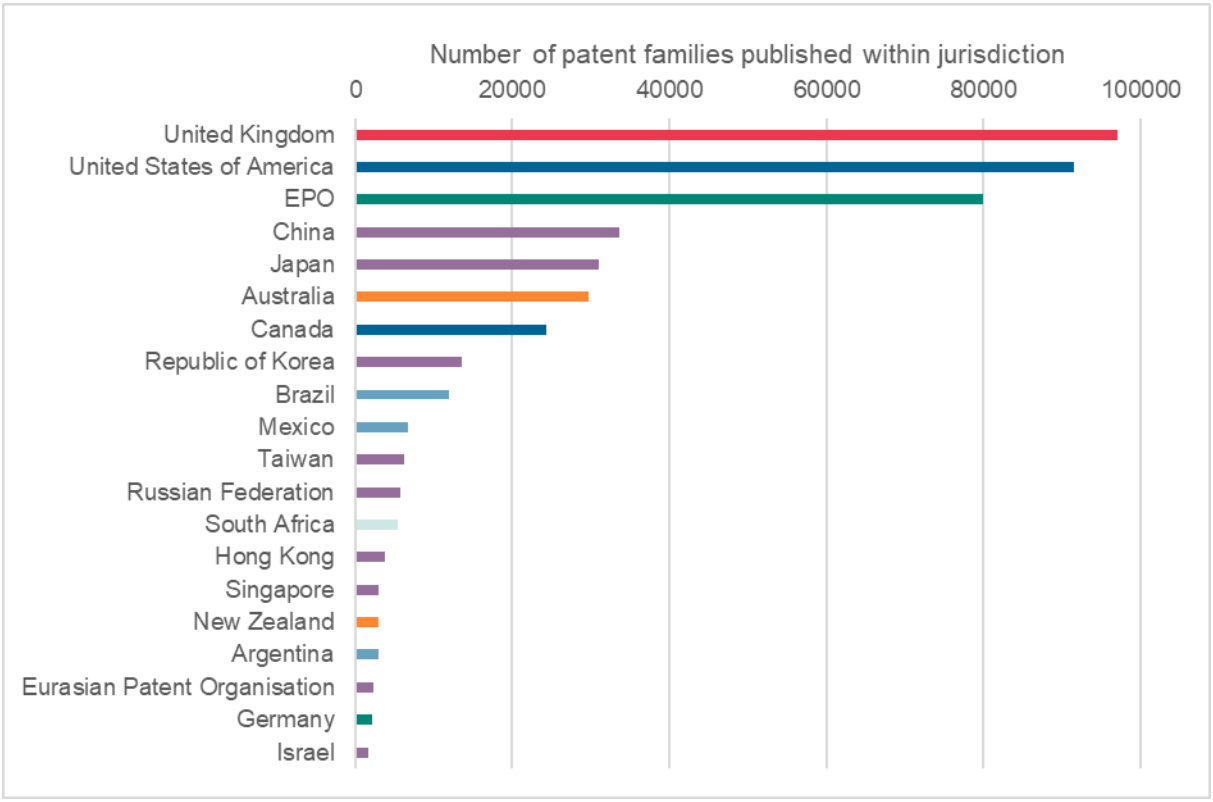


Source: PATSTAT Global – 2021 Spring Edition

Between 2000 and 2017, UK applicants most frequently sought protection through the UK Intellectual Property Office (IPO) than with IP offices abroad (Figure 1). UK applicants more often sought protection in North America[1] than in Europe. The IPO have published applications associated with 97,000 patent families[2] from UK applicants, whereas over the same time period 93,000 families were pursued in North America, 83,000 were pursued in Europe, and 49,000 were pursued in Asia.

[1] The region of North America includes the USA and Canada but excludes Mexico, which is included in the Central/South American region
[2] Patent families are counted using a fractional count corresponding to the proportion of its applicants that are from the UK (Appendix C)

Figure 2: The top 20 jurisdictions publishing patent families from UK applicants, filed between 2000 and 2017. Colour coding matches the continents in Figure 1



Source: PATSTAT Global – 2021 Spring Edition

A more detailed breakdown by jurisdiction (rather than continent) is shown in Figure 2, which shows the 20 jurisdictions most frequently publishing applications from UK applicants. After the IPO, UK applicants most frequently pursue applications in the offices of the "IP5" forum (which includes the European Patent Office and the national offices of the USA, China, Japan and the Republic of Korea), and with the offices that participate together with the IPO in the Vancouver Group (Australia and Canada).

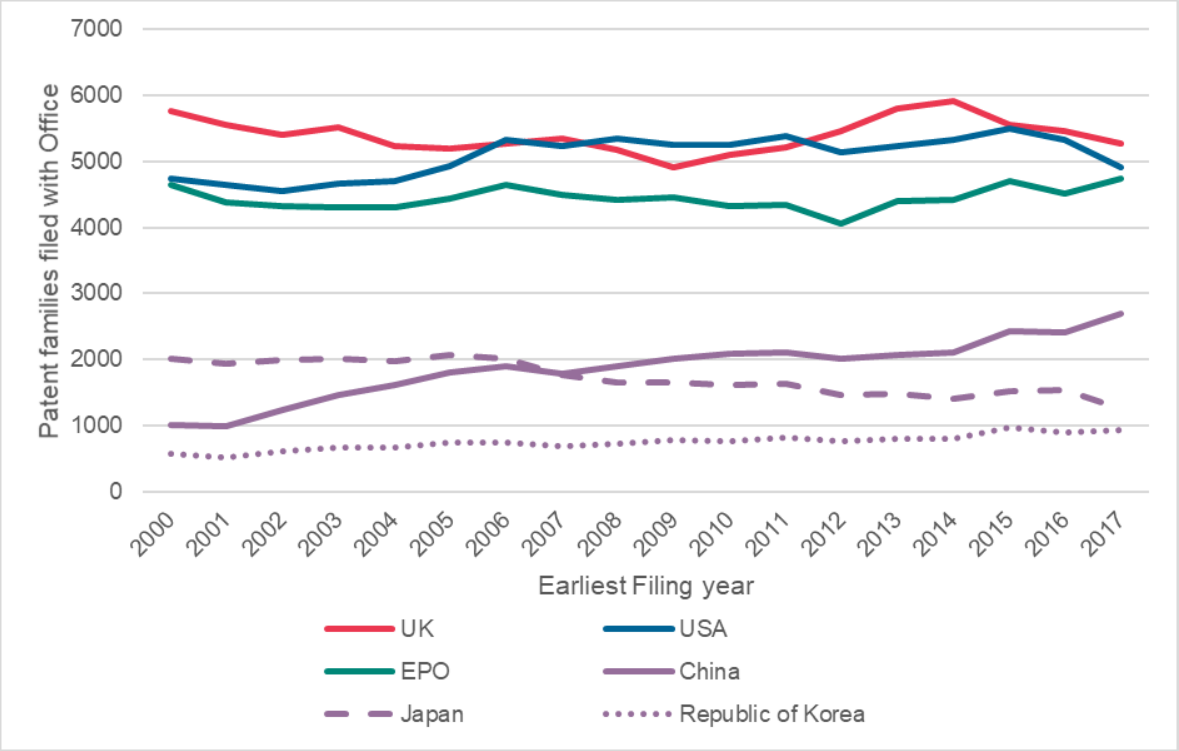
The majority of patent families published in North America are received by the USA rather than Canada, though around 22,000 patent families were published by both jurisdictions[3]. It can also be seen that almost all published patent applications in Europe are applied for via the European Patent Office (EPO). The preference towards filing through the EPO rather than individual national offices is likely to reflect the economy of scale associated with protecting an invention under the European Patent Convention (EPC).

Over two-thirds of the 49,000 patent families published in Asia (Figure 2) were filed in China, whose office published applications from 34,000 families. In a similar way as for filings to North America, it can be inferred that filings to Asia often include multiple jurisdictions. This is considered further in Section 3.7 which analyses the filing strategies of applicants pursuing patent protection in Asia.

[3] 68,000 patent families had a UK applicant and were published in the USA but not in Canada; conversely, 2,000 families had a UK applicant and were published in Canada but not the USA. Extending the analysis to applicants from other countries suggests that almost all applications pursued in Canada by non-Canadian applicants are pursued also in the USA

2.2 Time trends in patent filings per jurisdiction

Figure 3: Published [4] patent families pursued by UK applicants, with filing dates between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Between 2000 and 2017, China had the largest rise in patent families filed by UK applicants, with the number of families more than doubling in this time period from 1,008 in 2000 to 2,697 in 2017 (Figure 3).

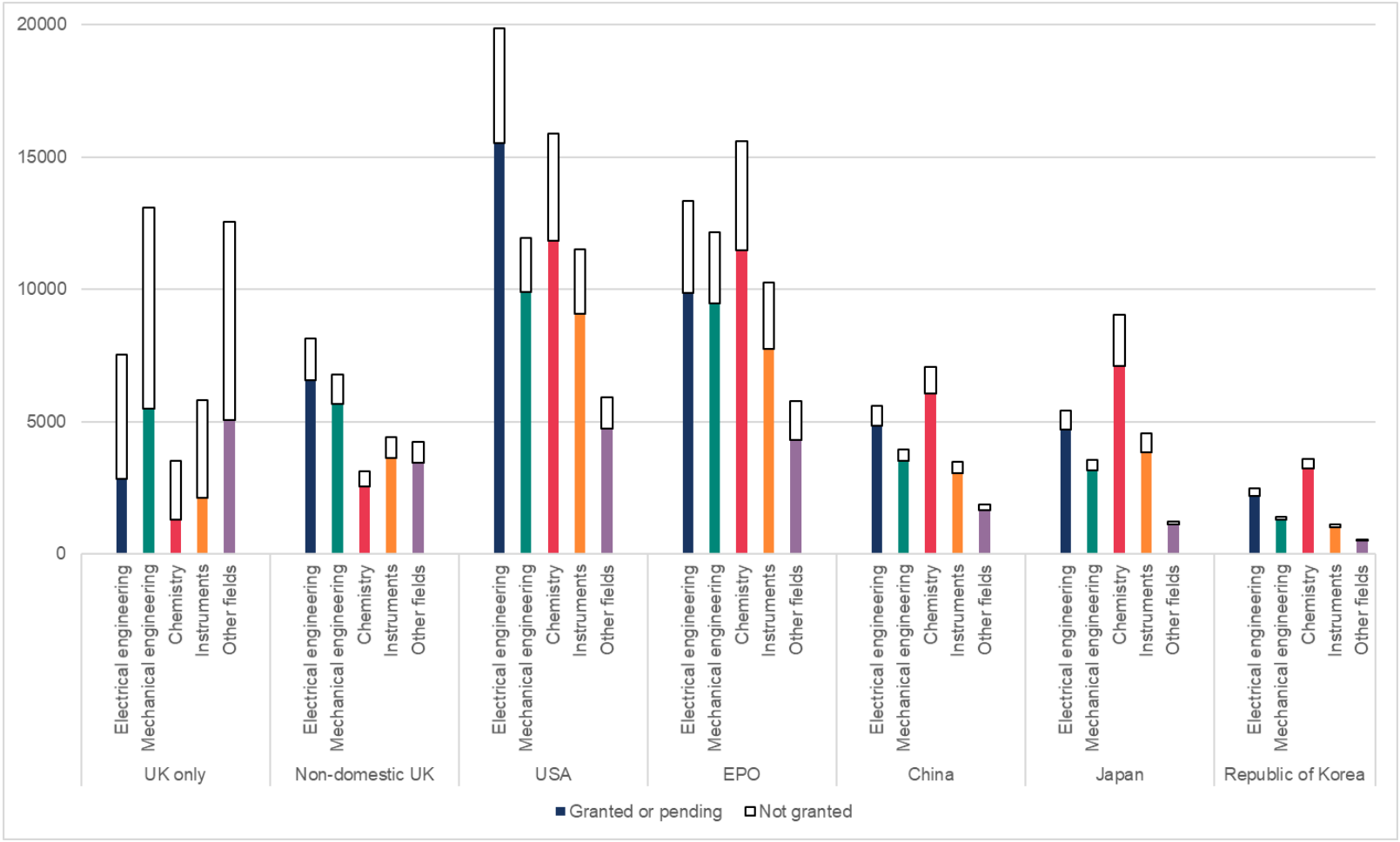
The number of published patent families filed per year at the IPO fell between 2000 and 2009 from 5,768 to 4,904, but recovered afterwards and reached 5,912 in 2014. Other notable trends shown are that there has generally been an upward trend in families with an application published in the USA, and there has been a sustained downward trend in UK applicants pursuing protection in Japan. This indicates that although there have been similar overall numbers of applications published between 2000 and 2017 in China and Japan (Figure 3), there has been an increasing tendency to pursue applications in China rather than in Japan.

2.3 Dependence on technology area

A patent family may relate to any technology that is capable of industrial application; the subject areas of patents are therefore wide-ranging. The World Intellectual Property Organisation (WIPO) has grouped these technologies into 35 “fields”, that fall within 5 broad “sectors”.

[4] Although there will be many applications filed with each jurisdiction that are never published, PATSTAT only includes limited information about these applications. We therefore rely on counts of published patents and assume that these are representative of the overall extent to which UK applicants pursue protection in each jurisdiction. Each family is counted at most once per jurisdiction regardless of whether there are multiple applications filed in each jurisdiction

Figure 4: Technology breakdown of patent families published[5] in each jurisdiction with a UK applicant, with filing dates between 2000 and 2017. Applications published in the UK are subdivided into two categories according to whether or not an equivalent application has been published in another jurisdiction



Source: PATSTAT Global – 2021 Spring Edition

[5] All applications filed after 2012 are included in the coloured parts of the bars, but may nonetheless have been terminated by offices who are examining applications quicker than other offices; these have been treated as pending to avoid skewing the results according to the relative processing speed of each office. A filing date of 2012 is a reasonable cut-off time for inferring that an ungranted application filed earlier is likely to have been terminated (Appendix D)

Applications in the Chemistry sector (which includes pharmaceuticals and biotechnology) are much less prevalent in the UK than in other countries (Figure 4), and suggests that applicants working in Chemistry-related technologies are more likely to pursue broad worldwide protection for their inventions. If an applicant seeks broad protection, then a patent granted by the EPO offers much greater coverage than a patent granted by a European national office[6]. The desire for broad patent protection in the Chemistry sector is also suggested by the prevalence of Chemistry applications in China, Japan and the Republic of Korea (Figure 4).

The technological breakdown of patent applications filed in the USA is broadly similar to those filed with the EPO, except that the USA receive many more applications in Electrical Engineering (Figure 4). This field includes subject matter that is traditionally implemented using computer programs, the patentability of which is treated differently in the USA than in the UK or Europe.

Relative to applications that are published outside the UK, patent applications published only by the IPO have a much higher tendency (Figure 4) to relate to the field of mechanical engineering and to "other fields" (which comprises civil engineering, furniture and other consumer goods). Applications filed only with the IPO have a much lower grant rate than those filed abroad (Figure 4),which supports anecdotal evidence that some applicants file speculative applications domestically[7] rather than incurring the expense of filing abroad. For these applications, the search report issued by the IPO may inform the applicant of the feasibility of obtaining patent protection elsewhere. Conversely, applications filed with the EPO and with the USPTO tend to also be filed with several other offices (see Section 3.2), which indicates a high level of investment due to patent processing fees and attorney fees. This investment is likely to be supported by a higher level of due diligence before any application is filed, which would explain the relatively high grant rate for applications filed with these offices by UK applicants (Figure 4). Although not all applications published by these offices have a corresponding application published by the IPO[8], in Section 3.4 we show that a significant proportion of them claim priority from an unpublished IPO application, which further supports the hypothesis that the IPO is often used to assess the feasibility of obtaining patent protection in other jurisdictions.

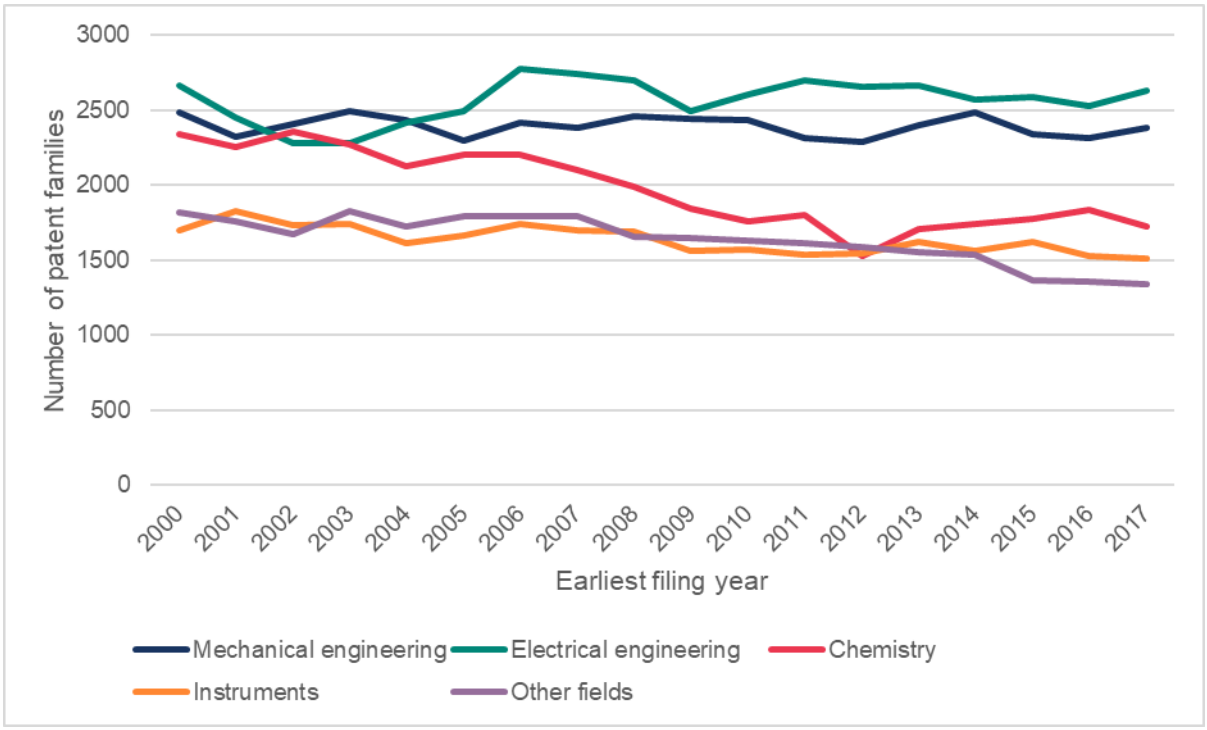
[6] The European Patent Office suggest that "it makes sense to file a European patent application … when protection is sought in at least four European countries"

[7] For example, customer interviews indicate that a common strategy for UK applicants is to request a search to be done on an application by the IPO before deciding whether to pursue the application in other jurisdictions

[8] See Figure 4 noting that, for example, if all applications published in the USA were also published in the UK, then the non-domestic UK categories would number at least as many applications as the USA categories

2.4 Time trends for each technology area

Figure 5: Published patent families filed worldwide in each technology sector by UK applicants[9] between 2000 and 2017.



Source: PATSTAT Global – 2021 Spring Edition

Apart from electrical engineering and mechanical engineering, which have remained broadly stable between 2000 and 2017 (Figure 5), each technology sector shows a downward trend. The most noticeable dip was in the Chemistry sector in 2012, though activity recovered since. A breakdown of this technology sector (not shown here) indicates that the dip relates to pharmaceuticals; this may correspond to a reported drop in research and development (R&D) spending[10] in 2012, and a decrease in drugs manufacture[11]. Alongside the recovery in pharmaceutical R&D spend, a breakdown of the patenting activity in the Chemistry sector indicates that its recovery can also be attributed to the field of biotechnology.

