

The role of European public research in patenting and innovation

An in-depth analysis of the patenting activities of European public research organisations and research hospitals at the EPO

October 2025 | Executive summary



Foreword

Public research is one of Europe's greatest strengths. Alongside universities, public research organisations (PROs) and research hospitals play a crucial role. From large multidisciplinary institutes, such as France's National Centre for Scientific Research (CNRS) or Germany's Fraunhofer-Gesellschaft, to specialised applied research centres, PROs have long shaped scientific progress and driven technological advances. In the European Union alone, they now employ over 350 000 researchers. Research hospitals are equally vital, converting discoveries into new drugs, diagnostics and medical technologies that safeguard the health of Europe's citizens while reinforcing some of its most competitive industries.

Today, as Europe seeks to become more competitive, these institutions are again in the spotlight. Policymakers increasingly view public research as key to Europe's future – a view reflected in the EU Startup and Scale-up Strategy. And patents are central to this, transforming scientific breakthroughs into assets that attract investment, power startups and maximise impact.

This study is the first comprehensive mapping of PRO and research hospital patenting across Europe. With almost 63 000 European patent applications over two decades, these organisations have emerged as central players in Europe's innovation system. They specialise in fields from life sciences to advanced engineering and contribute directly to the creation of successful startups. Yet their roles vary considerably across countries, and cross-border collaboration is still limited. Further integration – Enrico Letta's idea of a "fifth freedom" for research and innovation – is essential. The introduction of the European Unitary Patent as a tool to foster wider circulation of knowledge and more effective commercialisation across the continent is another step towards achieving this.

The study also serves as another milestone for the [EPO's Observatory on Patents and Technology](#). Since its creation in 2023, the Observatory has focused on public research and technology transfer, most notably with our analysis of European universities and their patent activities in a study launched last year. We also developed the [Deep Tech Finder](#), an interactive tool linking European patent data with business information to connect European universities, startups ... and now PROs.

The Observatory's work is grounded in collaboration. For this study, experts from the national patent offices of 24 EPO member states contributed: Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Czech Republic, Germany, Estonia, Spain, Finland, France, Greece, Croatia, Italy, Luxembourg, Latvia, Monaco, the Netherlands, Poland, Portugal, Slovenia, Slovakia, Türkiye and the United Kingdom.

Leading organisations also played a vital role: Fraunhofer ISI as main partner; European Association of Research and Technology Organisations (EARTO); other major PROs, such as the Spanish National Research Council (CSIC), the CNRS, the French Alternative Energies and Atomic Energy Commission (CEA) and the Netherlands Organisation for Applied Scientific Research (TNO); the Association of European Science and Technology Transfer Professionals (ASTP). Their contributions, from exchanges on the findings to providing case material, underline the shared commitment to growing the evidence base for policy and practice.

The findings presented here highlight both the achievements and the untapped potential of public research. They also point to the challenges ahead: strengthening the role of PROs across borders, making it easier to commercialise their products, and ensuring that the European patent system is used to its full potential.

Executive summary

This study, undertaken by the EPO's Observatory on Patents and