Figure 5 shows a more noticeable downward trend in activity with time compared to Figure 3. Because Figure 3 counts a patent family multiple times according to the jurisdictions it is ever filed in, this indicates that although UK applicants are overall filing fewer families of patent applications, the families that are filed are pursued in a larger number of jurisdictions.

[9] Each patent family is counted at most once (if it is wholly owned by UK applicants) whereas in Figure 3 each family was counted multiple times according to the number of jurisdictions it was filed in

[10] Source: Business enterprise research and development time series. Available at https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/timeseries/dlcd/berd

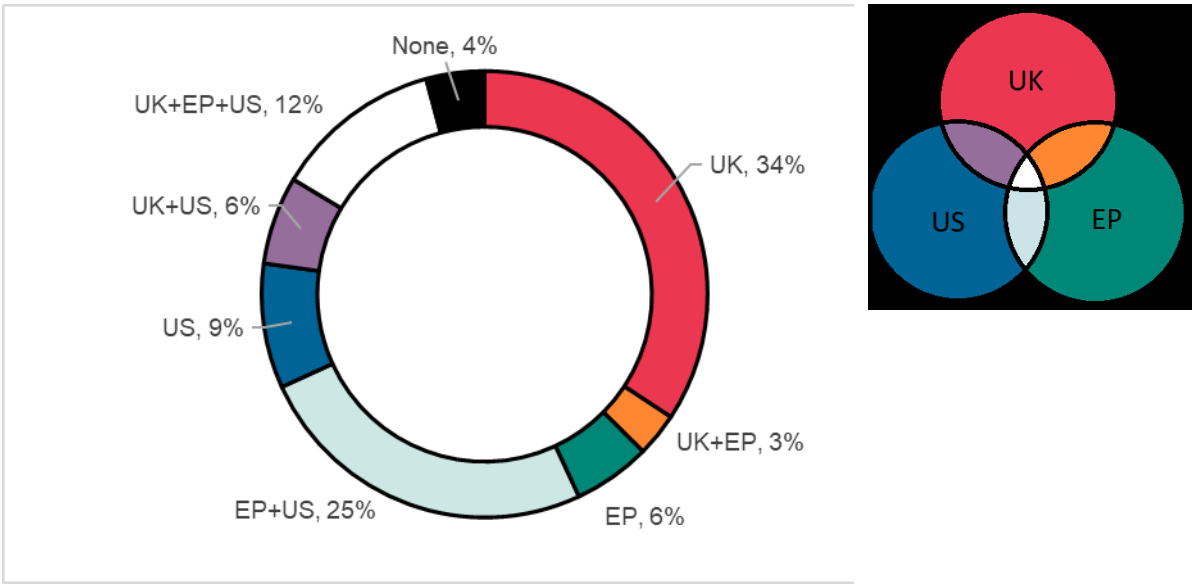
[11] Source: Financial Times "UK drug manufacture drops by a quarter", March 2015 https://www.ft.com/content/b359873c-bf9d-11e4-a03e-00144feab7de

3. Patenting strategies used by UK applicants

An invention may be protected in multiple jurisdictions by filing a "family" of several equivalent applications. This section analyses the combinations of jurisdictions in which UK applicants pursue[12] patent applications to protect an invention, which indicate the markets in which UK applicants seek protection.

3.1 Almost all inventions are filed with one or more of the IPO, the EPO and the USPTO

Figure 6: The combinations of the IPO, the EPO and the USPTO, that are included in patenting strategies used by UK applicants between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Almost all (96%) of patent families with UK applicants are published in at least one of the IPO, the EPO and the USPTO (Figure 6). There are three notable patenting strategies that are frequently used by UK applicants:

- Applications published by the IPO but neither the EPO nor the USPTO (34% of applications, shown in red in Figure 6). These applications tend not to be pursued anywhere other than the UK (See Section 3.2), and so these patent families represent the "domestic-only" applications filed by UK applicants.

- Applications published by both the EPO and the USPTO (37%, shown as light green and white in Figure 6). These applications tend also to be filed in several other jurisdictions (Section 3.2), and so these patent families represent applications for which broad protection is sought by the applicant.

- Patent families that are not published by either the IPO nor the EPO (13%, shown as black and blue in Figure 6). All patents with force in the UK must have been published by either of these offices, and so the absence of a

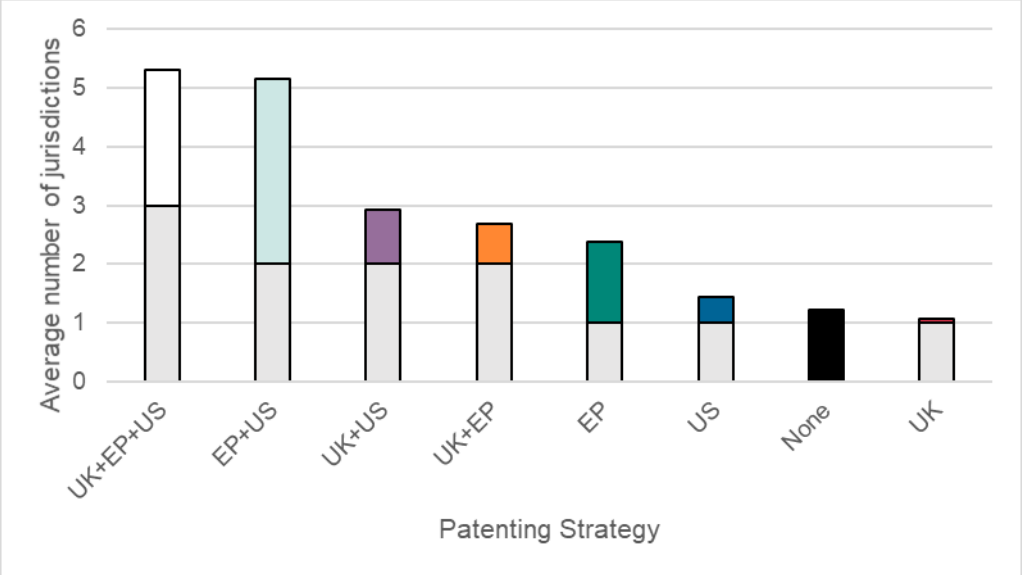
[12] It is possible that an applicant files an application but then withdraws it prior to publication. Very little data is available for such applications, though information is available if they are relied on to establish an earlier filing date (see Section 3.3). Because the publication of a patent indicates some level of ongoing interest by the applicant, the existence of equivalent applications published in several jurisdictions is used to infer the patenting strategy used by the applicant

published application indicates the decision of an applicant to either withdraw their application before it is published, or not to file the application at all with the IPO or the EPO. In either case, these families have no prospect of protection in the UK. Although these occur much less frequently than the other two strategies, they are interesting as they indicate an applicant from the UK who pursues protection for their invention wholly overseas. These are analysed in greater detail in Section 3.6.

There are also some applications that are published both by the IPO and by the EPO (15%, shown as orange and white in Figure 6). These are interesting because there is statutory provision that patents may not be in force in both jurisdictions covering the same invention. The EPO and the IPO represent two distinct routes by which patent protection can be obtained in the UK, and the dichotomy of applications filed under the European Patent Convention and filed directly with the IPO is considered separately in one of the other research papers within the 'building the evidence base on the drivers of IP demand' series.

3.2 The EPO and USPTO often form part of a broader worldwide patenting strategy

Figure 7: The average number of jurisdictions that receive an application published by each combination[13] of the IPO, the EPO and the USPTO, for patents first filed between 2000 and 2017. The grey part of each bar is a baseline that represents how many of these jurisdictions are used by each strategy; the coloured parts therefore indicate the average number of other offices that receive an equivalent application



Source: PATSTAT Global – 2021 Spring Edition

Patent applications that are published by both the EPO and USPTO are, on average, published by a total of over five national or regional offices[14] (Figure 7), which is more than families where the application is published in only one or neither of the EPO and USPTO. This indicates that applications that are pursued in the USA and in Europe (via the EPO) tend also to be pursued elsewhere using a broad strategy aimed at worldwide coverage. A comparison of the white and light blue bars in Figure 7

[13] The categories shown are mutually exclusive. For example, the "UK+US" category represents families that have been published by both the IPO and the USPTO, but not the EPO. The "None" categories represent families that have been published only by Offices other than the IPO, USPTO and EPO

[14] Coverage is calculated by excluding international applications made under the Patent Cooperation Treaty (PCT) from each family, as these provide no information about where patent protection will be sought. Each office is counted once per family to avoid distortions that may be caused by families that have multiple applications filed with the same office (which happens more in some jurisdictions than others)

suggests that the breadth of the strategy used for such applications does not depend on whether or not the IPO is included as part of that strategy.

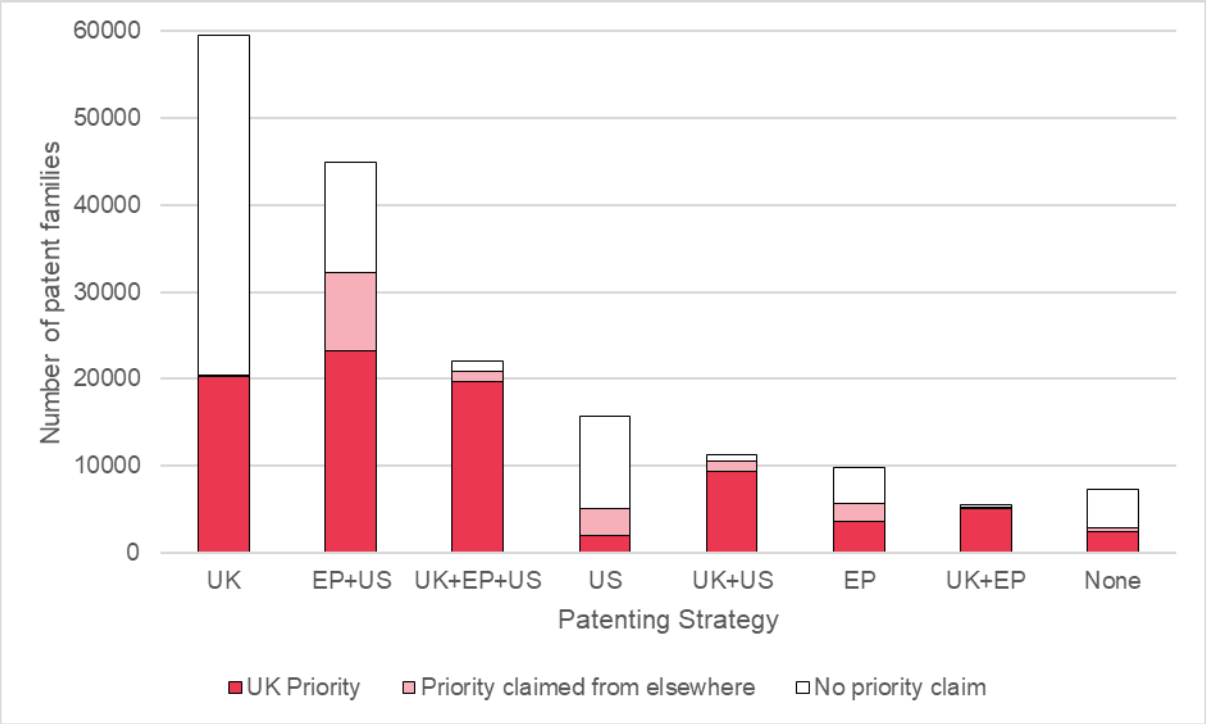
Applications that are published by the IPO but by neither the EPO nor the USPTO tend not to be pursued anywhere else either. The average number of jurisdictions for these applications is 1.06 which is the smallest out of the categories shown in Figure 7. At least 94% of applications[15] published by the IPO but neither the EPO nor the USPTO are therefore pursued only in the UK. To a lesser extent this is also true of applications that have no prospect of protection in the UK (i.e. are not published by either the EPO nor the IPO). Those that are pursued in the USA (shown in blue in Figure 7) are published by 1.45 countries on average, which indicates that over half of these applications are published in one jurisdiction only (i.e. the USA). The majority of those applications that are not published by the USA either (shown in black) are published in 1.23 countries on average, which indicates that the majority of these applications are only pursued in one jurisdiction.

[15] This minimum value is calculated using an assumption that all families are published in at most one jurisdiction other than the UK; the actual value will be larger as some families are published more widely

3.3 Most priority claims are derived from applications made to the IPO

A patent application may claim priority from an earlier application for the same subject matter (Appendix A). Almost all applications are filed either on the priority date (and are either the only application filed, are used to form the basis of a priority claim for later applications), or are filed within the last month of the priority year (Appendix E). This implies that applicants generally make use of the full priority year before committing to a strategy (rather than, for example, filing applications immediately after receiving a favourable search report from the IPO).

Figure 8:The priority claims associated with families published by each combination[16] of the IPO, EPO and USPTO, and with filing dates between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Applications filed with the IPO are often used by UK applicants to form the basis of a priority claim made by subsequent applications. Almost all of the families that claimed priority did so using an application filed with the IPO (Figure 8), with few claiming priority from elsewhere[17]. In almost all cases where an application is published both by the IPO and by either the EPO or the USPTO, priority is claimed using the UK application, which indicates that the IPO was the office of first filing. A frequent patenting strategy shown by Figure 8 is to file an application with the IPO so as to secure a priority date, use that application to claim priority in other jurisdictions, and then withdraw it before it is published by the IPO[18]. Between 2000 and 2017 this

[16] The categories shown are mutually exclusive. For example, the "UK+US" category represents families that have been published by both the IPO and the USPTO, but not the EPO. The "None" categories represent families that have been filed only at offices other than the IPO, USPTO and EPO

[17] The Patents Act 2004, which came into force in 2005, dispensed with the requirement for UK residents to first make an application in the UK before making applications in any other country for the same invention, though this does not appear to have influenced the number of priority claims made using patent applications filed in the UK

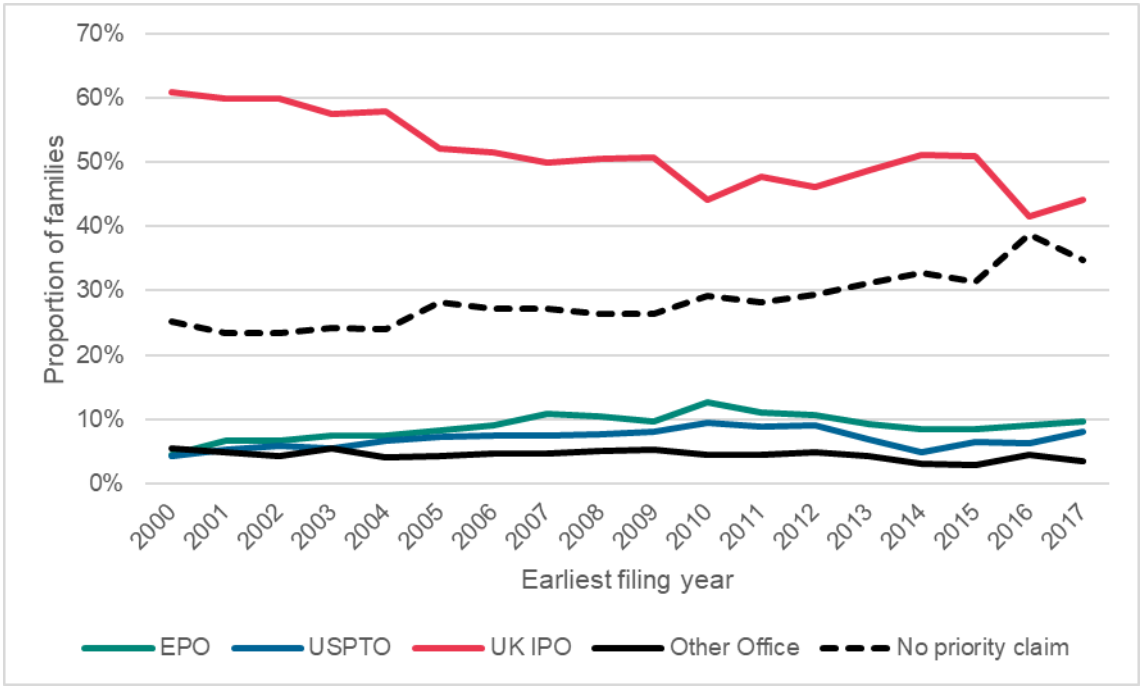
[18] The categories in Figure 8 relate to the jurisdictions in which the application has been published; the presence of UK priority claims in categories that exclude the UK (such as "EP+US") therefore indicate that there is an unpublished application filed with the IPO that has been used to claim priority

strategy was used in 52% of applications published both in the USA and through the EPO, which tend to be published in a broad range of jurisdictions[19].

Conversely, priority claims are less likely to be made when applications are only published in one jurisdiction[20]. Families published only by the USPTO are the least likely to claim priority from an application filed with the IPO, followed by families that are published only by the IPO. For the latter category, the priority claim may arise, for example, when a search report indicates that an invention is not new, and the applicant develops their invention further to distinguish it from the prior art cited in the search report.

Apart from the IPO, UK applicants most frequently file a priority application with the EPO or the USPTO. These account for almost all of the non-UK priority claims shown in Figure 8 for families filed with one of these offices but not the other. For applications that are published by both the EPO and USPTO, the filing of priority applications is more evenly split between the offices.

Figure 9: The extent to which priority is claimed from applications filed with each office, for patent families published by both the EPO and USPTO but not the IPO, between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Figure 9 provides a breakdown of priority claims for patent families pursued both through the EPO and in the USA (but not through the IPO), which show the greatest variety of jurisdictions from which priority is claimed. Across the period shown, there has been a modest increase in priority being claimed from either an EP application or a US application. The largest change instead comes from a drop in usage of the IPO as an office of first filing, from 61% in 2000 to 44% in 2017. This decrease is commensurate with the increase in the proportion of families for which no priority claim is made, which suggests applicants who do not pursue protection through a published IPO application are increasingly likely to file applications directly with the

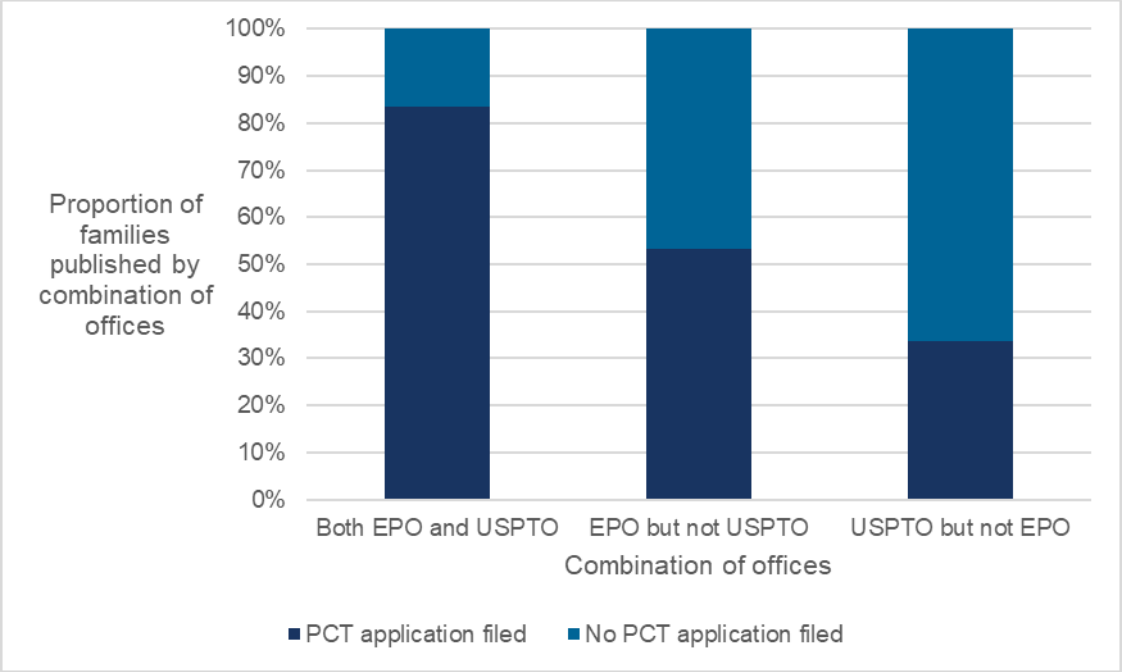
[19] See Section 3.2
[20] An applicant may take advantage of the year-long period and file an application that claims priority from an earlier application filed with the same office

EPO and USPTO, rather than filing a speculative application with the IPO and only later deciding whether pursuit of a patent overseas is worthwhile. An alternative explanation is that before 2005, there was a legal requirement for UK applicants to first file an application via the IPO before applying to other offices for the same invention. The drop in priority claims from the IPO may therefore reflect applicants no longer being obliged to use the IPO as the office of first filing.

3.4 Usage of Patent Cooperation Treaty and the IPO in international filings

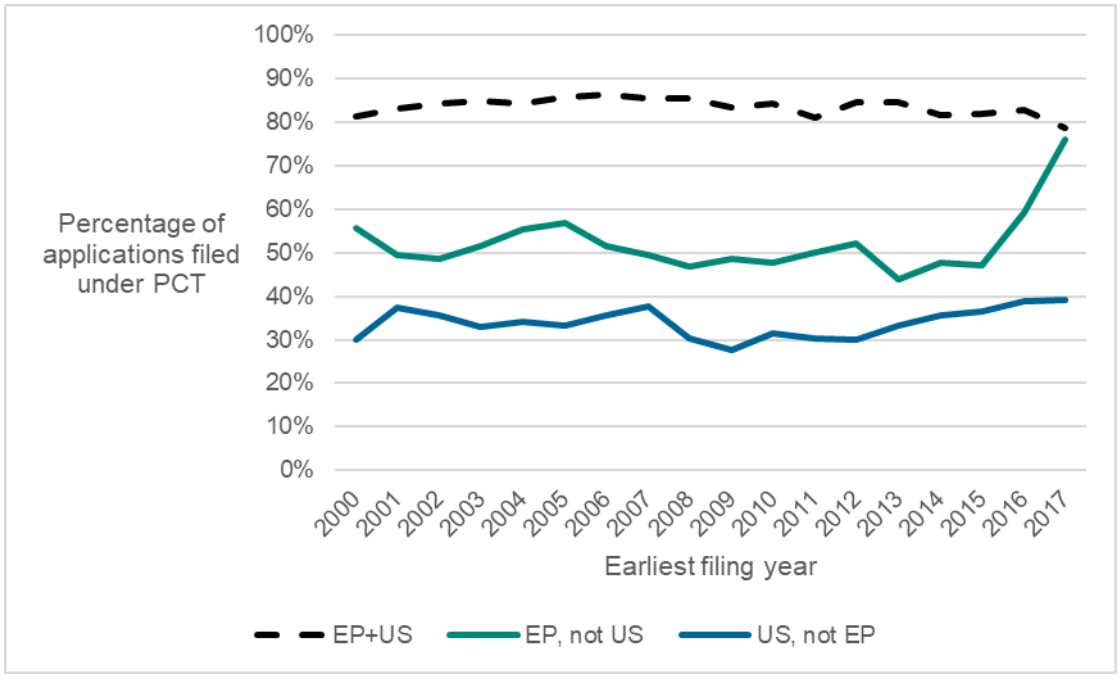
The Patent Cooperation Treaty (PCT) offers applicants an alternative route to obtain patent protection, and enables them to consider a search opinion prepared by an International Search Authority before pursuing applications in specific jurisdictions (Appendix A).

Figure 10: The extent to which the PCT is used in filing strategies that involve some combination of the EPO and USPTO, for applications filed between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Figure 11: Time trends showing the year-on-year variation, between 2000 and 2017, of the usage of international (PCT) applications for patent applications pursued using the strategies shown



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A large majority of patent families filed with both the EPO and USPTO are also filed as international applications under the PCT (Figure 10), and this has remained broadly stable throughout the period shown, reaching a peak of 86% in 2006 and falling gradually thereafter to 82% in 2016, though there has been a recent drop to 79% (Figure 11). There are advantages to filing via this route when protection is sought in multiple jurisdictions; prior to each office receiving the application (upon entry into the regional or national phase), the International Search Authority reports on their opinion on the patentability of the application. The applicant may choose to request an additional preliminary examination of their application, and they may do so after filing amendments. An international application may allow an applicant to reduce the amount of amendment necessary to be done to their applications in each jurisdiction. In addition, an international application provides the applicant with some more time before deciding whether to pursue the application in each jurisdiction. An international application must enter regional or national phase within 30 months after first filing; without an international application an applicant has only 12 months in which they may file applications in other jurisdictions whilst maintaining an earlier filing date by claiming priority.

Conversely, the majority of families filed with the USPTO but not the EPO are not filed under the PCT (Figure 10), though there has been an increasing trend of using the PCT since 2008 (Figure 11). As was shown in Figure 7, most of these applications are filed only with the USPTO, and so the benefits of filing an international application are less likely to be relevant to the applicant.

Applications that are filed at the EPO but with no equivalent filed with the USPTO are often filed with other national or regional offices (Figure 7), which may explain the increased filings under the PCT compared to applications filed with the USPTO but not the EPO. There is a pronounced increase in usage of the PCT for these applications filed in 2016 or later.

Figure 12: The extent to which the IPO features in patenting strategies that involve some combination of the EPO and the USPTO, for applications filed between 2000 and 2017

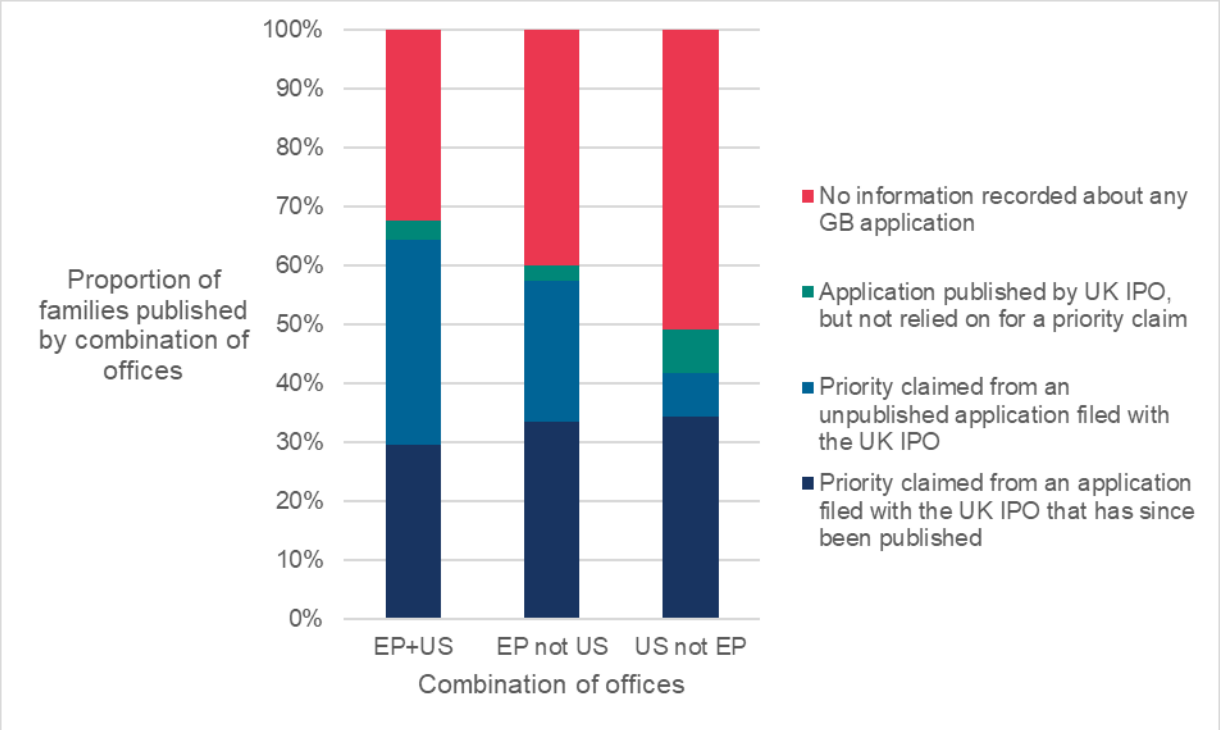

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Figure 8 separates out patent families depending on whether or not they are published in the UK. In Figure 12, these are recombined to focus on how the IPO features in filing strategies that involve one or both of the EPO and USPTO.

The majority of applications pursued through the EPO claim priority from an IPO application (Figure 12). This has been done to an increasing extent throughout the period 2000-2017 (Appendix F), which implies that there is increasing usage of the IPO as an office of first filing to secure a priority date for inventions that are subsequently pursued in other jurisdictions. This may be due to the processing speed by the IPO, as faster processing of the first Office action provides the applicant with more time to consider a search report and decide whether to pursue their application elsewhere.

A significant number of applications filed with the IPO are unpublished but used to support a priority claim elsewhere, which indicates that they were withdrawn by the applicant before publication. This is most noticeable for applications that are published by the EPO. The same invention cannot be protected both through the EPO and the IPO[21], and so an applicant would be incentivised to pursue the broader protection afforded by a granted European patent rather than one enforceable only in the UK.

A far greater proportion of IPO applications are used to claim a priority date for a subsequent US application, provided there is no equivalent application published by the EPO. If there is no pending European patent application, then the only remaining

[21] Section 73(2) of the UK Patents Act provides for revocation of a patent granted by the IPO if there is a granted EP equivalent that protects "the same invention". It is possible to overcome this by distinguishing one invention from the other, for example by narrowing the scope of one of the patents through amendment

route to protection in the UK is through pursuit of an IPO application, and so the applicant is less likely to withdraw their IPO application.

3.5 Does each type of international filing strategy correlate with a technology area, and do any other offices typically form part of that strategy?

A patent application may be pursued through offices other than the IPO, the EPO and the USPTO. Although UK applicants almost always pursue their applications through at least one of these offices, they often pursue protection in other jurisdictions too. The selection of jurisdictions is likely to depend on the market for the technological advance that is protected by the patent, and so this section considers both the technology sector and the jurisdictions for which protection is sought.

Figure 13 - Figure 15 show the offices that most frequently received equivalent applications to those published by some combination of the EPO and the USPTO. Each bar is broken down by the technology sector that each patent application relates to, with the total height therefore representing the total number of applications also received by the respective office. These figures visualise the technological nature of the applications, which differ between those applications filed with the USPTO but not the EPO, and vice versa. They also visualise the relative breadth of filing strategies employed by applicants who pursue applications through the EPO, through the USPTO, or through both.

A large proportion of patent families published by both the EPO and the USPTO relate to the field of chemistry (Figure 13), which implies that much of the UK interest in geographically broad patent protection relates to this field. Conversely, a large proportion of patent families published by the USPTO but not with the EPO relate to electrical engineering (Figure 15). Subject matter that traditionally relates to computer programs falls within this technology field, and the results may be a consequence of the differing legal approaches to the patentability of computer programs in the USA compared to the EPO[22], or may relate to patenting being done by a UK research arm of a multinational company.

Compared to applications that are pursued in the USA, inventions in the field of mechanical engineering account for a higher proportion of applications that are pursued via the EPO but not in the USA (Figure 14), though this is only the case for applications that are pursued only through the EPO and/or the IPO. A comparison of Figure 13 and Figure 14 shows that relatively few patent applications are pursued through the EPO without being pursued also in the USA (see also Figure 6).

China is a frequent co-recipient of applications for which international protection is sought (Figure 13 - Figure 15), and the UK frequently publishes applications that have also been published by one (but not both) of the EPO (Figure 14) and the UPSTO (Figure 15). A relative majority of applications published by one (but not both) of the EPO and the USPTO are not published anywhere else[23]. These offices represent

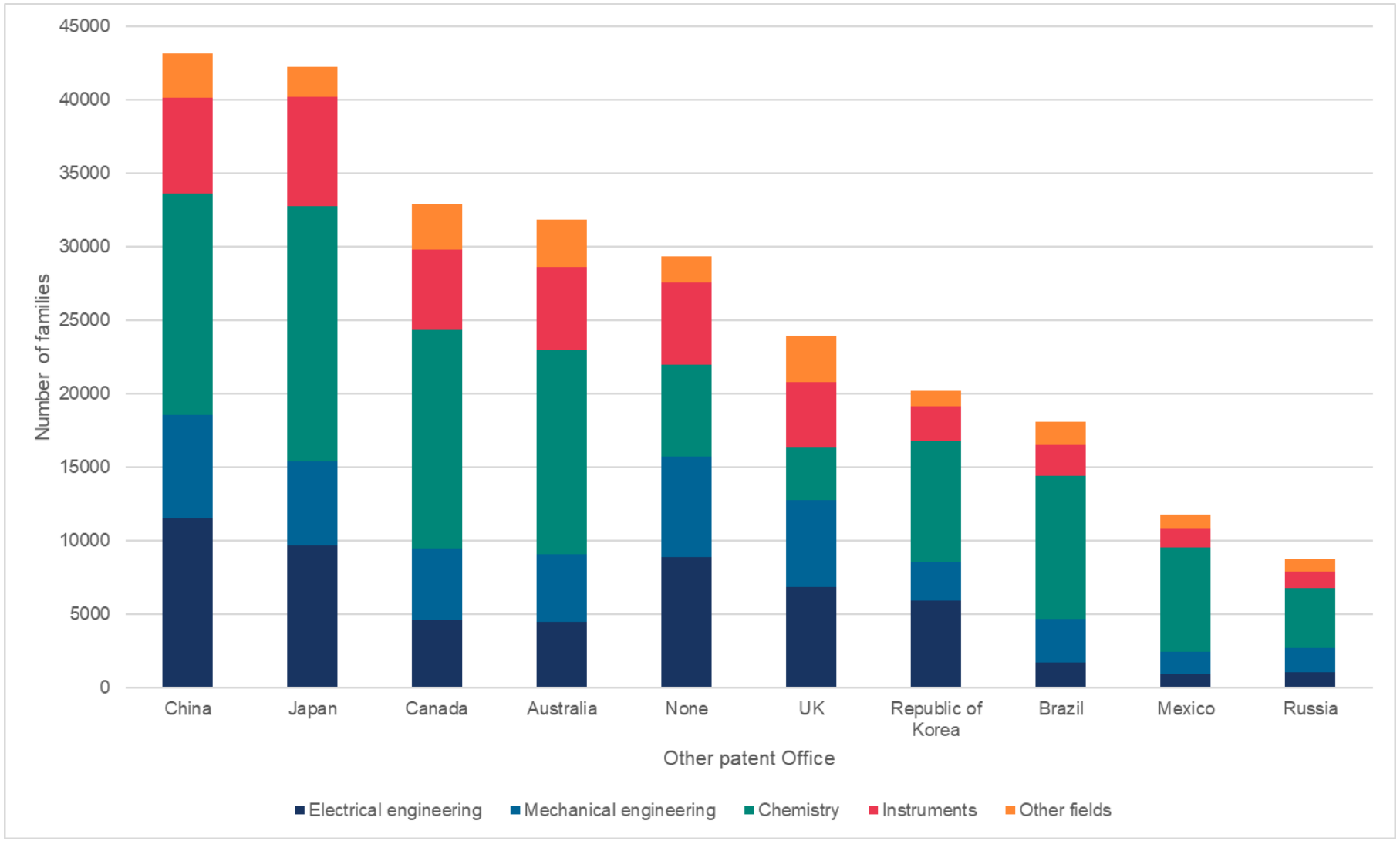
[22] Article 52 of the European Patent Convention provides that computer programs as such are excluded from patentability; there is no explicit statutory exclusion of computer programs in the US and so the extent to which they are patentable has instead been developed through case law

[23] These are represented by the columns entitled “None” in Figure 13 and Figure 14, which relate respectively to families published only by the EPO and the USPTO

large markets, and so there may be less incentive for an applicant to invest effort protecting their invention elsewhere.

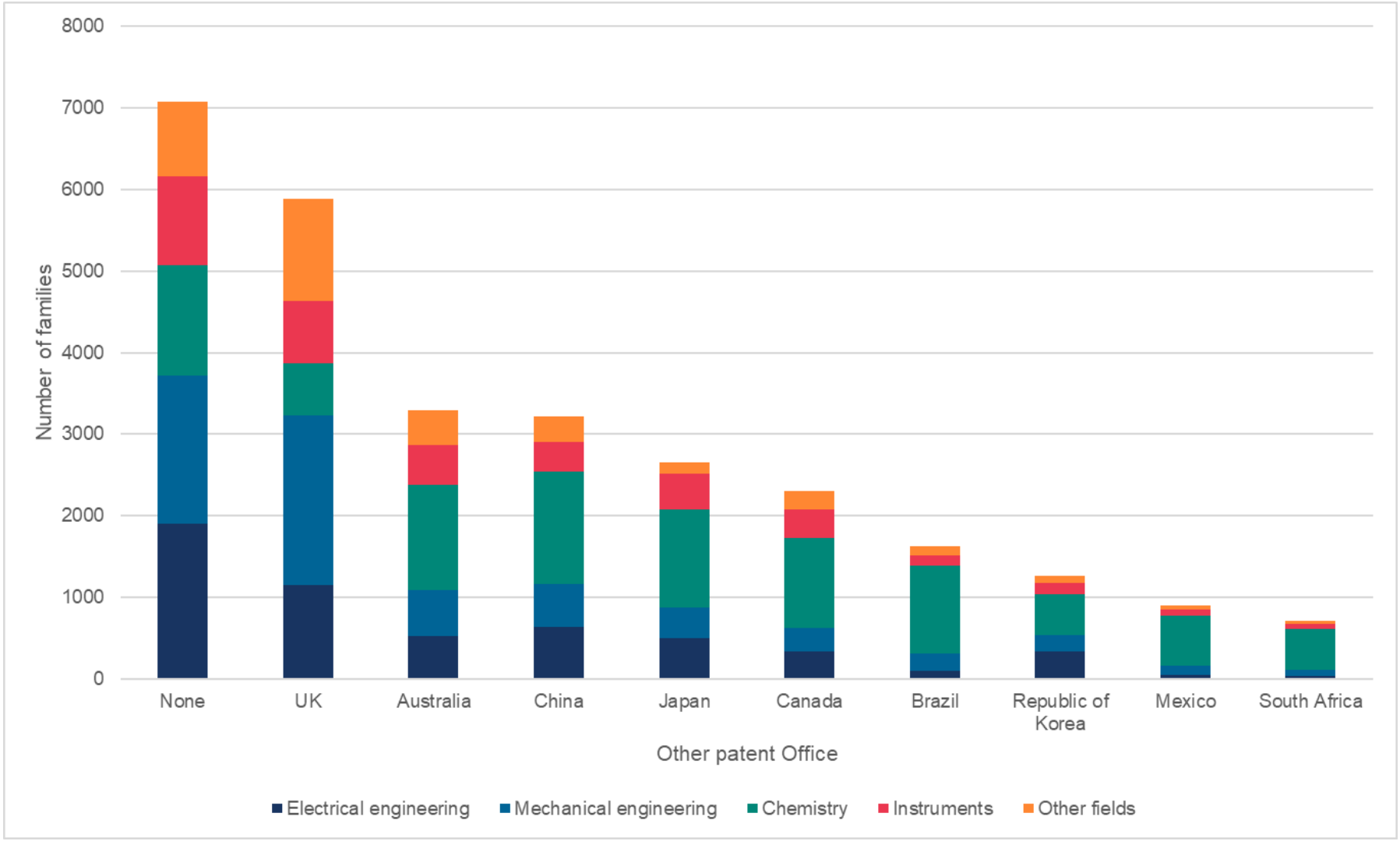
Applications that are pursued both through the EPO and through the USPTO (Figure 13) are also pursued in a greater variety of jurisdictions than applications pursued through only one of those offices, which show less of a tendency to file with Offices other than the IPO (Figure 14 and Figure 15). Applications pursued through both the EPO and through the USPTO show a more even distribution of applications across other Offices and, together with Figure 7, suggests that each application filed with both the EPO and USPTO is likely also to have been filed in several other Offices.

Figure 13: The offices that most frequently published equivalent applications to those that were published by both the EPO and the USPTO between 2000 and 2017



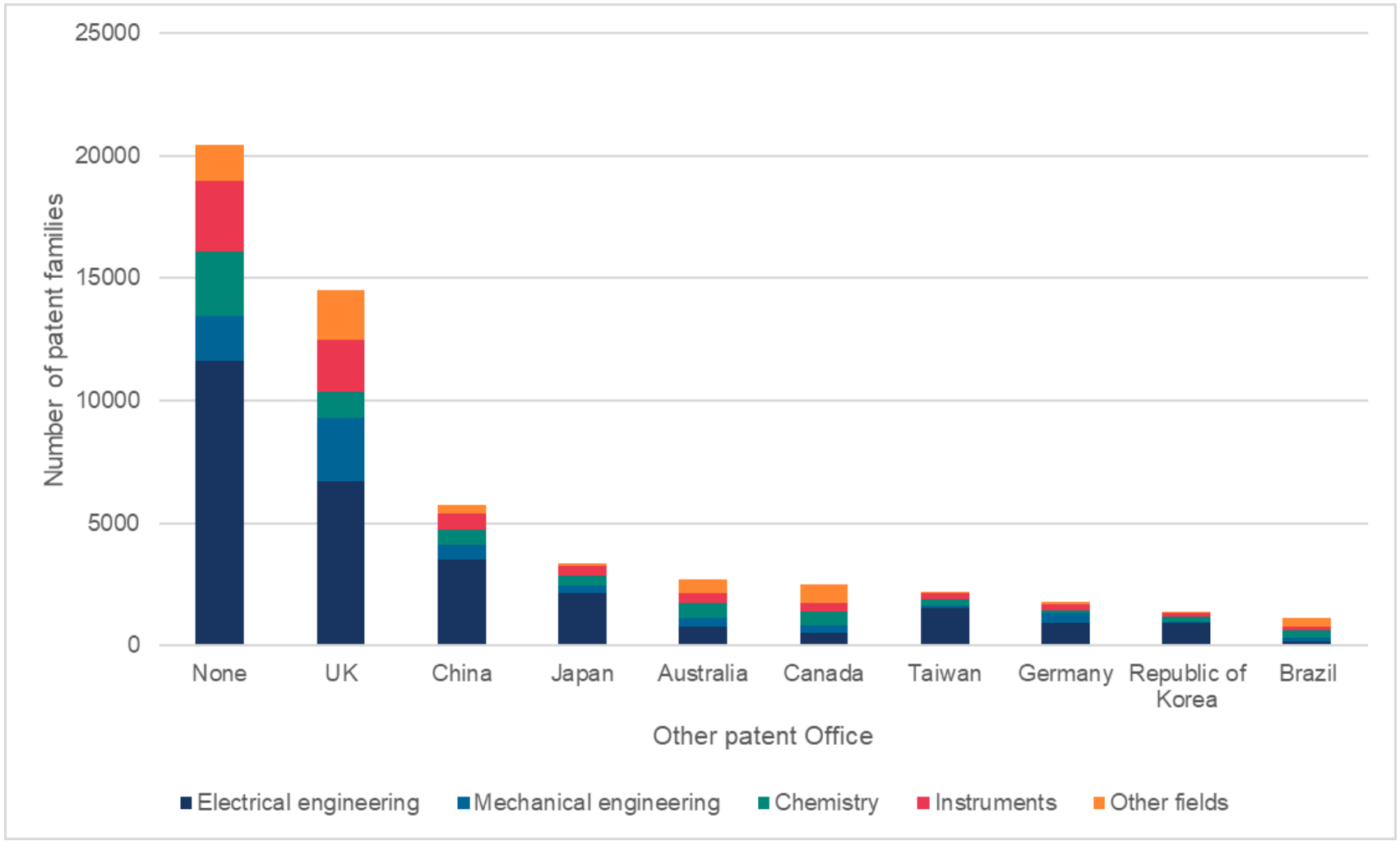
Source: PATSTAT Global – 2021 Spring Edition

Figure 14: The offices that most frequently published equivalent applications to those that were published by the EPO but not the USPTO between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Figure 15: The offices that most frequently published equivalent applications to those that were by the USPTO but not the EPO between 2000 and 2017

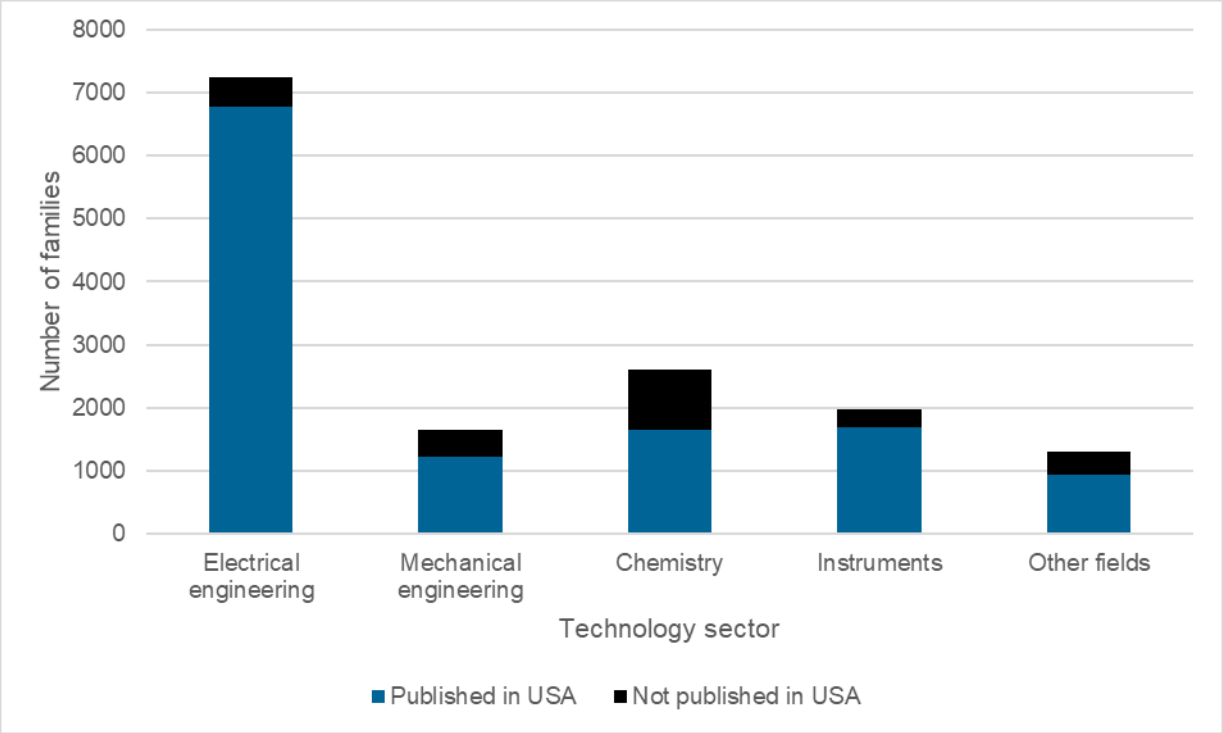


Source: PATSTAT Global – 2021 Spring Edition

3.6 Applications pursued wholly outside the UK

Applications with no applications published by either the EPO or IPO are interesting as they are associated with applicants from the UK who pursue their inventions entirely outside the UK. Over half of these applications are only published in one jurisdiction (Figure 7)[24].

Figure 16: The technology sectors for which UK applicants pursued patent protection wholly outside the UK, with filing dates between 2008-2017



Source: PATSTAT Global – 2021 Autumn Edition

Patent applications pursued wholly outside the UK are likeliest to relate to the field of electrical engineering. Protection for the majority of these applications is sought in the USA, particularly in the field of electrical engineering. The electrical engineering sector covers more fields that are associated with computer programs and business methods. Inventions in these fields may be excluded from patentability, and the boundary for allowability is determined by case law in each jurisdiction. Compared to other jurisdictions, the IPO and the EPO have taken a fairly strict stance towards the allowability of patents in this area, and this may have led to the increased tendency of these patents to be pursued elsewhere.

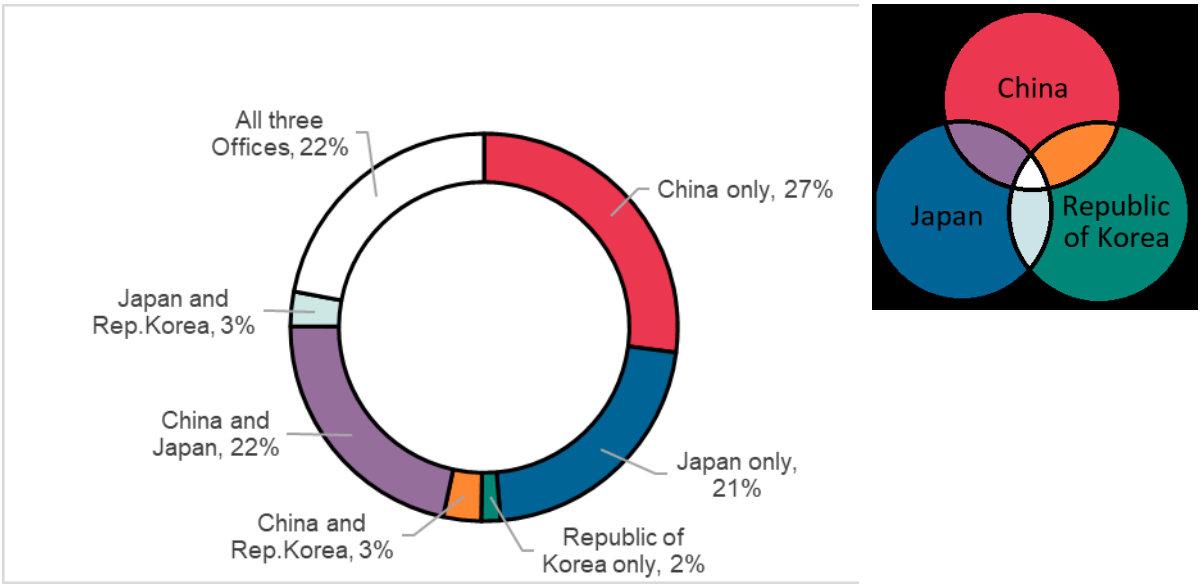
The black portions of the bars in Figure 16 relate to patent families that are not published in the USA, of which there were 2,480 first filed between 2008 and 2017. There are relatively few of these (less than 250 per year when aggregated across all offices), and are unlikely to represent any overall trend in UK applicant behaviour.

[24] The applications with no prospect of protection in the UK relate to the blue and black portions of Figure 7

3.7 Filings with China, Japan and the Republic of Korea

After the IPO, EPO and USPTO, the IP offices most frequently publishing applications by UK applicants are China and Japan (Figure 2), and the Republic of Korea appears 8th. As these three offices are part of the IP5 forum of offices, we analyse the extent to which UK applicants file applications with them. The technological breakdown of patent applications pursued in each country are also similar (Figure 4), which suggests that a common strategy may be to file equivalent applications with several of these offices.

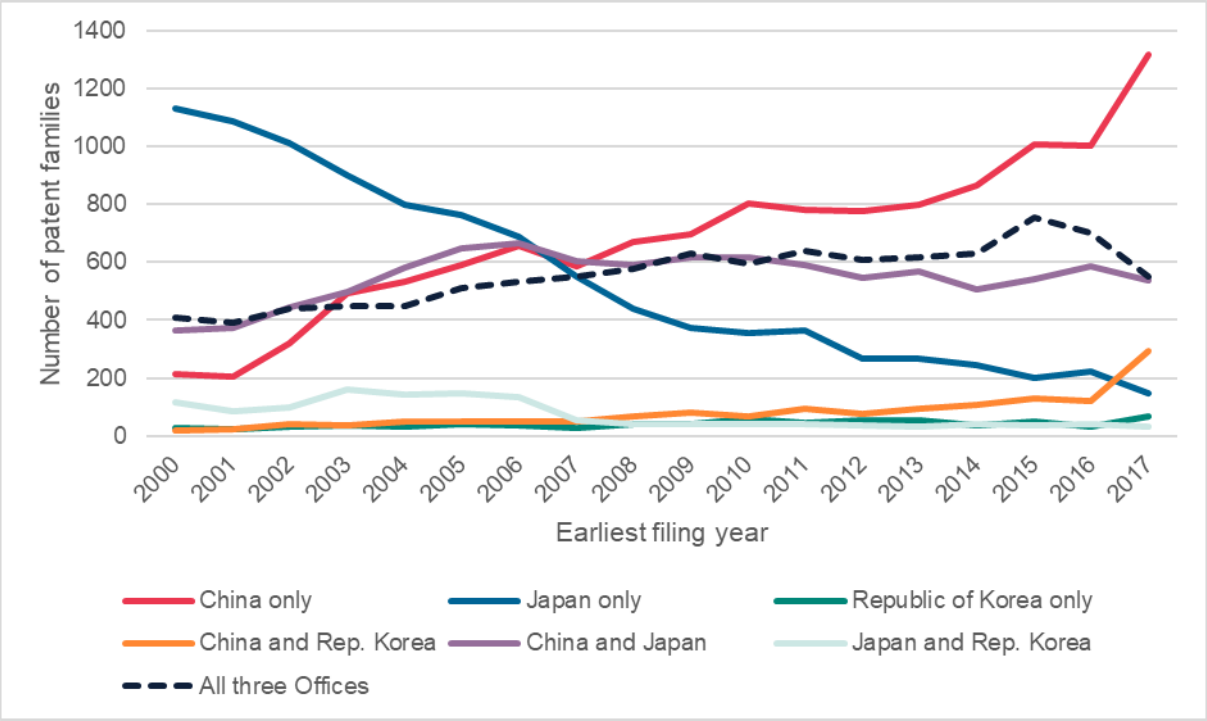
Figure 17: Share of patent families published in either China, Japan, or the Republic of Korea by UK applicants, by combination of Offices publishing each family (patent families first filed between 2000 and 2017)



Source: PATSTAT Global – 2021 Spring Edition

Between 2000 and 2017, UK applicants pursued more applications in China (71%, including applications concurrently filed in Japan and/or the Republic of Korea) than Japan (68%) or the Republic of Korea (30%).

Figure 18: Time trends of patent applications filed by UK applicants and published by China, Japan and the Republic of Korea between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

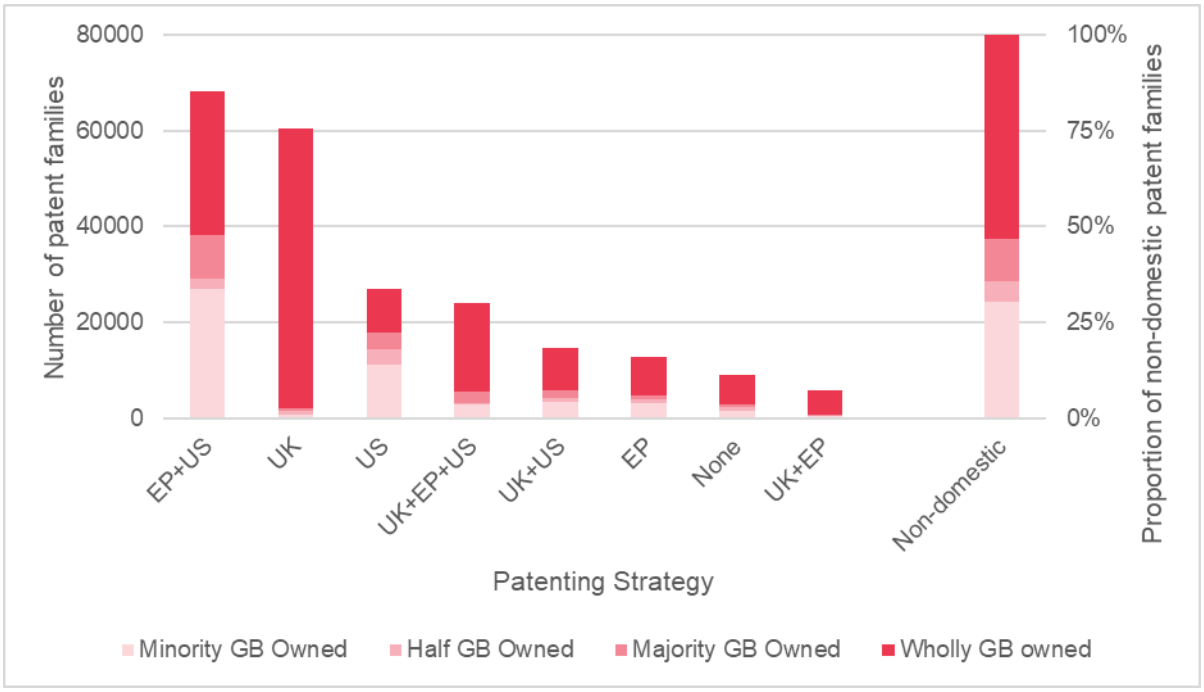
Figure 18 shows how the patenting behaviour of UK applicants have changed between 2000 and 2017. Although published Japanese applications account for a large proportion of the applications shown in Figure 17, filings have been in steady decline throughout that period (Figure 18). Conversely, published Chinese applications have steadily grown throughout the period, which follows the overall trend of increasing patenting activity in China. The number of applications published by both Japan and China has, however, remained broadly stable over the past decade, and there seems to be an increasing tendency to pursue protection also in the Republic of Korea. Almost all applications published by the Republic of Korea are also published by either Japan or China (Figure 18, see dashed, orange and pale green lines) rather than published only by the Republic of Korea (Figure 18, see green line)

4. Co-ownership of patents by applicants from the UK and overseas

4.1 Internationally filed patent families are more likely to have international co-applicants

A patent may have several applicants, and not all of these applicants are necessarily from the same country. The patenting strategy used may depend on the nationality of the applicants. For example, an application with an American co-applicant may be more likely to be pursued in the USA.

Figure 19: The share[25] of UK applicants for patent applications[26] pursued using each using each combination[27] of the IPO, the EPO and the USPTO, for patents first filed between 2000 and 2017. The "non-domestic" column shown to the right is aggregated over all combinations other than "UK"



Source: PATSTAT Global – 2021 Spring Edition

If a UK applicant pursues an application in the UK, but neither in Europe nor the USA, then they almost always do so either alone or solely with UK co-applicants. These applications are almost always pursued solely in the UK (Section 3.2), which suggests that the decision not to pursue patent protection abroad may be driven by a lack of overseas presence (and thus a lack of ability to exploit or enforce their intellectual property rights abroad). Conversely, patent applications that are shared with a non-UK applicant are generally published in either the USA, by the EPO, or both.

[25] Different patent offices supply different levels of applicant information to the EPO for compilation into PATSTAT. The analysis shown here maximises coverage by aggregating the applicants across all family members. Although first applicants may have larger weighting due to some offices not providing information about co-applicants, this effect is assumed to balance out in a way that does not distort the share of patent families owned by applicants from a particular country

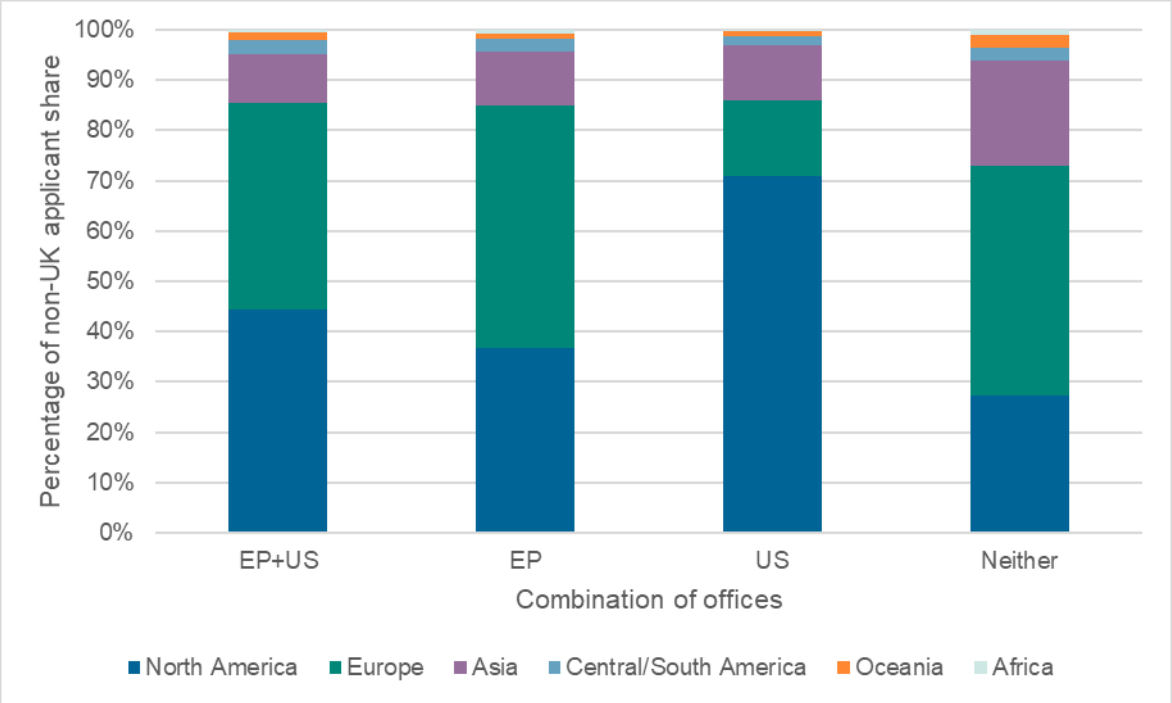
[26] Here, fractional counting is not used as the analysis concerns patent families rather than the behaviour of UK applicants (whose influence on a patenting strategy is assumed to be commensurate with their share in the patent alongside other co-applicants from abroad)

[27] The categories shown to the left are mutually exclusive. For example, the "UK+US" category represents families that have been published by both the IPO and the USPTO, but not the EPO. The "None" categories represent families that have been filed only at Offices other than the IPO, USPTO and EPO. The "Non-domestic" category to the right is an aggregate of all combinations other than "UK", as almost all applications filed with the IPO but neither the USPTO nor the EPO are not published outside the UK

The majority (53%) of non-domestic patent applications made by UK applicants (i.e. which are pursued outside the UK) have no co-applicants recorded as being from outside the UK (Figure 19), and indicates that many UK-based applicants are able to exploit their inventions globally. This may be related to the size of the company, which is analysed in Section 5.

4.2 Most non-UK co-applicants are from the USA

Figure 20: The breakdown of non-UK applicant share for published applications that have both UK and non-UK applicants and with filing dates between 2000 and 2017. Each column represents a different patenting strategy involving some combination of the EPO and USPTO, and each column is broken down by the continent of the non-UK applicant



Source: PATSTAT Global – 2021 Spring Edition

The majority of applications with UK applicants have no co-applicants from overseas (Figure 19). However, the majority of applications that are shared with overseas applicants have applicants from North America[28], followed by the rest of Europe (Figure 20). Almost all of the co-applicants from North America are from the USA rather than Canada, and American co-applicants are most frequent non-UK applicant associated with a patenting strategy that involves the USA but not the EPO.

There is some variation in the applicant continent depending on the patenting strategy that is used. American applicants have the largest (non-UK) share of applications that are filed in the USA but not with the EPO, whereas European applicants have the largest (non-UK) share of applications filed with the EPO but not in the USA. This suggests that presence plays a factor in the patenting strategy, whether for convenience of patent prosecution, or for the ability to enforce the rights associated with a granted patent.

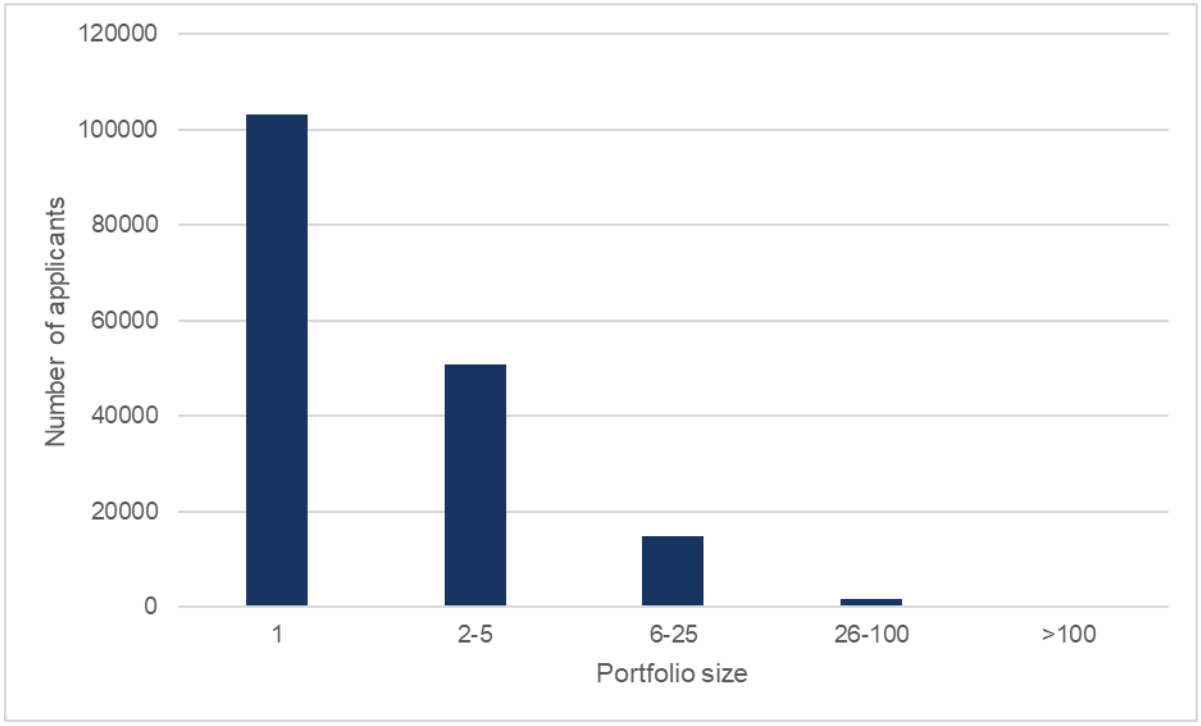
[28] There are a higher proportion of European applicants associated with applications published by the EPO but not the USPTO (and with neither office), but the number of these applications is much smaller than those published by USPTO (Figure 18)

5. Analysis of applicants according to size

PATSTAT can be used to associate applicants with their applications, and thereby to analyse their historical patenting activity. Applicant behaviour may be analysed according to their historical patenting activity, so as to assess differences between the behaviour of applicants who are prolific filers of patent applications, and applicants who only ever pursue protection for a single invention. For UK companies that are registered with Companies House, it is also possible to use self-declared information, collated by Bureau van Dijk (Appendix B) to assess the size of the company.

5.1 Filings have reduced from applicants with small portfolios

Figure 21: The breakdown of applicants active between 2000 and 2017 according to their historical patenting activity

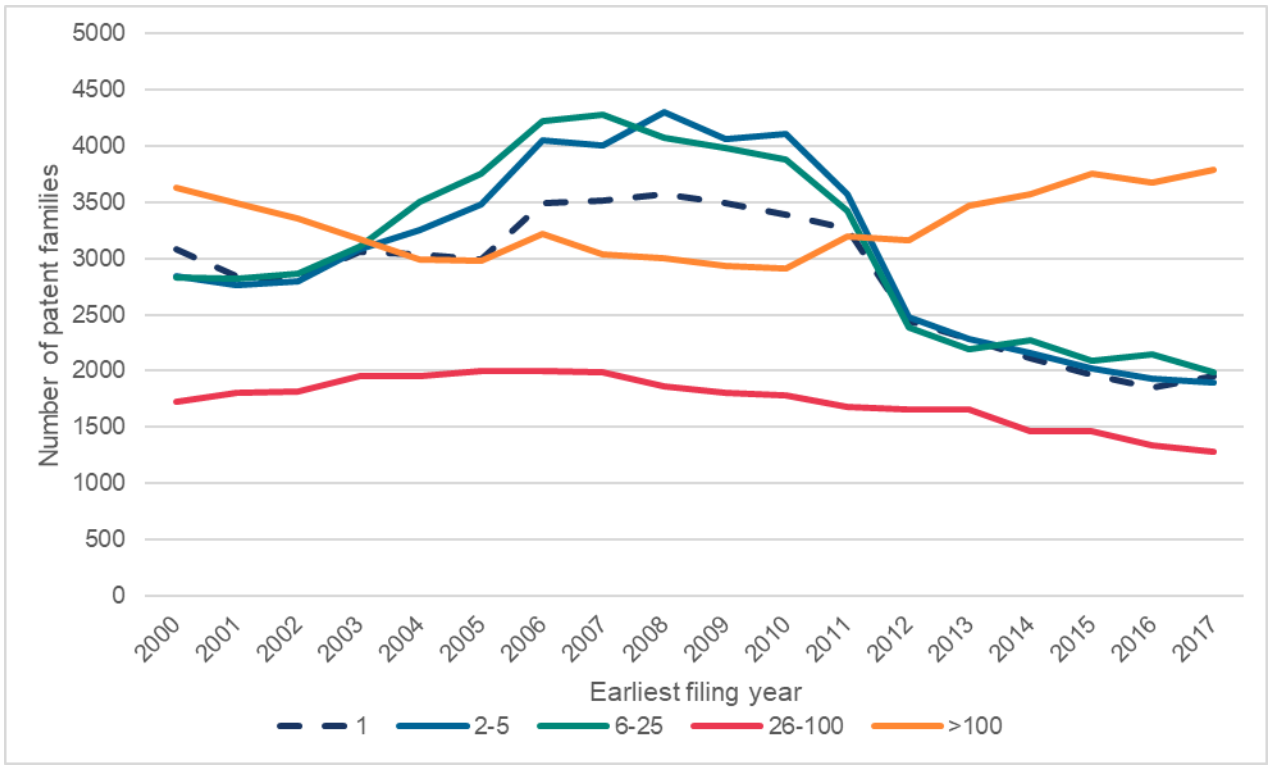


Source: PATSTAT Global – 2021 Spring Edition

The historical patenting activity of an applicant may be used to classify different types of applicant[29]. The majority of applicants are only ever associated with a single patent family (Figure 21). There are twice as many (over 100,000) applicants associated with a single patent family than are associated with between 2-5 (approximately 50,000), and the number of applicants decreases quickly with portfolio size. This means that a significant amount of UK patenting activity is due to infrequent users of the patent system rather than applicants that are frequent filers.

[29] Because historical patenting activity may be measured entirely using patent data (rather than matching to external data sources such as Orbis), coverage is more consistent. However, different patent offices provide different levels of applicant information to PATSTAT, and this can vary in time. We therefore consider only the first applicant listed against each patent family (rather than all applicants), for which coverage is broadly complete

Figure 22: Patenting activity of UK applicants between 2000 and 2017, broken down by the applicant's historical patenting activity

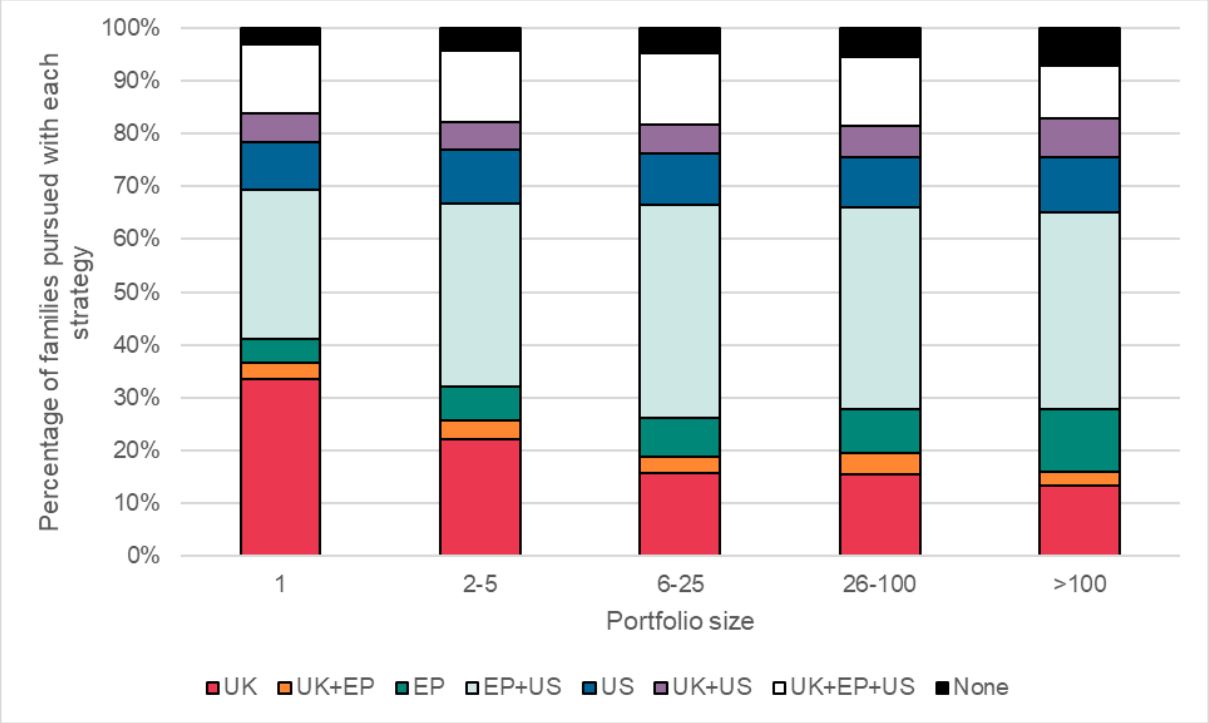


Source: PATSTAT Global – 2021 Spring Edition

The change in time of patenting activity varies according to the applicant's historical activity (Figure 22). Highly-active applicants show a much more stable level of activity over the period shown than other applicants and, for the largest UK applicants (portfolio size >100), their activity has steadily risen since 2009. This trend is reversed for applicants with smaller portfolios, with a sharp drop occurring between 2011 and 2012 for applicants with a portfolio size of 25 or fewer, and a broadly downward trend since.

The dashed line in Figure 22 relates to applicants associated with a single family of patent applications. It follows that this line relates to a different set of applicants from one year to the next, and therefore indicates a large turnover of applicants each year. This line represents a significant number of patent families, and so, like Figure 21, indicates that a significant proportion of UK patenting activity is due to applicants who only ever seek protection for a single invention.

Figure 23: The filing strategies used by UK applicants between 2000 and 2017, broken down by the applicant's historical patenting activity and by the combination[30] of the IPO, the EPO and the USPTO that publish the applications

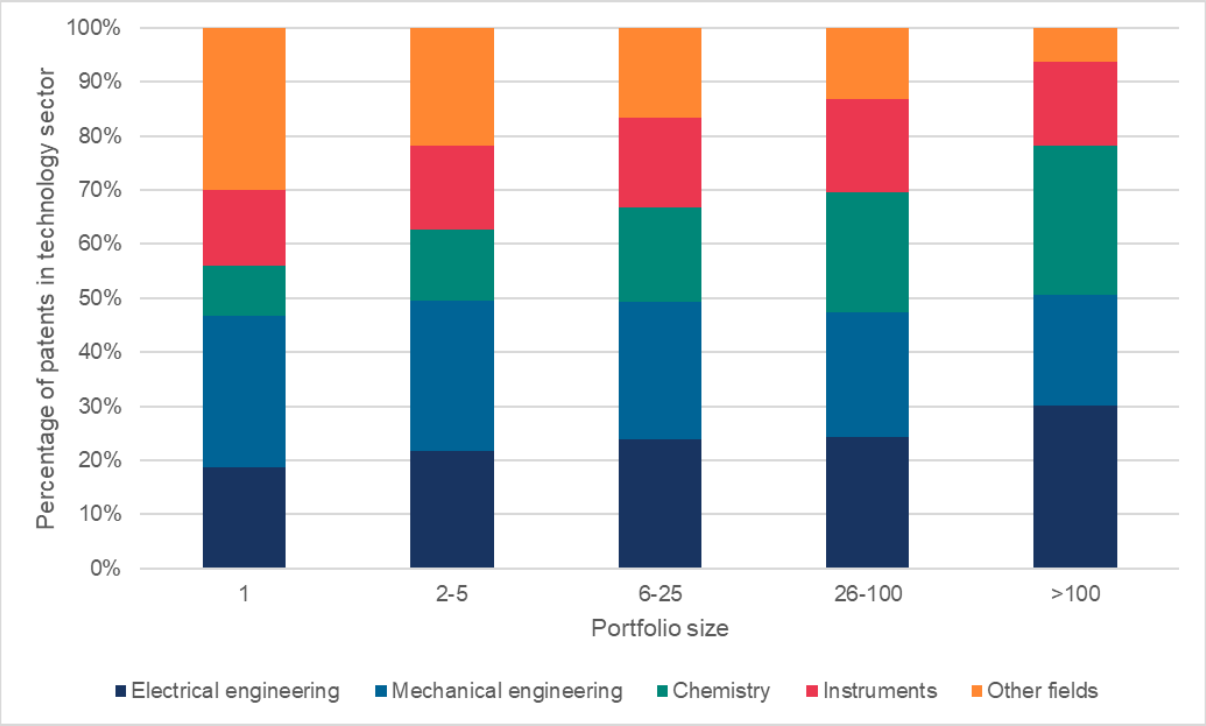


Source: PATSTAT Global – 2021 Spring Edition

UK applicants who have a portfolio size of 1 are more likely only to pursue domestic protection (Figure 23), and applicants become likelier to seek protection in other jurisdictions as their patent portfolio increases. This can be seen by the shift between the strategies relating to the UK only, and to the combination of the EPO and USPTO, which is the main difference across the categories shown. Other differences are that applicants with larger portfolios are slightly likelier to pursue protection in Europe (and not the USA or the UK), and to pursue protection wholly outside the UK.

[30] The categories shown are mutually exclusive. For example, the "UK+US" category represents families that have been published by both the IPO and the USPTO, but not the EPO. The "None" categories represent families that have been filed only at Offices other than the IPO, USPTO and EPO

Figure 24: The subject matter of patents pursued by applicants between 2000 and 2017, broken down by those applicants' portfolio size



Source: PATSTAT Global – 2021 Spring Edition

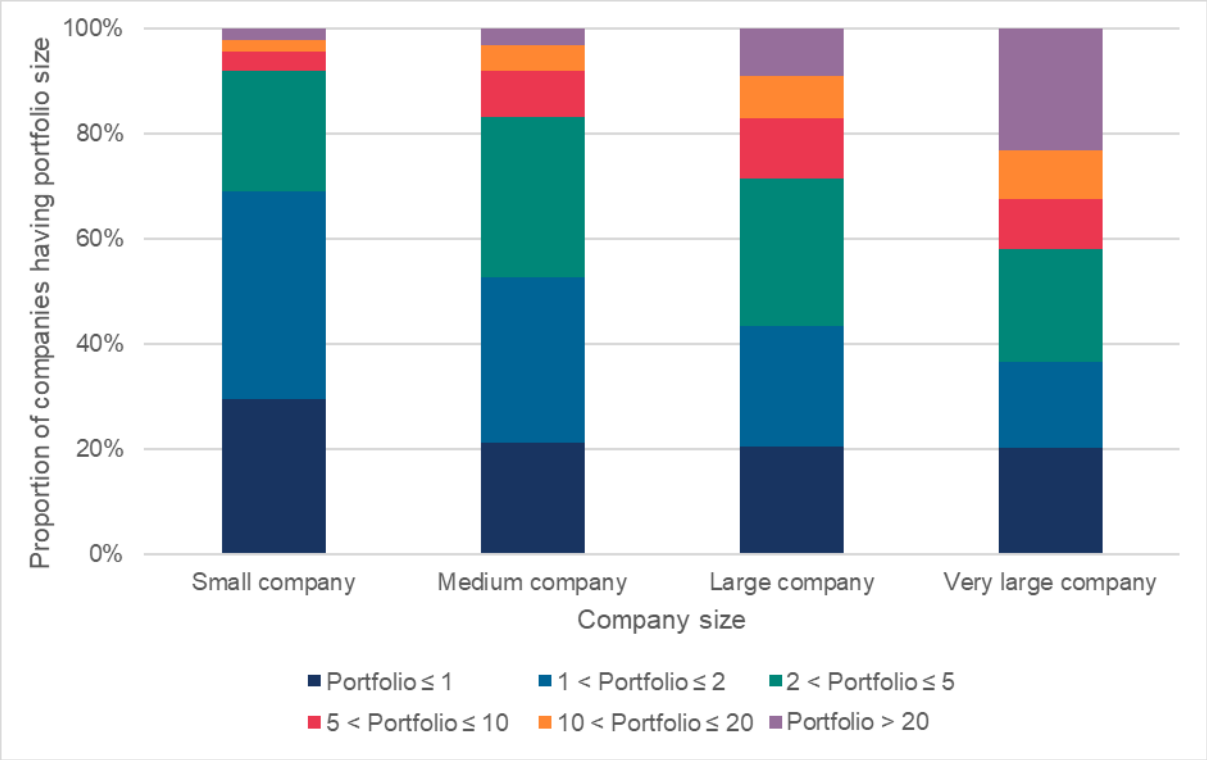
UK Applicants with larger patent portfolios are much more likely to pursue patents in the sector of Chemistry (Figure 24). Conversely, “other fields” (which includes civil engineering, furniture/games and other consumer goods such as kitchen utensils) are much likelier to be pursued by applicants with small patent portfolios. The fall in UK patenting activity in these “other fields” (Figure 5) may therefore be attributed to a fall in the number of applicants with smaller portfolios. The fall in filings from applicants with a single family of patent applications to their name would be caused either by there being less innovative activity being done by new inventors, by fewer new inventors choosing to pursue patent protection, or by an inventor or prospective applicant being acquired (with the effect that their inventions may subsequently be filed in the name of the acquiring body).

5.2 Patenting activity of UK companies

5.2.1 Portfolio size correlates with company size, particularly at the extremes

The remainder of this section analyses how a company's patenting behaviour may be influenced by its size. First, the relative portfolio sizes held by companies in each category is analysed, before considering the patenting strategy used and technology fields in which protection is sought.

Figure 25: The distribution of portfolio sizes for each company size, based on patents filed between 2000 and 2017



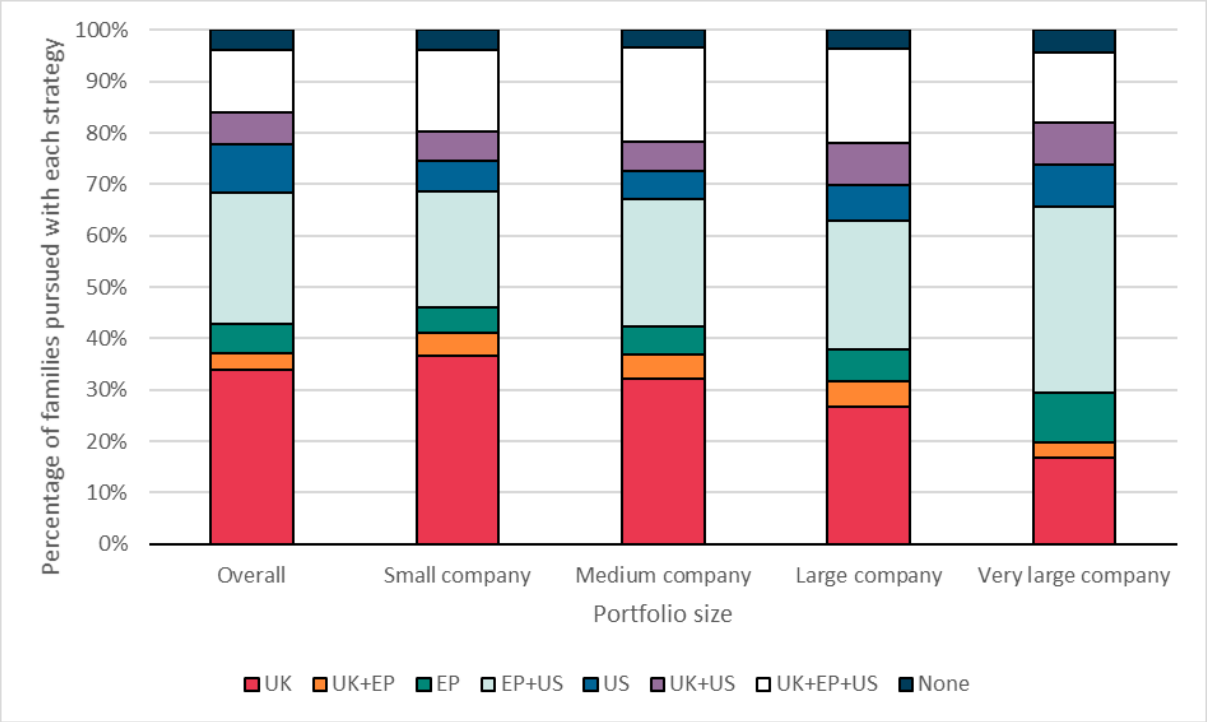
Source: Orbis/PATSTAT Global – 2021 Spring Edition

The greatest contrast between companies of differing sizes arises for the proportion holding either very large or very small portfolios. 68% of small companies detected by our analysis have a portfolio size of 2 or fewer[31], whereas the proportion is much lower for medium (52%), large (44%) and very large companies (38%). Conversely, a much larger proportion (23%) of very large companies have portfolios of over 20 patent families, whereas the proportion is much smaller for large (9%), medium (5%) and small (2%) companies. Between these extremes, the distribution of portfolio sizes is broadly similar for medium, large and very large companies, though almost all (91%) small companies have a portfolio size of 5 or fewer.

[31] Due to the fractional counting used, this would happen if, for example, an applicant has a single patent application in their name that is shared with other co-applicants

5.2.2 Filing strategies taken by companies

Figure 26: The filing strategies taken by companies, between 2000 and 2017, depending on their relative size, and broken down by the combination[32] of the UK IPO, the EPO and the USPTO that publish the applications



Source: Orbis/PATSTAT Global – 2021 Spring Edition

Smaller companies are likelier to pursue protection only via the IPO, and hence not to pursue protection internationally (Figure 26). Conversely, larger companies are more likely to pursue protection in both the USA and via the EPO. Despite there not being a very strong correlation between company size and portfolio size (see

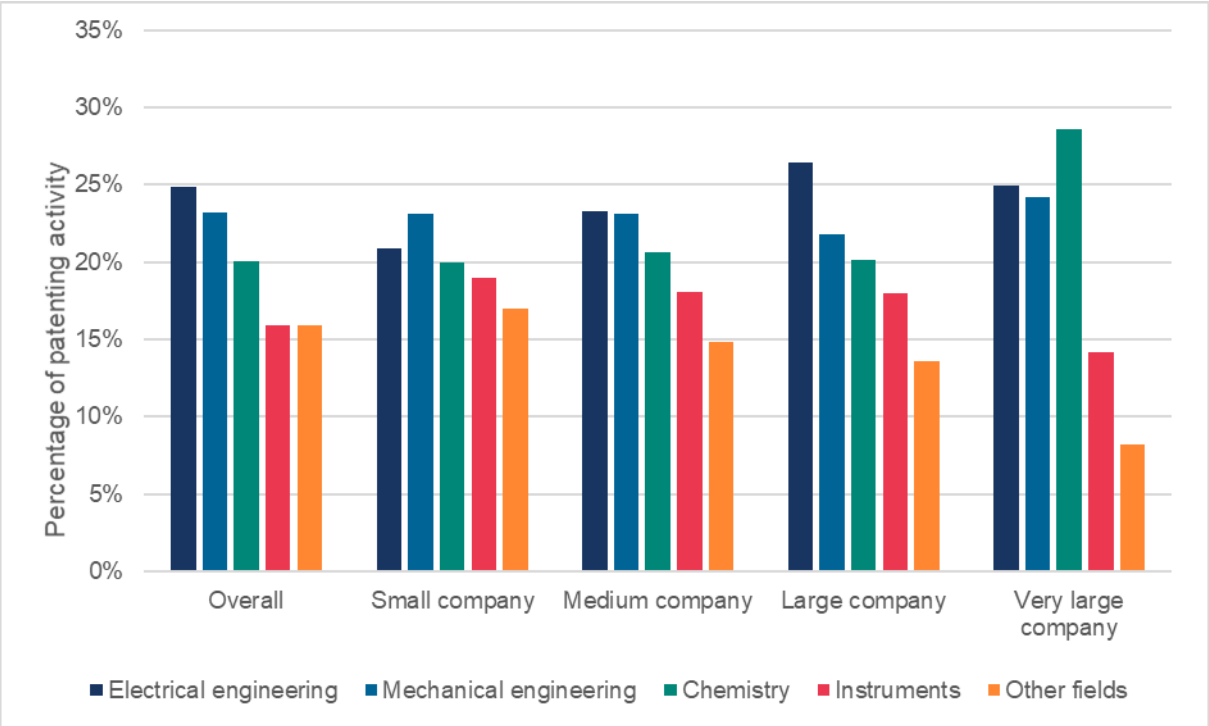
Figure 25), there is nonetheless a similarity with Figure 26 in that larger companies are likelier to pursue broad protection for their inventions.

[32] The categories shown are mutually exclusive. For example, the "UK+US" category represents families that have been published by both the IPO and the USPTO, but not the EPO. The "None" categories represent families that have been filed only at Offices other than the IPO, USPTO and EPO

5.2.3 Patenting activity of UK companies within technology sectors

The five technology sectors shown below can be further broken down into 35 technology fields; a breakdown of each sector into its constituent fields is given in Appendix G.

Figure 27: The tendency of companies to pursue patent protection in each technological sector, between 2000 and 2017. For comparison, the overall patenting activity of all applicants (including individuals and unmatched companies) is shown to the left



Source: Orbis/PATSTAT Global – 2021 Spring Edition

The patenting activity of small and medium companies is closest to the overall trend shown by all applicants (including individuals), which is generally the case within each technology sector other than Chemistry. Within the Chemistry sector, pharmaceuticals and biotechnology are fields of high activity regardless of company size. Conversely, some fields seem to be favoured more by larger companies, such as organic fine chemistry and basic materials chemistry (which includes fertilizers, dyes/paints, and fossil fuels), which accounts for the higher activity of very large companies in the Chemistry sector shown in Figure 27. The high proportion of very large companies active in the Chemistry sector is consistent with the conclusions drawn in Section 5.2.2. Patents in this sector are typically published by both the EPO and the USPTO, indicating that broad worldwide coverage is sought, and a very large company is likelier to have an international presence. Conversely, very large companies are less likely to be active in the sector entitled “Other fields” (which includes civil engineering, furniture, games and consumer goods).

6. Conclusions

When deciding to protect their inventions through applying for a patent, UK applicants can pursue different strategies. For example, they are free to select the jurisdictions in which to pursue protection, whether to file an international application under the PCT, or whether to first file an application with the IPO before deciding whether to pursue protection elsewhere.

The majority of applications with a UK applicant are pursued using one of two strategies; either an application is filed only directly with the IPO, thereby having the prospect of only protecting their invention in the UK, or an application is pursued internationally, with broad protection sought by filing with both the EPO and the USPTO amongst other offices (including the IPO), and usually by filing an international application using the PCT system.

Domestic patent applications filed directly with the IPO have lower grant rates than those filed overseas and are more likely to have been filed by smaller companies, or by new applicants with small portfolios. The lower grant rate may therefore be due to the applicants being less familiar with the patent system or may also indicate a filing strategy where speculative patents are first filed, before subsequently deciding whether to pursue protection elsewhere. The latter conclusion is supported by the observation that almost all applications filed with both the IPO and the EPO claim priority from the IPO application. An application with the IPO is redundant if an equivalent application is granted by the EPO, because patents cannot be in force in both jurisdictions for the same subject matter. However, there is no harm to the applicant in having the same subject matter published in both jurisdictions, and so the IPO application used to claim priority may be published so as to form the basis of a “fall-back” application if the equivalent application is not granted by the EPO.

Although not as prevalent as filings with the USPTO and EPO, a significant proportion of applications from UK applicants are filed with China, Japan and the Republic of Korea. Filings to Japan have generally decreased over the past decade, though there has been a large increase in Chemistry patents filed in all three of China, Japan and the Republic of Korea. There has also been a large increase in the number of applications filed in China, most notably in the field of electrical engineering.

Most patents by UK applicants have no international collaboration, and the applicants that do collaborate do so by filing patents with an American co-applicant using a strategy that includes the USA.

An applicant’s portfolio size is broadly independent of their size in terms of typical metrics such as employee count or annual turnover. The exceptions to this are that small companies are more likely to have a single patent (or to be a co-applicant on a single patent), and very large companies are more likely to have extremely large portfolios. This suggests that it would be difficult to estimate the innovative activity of a company based on their size alone. Although there may be a correlation between the R&D spend of larger companies and the size of their patent portfolio, this has not been analysed in this study because a patent is notoriously difficult to assign a value to[33].

[33] See https://www.gov.uk/government/publications/the-patent-guide for further details

The vast majority of UK applicants have a handful of patent applications, and most of these applicants only ever apply for a single patent. Although a significant proportion of UK patenting activity has been due to these applicants, their activity has declined sharply over the past decade and there are fewer and fewer new applicants each year. In addition, the patenting activity of existing applicants with small portfolios has also declined over the past decade whereas patenting activity of applicants with larger portfolios has steadily grown over the same period.

Appendices

Appendix A: Routes by which patent protection may be obtained

A patent is an intellectual property (IP) right that grants the owner a monopoly over the exploitation of their invention. A patent is obtained by filing an application with national IP offices, or regional offices such as the European Patent Office (EPO). Each IP office has a different jurisdiction, and so an applicant seeking broad geographic protection for their patent may choose to file equivalent applications at multiple offices. These applications are referred to as a "family" of patent applications.

Before a patent may be granted, a search must be carried out to identify prior art that may demonstrate that the invention is not new and inventive, thereby preventing a patent from being granted. A search report is issued to the applicant, who has the opportunity to withdraw their application (for example, if the report is unfavourable) or to pursue protection in other jurisdictions (claiming priority from the first application as described above). If the application is not withdrawn by the applicant then it is published. Substantive examination then takes place, and the applicant amends the application (or files observations) either until the application is in order for grant or until the application is terminated.

Each of the above stages of the patent application process take time; for example, the IPO currently aims to issue a search report within 6 months of the search request and to publish an application 18 months after it was first filed. For international applications made under the PCT, it can take up to 31 months after filing until an application is processed by a national office or a regional office (such as the EPO).

In order for a patent to be granted, the invention it protects must have been novel and inventive compared to the prior art assessed at the date the application was filed. Patent law provides for a mechanism by which equivalent applications may be subsequently filed in other jurisdictions, whilst retaining the filing date of the earlier application for the purposes of assessing novelty and inventiveness. This is known as "claiming priority". This must generally be done within a year of filing the earliest application, which gives the applicant the opportunity to consider the contents of a search report[34] before deciding whether to pursue protection in other jurisdictions.

Equivalent applications may also be pursued in several jurisdictions through filing an international application under the Patent Cooperation Treaty (PCT), which is searched[35] on behalf of the World Intellectual Property Organisation. The applicant can, up to 30 months after the application was first filed, subsequently choose the jurisdictions that they seek protection for their invention. If the applicant anticipates seeking broad worldwide protection, then filing under the PCT can be a more efficient route as the applicant obtains a single search report from an International Search Authority, rather than separate search reports prepared by examiners in each jurisdiction. If broad worldwide protection is sought, then filing under the PCT can also

[34] A patent application is first searched (to give a preliminary indication of whether it is new and inventive at the priority date), after which the applicant has an opportunity to withdraw their application before it is published, or to file applications in other jurisdictions whilst claiming priority from the searched application to secure the date from which the novelty and inventiveness of the invention is assessed

[35] An International Searching Authority identifies prior art that relates to the application, and provides an opinion on the patentability of the invention. The applicant has the option to request an International Preliminary Examination, though this is not binding on any of the national or regional offices

reduce the time spent on the administrative aspects of filing separately with each office.

Appendix B: Data sources and limitations

This paper analyses the behaviour of applicants based in the UK using PATSTAT, which is a database containing patent bibliographic data compiled by the EPO. This data relates to published patent applications and includes information that identifies the applicant, their (self-declared[36]) country of residence, the filing and publication dates of the application, the technology area the invention relates to, and the existence of equivalent applications that were processed concurrently at other offices.

The PATSTAT database is updated twice a year, and the version used in this paper relates to a snapshot taken in Spring 2021[37], which includes all patents published up to early 2021. Due to the time taken between filing an application and it being published, applications that have been filed recently will not yet have been included in PATSTAT, as they were not published in time. Although internal IPO data could in principle be included, this only relates to applications filed with the IPO and therefore provide very little information about unpublished applications that are no longer pursued in other jurisdictions. For consistency, only published applications are considered in this paper.

This paper is concerned with applicant behaviour, and reporting is done using the date an application was first filed. This date is both under the direct control of the applicant (as opposed to the date an application was published, or granted), and represents the best available estimate for the time the innovative activity took place. Due to the time taken for an application to be published after filing, patent data is only likely to be substantially complete for applications with first-filing dates in 2017 or earlier (almost all of which would have been published by mid 2020), which is the date range used in this paper. Although the transitional period following Brexit has only just ended, it is too early to draw any conclusions about what effect, if any[38], Brexit has had on applicants' filing strategies as almost all affected applications will not yet have been published.

Each patent family is attributed to UK applicants according to the proportion of associated applicants that are recorded as from the UK rather than other countries. Patent offices provide a varying level of applicant information for inclusion in the PATSTAT database, and so information is aggregated over all applications in the patent family. Where there are multiple applicants, it is assumed that each applicant has an equal influence on the patenting strategy used, and fractional counting is used (Appendix C). Although there are situations where this might not be the case (for example, an application may list both a multinational company and an employee inventor as co-applicants), it is impossible to determine the relative influence of each applicant with any certainty and so we must assume that they have equal control of the patent application.

[36] Applicants must provide an address as part of their application, and throughout this paper we define "UK applicant" to mean any applicant whose address is in the United Kingdom. Multinational companies may, in principle, provide the address for any of their headquarters and, in these cases, we assume that the declared address corresponds to the country in which the invention was primarily conceived

[37] PATSTAT Global – 2021 Spring Edition

[38] The European Patent Office is not an EU institution and so the status of the UK as an EPO contracting state has not been affected

Some patent families include only a single PCT application, which indicates that the applicant has not yet[39] pursued their application in any jurisdiction. These families therefore provide no information about where an applicant seeks protection and are therefore excluded from the analysis in this paper unless stated otherwise.

In Section 5, the behaviour of companies that are listed as patent applicants is broken down according to their size. The size information is sourced from Orbis, a database provided by Bureau van Dijk and compiled using information available from Companies House (and similar bodies in other countries worldwide). This information is reconciled against patent data by matching between the company name recorded in Orbis against the applicant name recorded in PATSTAT. To avoid spurious matches with patent data, we use exact name matching, and therefore assume that an applicant provides exactly the same name (including the format of abbreviations such as “Ltd.”) to Companies House and to the IP offices with which they file applications. This might not always be the case and so the results should be treated as representative rather than exhaustive. Results in Section 5 are therefore expressed in relative, rather than absolute terms.

Appendix C: Fractional counting of patent families

The analysis in this paper concerns the behaviour of applicants from the UK and, unless stated otherwise, a fractional count is used to represent how large a “share” of each patent application is associated with UK applicants. For example, an application with one UK applicant and three non-UK applicants would be treated as 1/4 of an application.

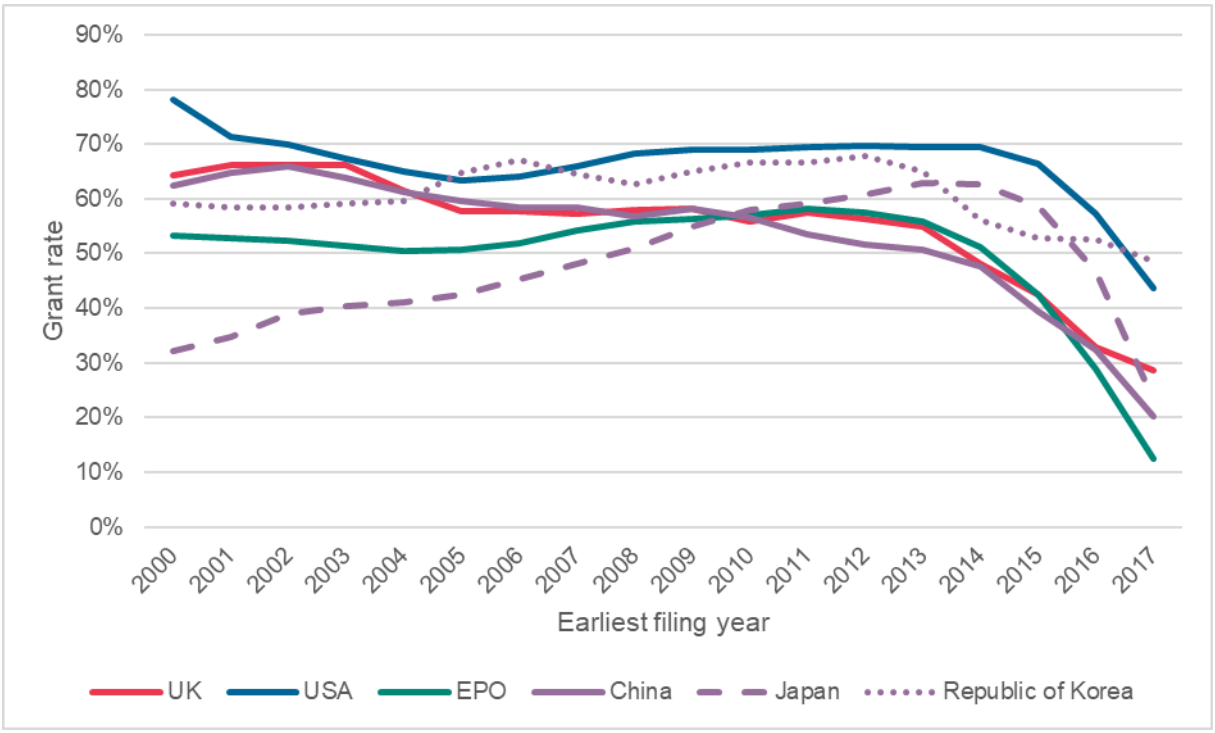
A patent may be filed in several jurisdictions, forming a “family”; the data held by EPO is supplied independently by patent offices in each jurisdiction and there is therefore the possibility of conflicting information. Some offices supply information about the first applicant only; some patent families were also found where the same applicant is listed as having different nationalities for different offices. Because it is infeasible to address these issues with any certainty, the approach used was to simply aggregate all available information over the patent family as a whole, on the basis that the effect of erroneous (or missing) applicant country information is minimised.

[39] A PCT application may enter national or regional phase up to 30 months after the application was first filed

Appendix D: Grant rates of applications by jurisdiction and year

Section 2.3 estimates the grant rate of patents. A patent can take several years to be granted after the application has been filed. For more recently filed applications, it is likely that an application that has not been granted is due to examination backlogs rather than the application having been refused or otherwise terminated. Because the analysis in Section 2.3 covers patents filed worldwide, it is important to consider the size of the examination backlogs in the larger patent offices so as to avoid biasing the results.

Figure 28: The grant rate of applications in each jurisdiction, per year in which the application was first filed. 2000-2017.



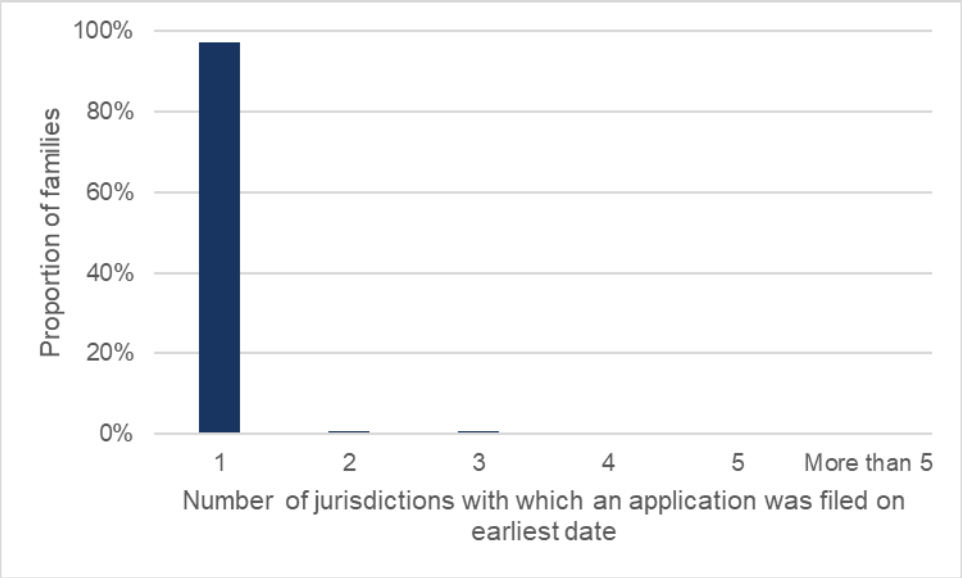
Source: PATSTAT Global – 2021 Spring Edition

Figure 28 shows that before 2012, grant rates by the IPO and the other offices shown were broadly stable from one year to the next, but fell after 2012. These recent drops in grant rate are assumed to be due to examination backlogs, and so when estimating the grant rate in Section 2.3, patents are only included if they were first filed in 2012 or earlier.

Appendix E: Filings made by UK applicants within the priority year

A patent application may claim priority from an earlier application for the same subject matter (Appendix A), and this must generally be done within a year of filing the earliest application. The applicant thus may choose whether to pursue applications elsewhere at any time within a year of filing an application. This appendix analyses the extent to which various approaches are taken.

Figure 29: A breakdown of patent families filed by UK applicants between 2000 and 2017, according to the number of jurisdictions with which an application was filed on the earliest filing date



Source: PATSTAT Global – 2021 Spring Edition

Figure 29 shows that UK applicants almost always adopt the strategy of filing with a single jurisdiction on the filing date, which has the advantage of deferring unnecessary commitment of financial and administrative work associated with filing multiple applications. Competing hypotheses for subsequent filing behaviours are that the applicant acts son after receiving a search report in relation to their earliest application, or that they instead act as late as possible (which would allow time to consider external factors such as market developments, in addition to any search reports issued within the priority year). Section 3.3 shows that the jurisdiction of first filing is almost always the UK (Figure 8), and the IPO aim to issue a search report within 6 months of the filing date. Applicants acting primarily in response to a search report might therefore be expected to file between 6 and 11 months of the priority date, rather than leaving it to the last month of the priority year.

Figure 30: The times at which applications are filed with jurisdictions within the priority year[40]

Source: PATSTAT Global – 2021 Spring Edition

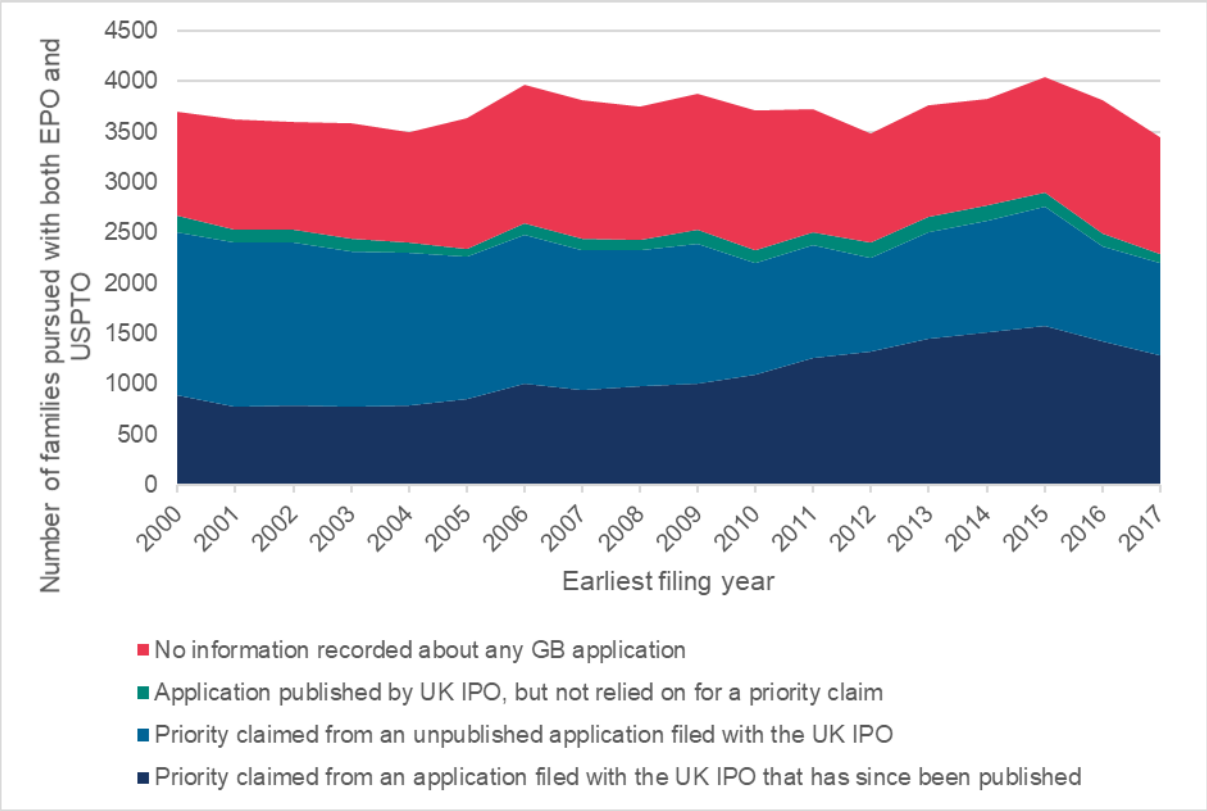
Figure 30 shows that a large majority of applications filed later than the priority date are filed very close to the end of the priority year. Although some applications are filed between 6 and 11 months, these are in the minority and account for less than 10% of filings with each jurisdiction. This implies a tendency of applicants to make full use of the priority year.

[40] Applications filed later than 12 months are not included. Such applications may be filed much later, and relate to different inventions in cases where multiple inventions are disclosed by a single application, or where incremental developments have been made to an invention that motivate an application in their own right. The laws surrounding such applications differ from jurisdiction to jurisdiction, and so they have been omitted here

Appendix F: Time trends of priority filings with the IPO

In Section 3.4, the overall usage of the IPO was shown for the period 2000-2017 for applications pursued either with the EPO, the USPTO, or with both offices. Here, the change in time over this period is shown[41].

Figure 31: The extent to which the IPO features in patenting strategies that involve both the EPO and the USPTO. The total area represents all patent families published by both offices and with filing dates between 2000 and 2017.

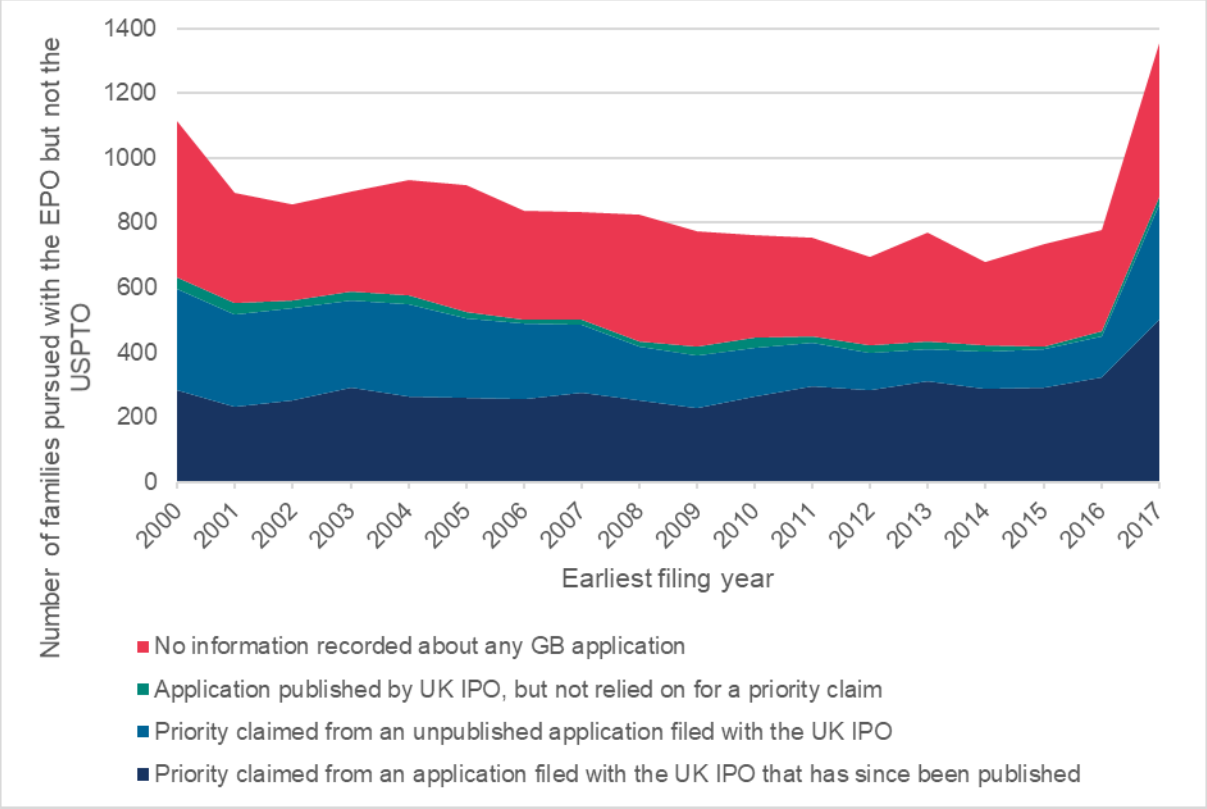


Source: PATSTAT Global – 2021 Spring Edition

The number of applications pursued both at the EPO and the USPTO have remained broadly stable since 2000 (Figure 31) and, although there has been a consistent proportion of these applications that claim priority from an earlier application filed with the IPO (the blue portions of Figure 31), an increasing number of these go on to be published by the IPO, indicating an ongoing interest of the applicant in pursuing protection specifically in the UK. Almost all applications published by the IPO (and pursued both through the EPO and the USPTO) have been relied on to claim priority elsewhere.

[41] Here, patent families are counted whether it includes an IPO application or not. The time trends shown in Figure 31 therefore differ from Figure 9, which excludes patent families that include a published IPO application.

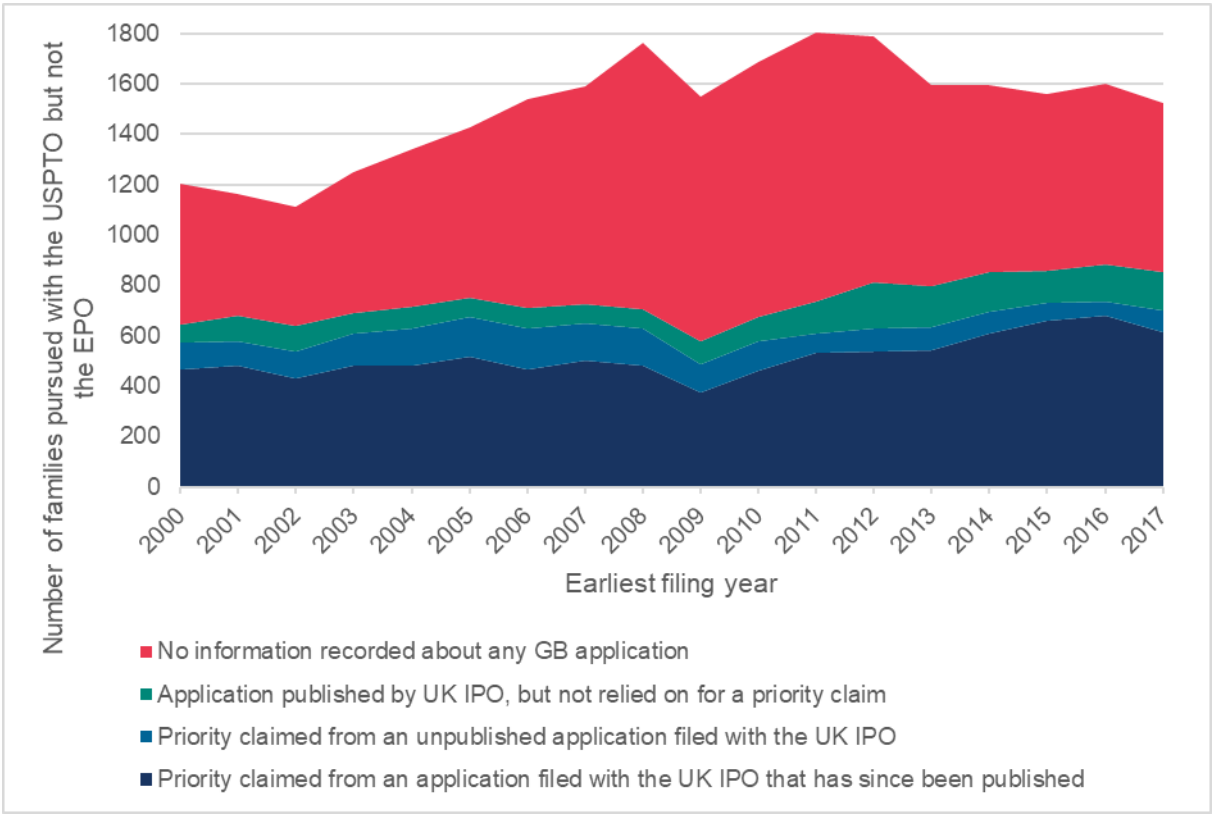
Figure 32: The extent to which the IPO features in patenting strategies that involve the EPO but not the USPTO. The total area represents all published patent families with filing dates between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

Although there has been a recent increase in the number of patent families pursued at the EPO but not the USPTO (Figure 32), the proportion of these families that also use the IPO (either to file an earlier application or to pursue protection specifically in the UK) follows a similar trend as for families that are also pursued at the USPTO (Figure 31), with there being more patent families that are also published by the IPO.

Figure 33: The extent to which the IPO features in patenting strategies that involve the USPTO but not the EPO. The total area represents all published patent families with filing dates between 2000 and 2017



Source: PATSTAT Global – 2021 Spring Edition

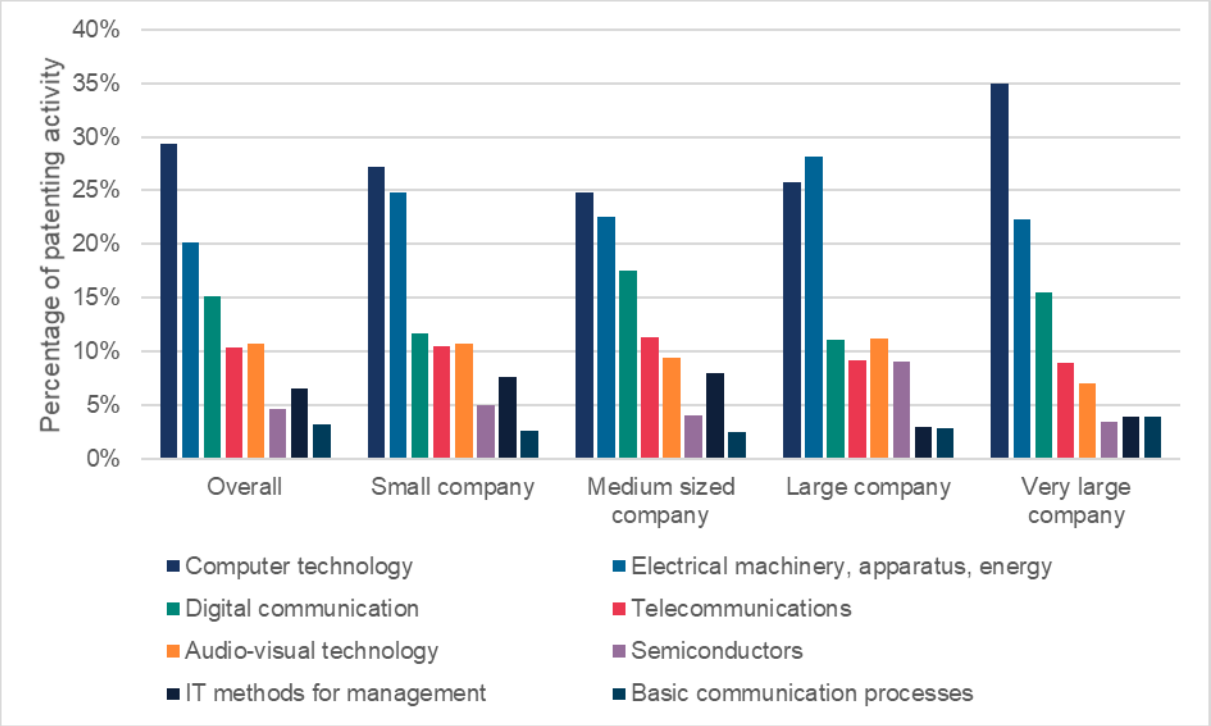
If a patent family is not published by the EPO, then the only route to protection in the UK is through the IPO. This explains why almost all patent applications filed with the IPO, and used to claim priority in the USA but not at the EPO, go on to be published (Figure 33), in contrast to those that are also pursued at the EPO (Figure 31). Between 2000 and 2010 there was a rise in applications from UK applicants published by the USPTO, and this rise was due predominantly to applications that were never published in the UK. Since then, publications have dropped slightly, though an increasing proportion are now pursued also in the UK.

Appendix G: Patenting activity of UK companies per technology field

In Section 5.2.3 the overall patenting activity of UK companies was shown in terms of five technology sectors. These can be further broken down into 35 technological fields, which are shown here.

G.1 Electrical engineering

Figure 34: The patenting activity of applicants within the technological sector of electrical engineering, between 2000 and 2017. The breakdown for companies of various sizes is shown with the overall patenting activity (including non-companies) shown to the left



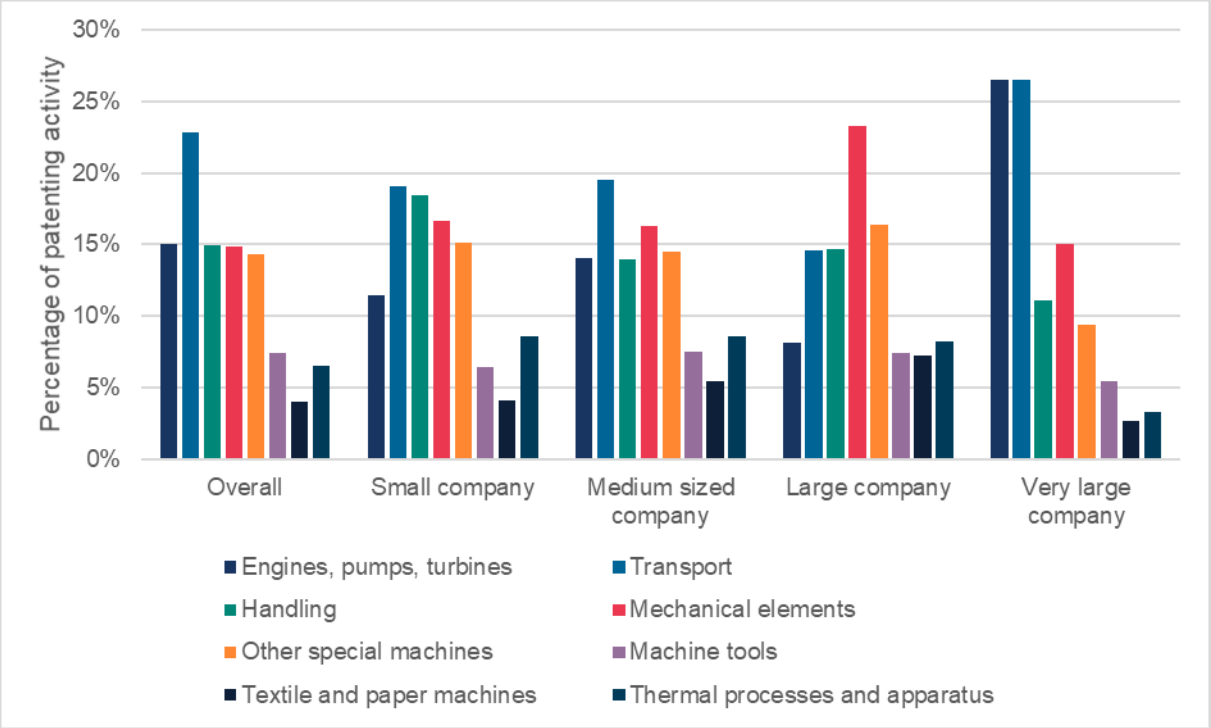
Source: Orbis/PATSTAT Global – 2021 Spring Edition

Both small and medium companies follow the overall trend in patenting activity by UK applicants in the sector of electrical engineering (Figure 34). The larger companies are more active in the fields of computer technology[42] and electrical machinery[43], with very large companies being particularly active in computer technology. Small and medium companies have a larger tendency to work in the field of digital communications[44], but also "IT methods for management". Patents in the latter are less likely to be patentable in the UK due to business methods being excluded from patentability under the UK Patents Act. The larger tendency of smaller companies to pursue patents for this subject matter may therefore indicate an unfamiliarity with the legal provisions relating to patenting inventions.

[42] This technology field includes subject matter relating to computer architecture, data processing and storage, speech processing and information and communication technology (ICT)
[43] This technology field includes subject matter relating to basic electric elements, lighting, heating and power generation and distribution
[44] This technology field includes subject matter relating to encryption, networking and wireless communications

G.2 Mechanical engineering

Figure 35: The patenting activity of applicants within the technological sector of mechanical engineering, between 2000 and 2017. The breakdown for companies of various sizes is shown with the overall patenting activity (including non-companies) shown to the left

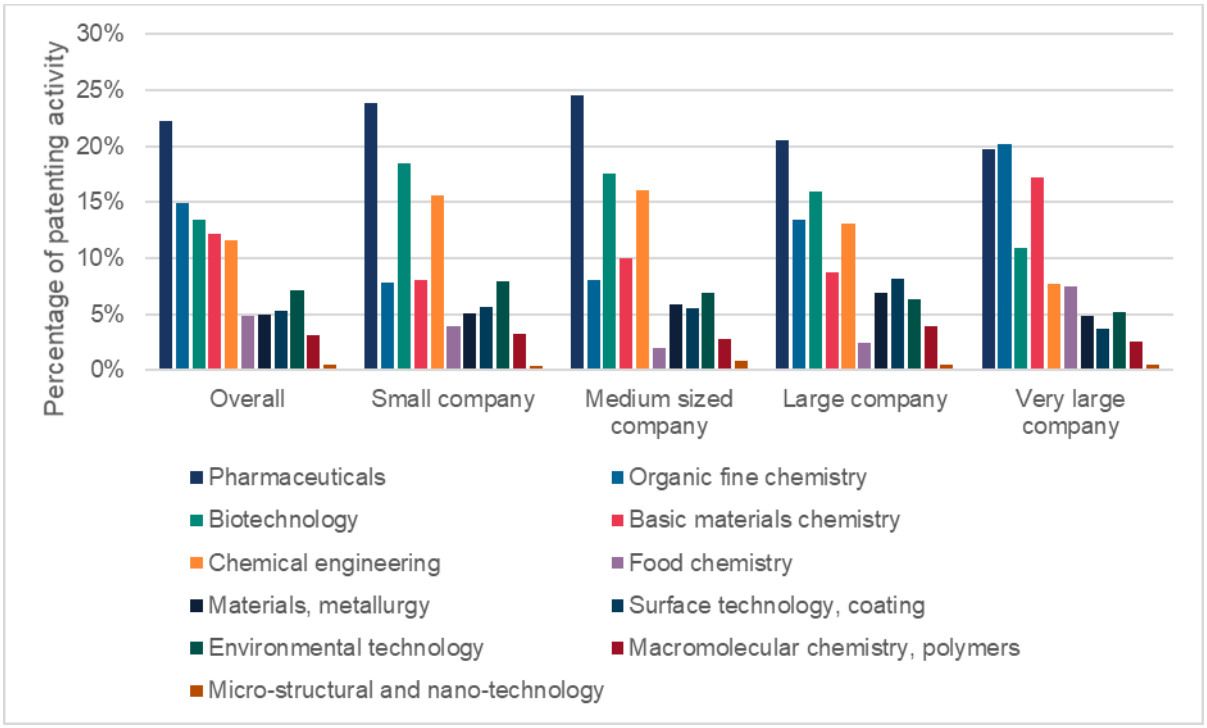


Source: Orbis/PATSTAT Global – 2021 Spring Edition

Compared to the overall trend in UK applicants' patenting activity in the mechanical engineering sector, very large companies are much more active in the fields of engines, pumps and turbines, and the field of transport, which primarily relates to vehicles. Large companies instead show a much greater activity in the field of mechanical elements.

G.3 Chemistry

Figure 36: The patenting activity of applicants within the technological sector of chemistry, between 2000 and 2017. The breakdown for companies of various sizes is shown with the overall patenting activity (including non-companies) shown to the left

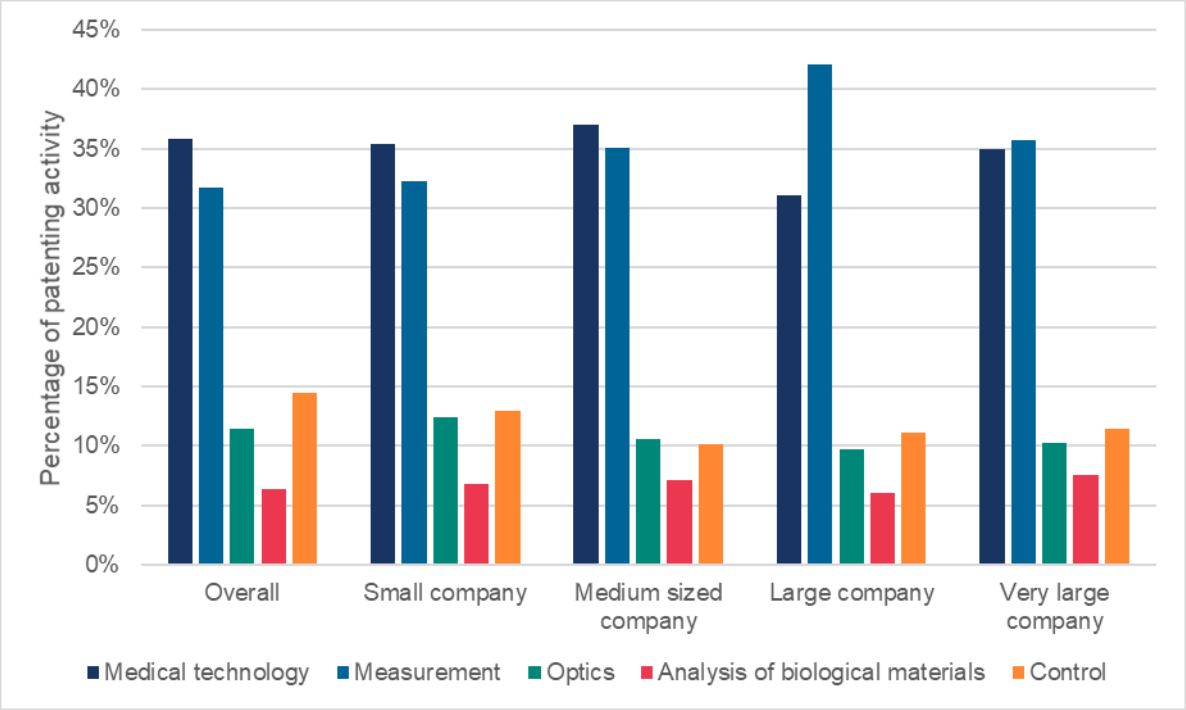


Source: Orbis/PATSTAT Global – 2021 Spring Edition

Pharmaceuticals and biotechnology seem to be both seem to be popular areas regardless of the size of the company, However, organic fine chemistry is favoured more as the company size increases, as are the technologies categorised as “basic materials chemistry” (which includes fertilisers, dyes, paints and fossil fuels). Conversely, chemical engineering (which relates to physical processes such as mixing, separating, and spraying) is favoured less as the company size increases. The field of food chemistry is interesting as it is favoured predominantly by small companies and by very large ones, and accounts for only a small proportion of the activity of medium and large companies. This suggests that activity in this area is dominated by large multinationals and smaller companies such as start-ups.

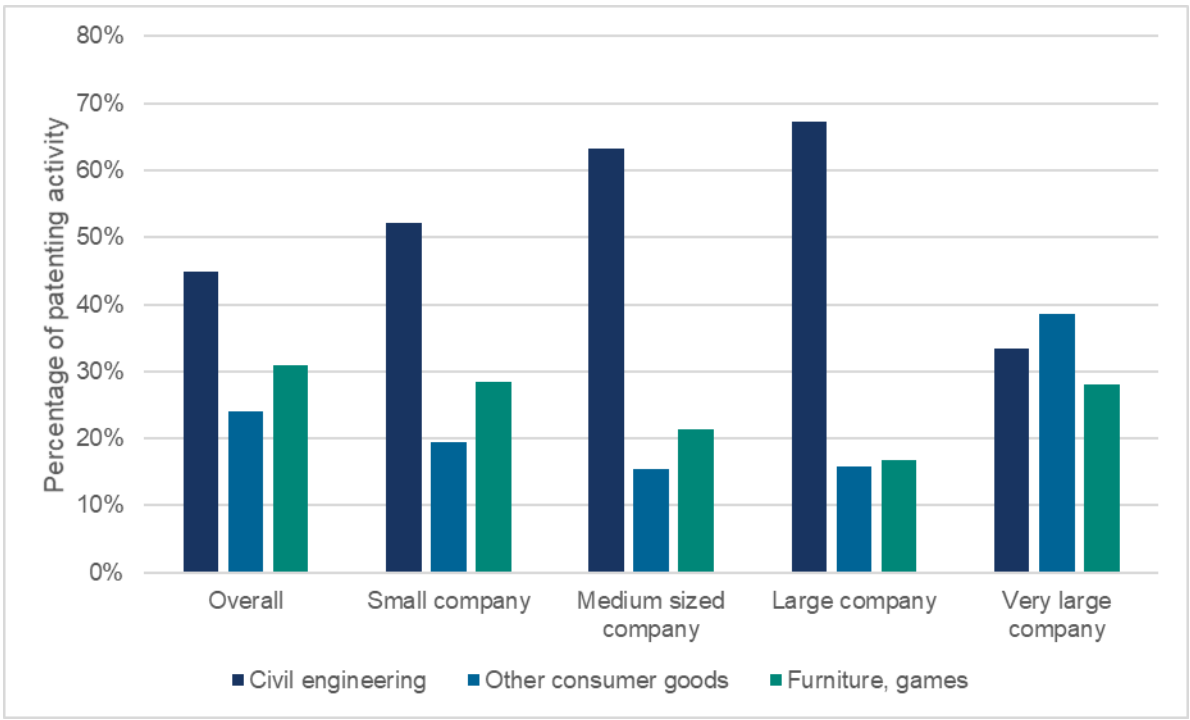
G.4 Instruments and Other fields

Figure 37: The patenting activity of applicants within the technological sector of instruments, between 2000 and 2017. The breakdown for companies of various sizes is shown with the overall patenting activity (including non-companies) shown to the left



Source: Orbis/PATSTAT Global – 2021 Spring Edition

Figure 38: The patenting activity of applicants within the technological sector entitled “other fields”. The breakdown for companies of various sizes is shown with the overall patenting activity (including non-companies) shown to the left



Source: Orbis/PATSTAT Global – 2021 Spring Edition

Applicants working in the instruments technology sector seem to specialise in similar fields regardless of their size, with the exception being that larger companies are likelier to specialise in measurement (e.g. sensors) fields whereas smaller companies are likelier to specialise in medical technology. In the sector entitled “Other fields”, larger applicants are generally likelier to be working in civil engineering and less likely to be working in consumer goods, furniture and games. The exception to this is very large companies, and these are likely to be multinational corporations who supply to retailers worldwide.

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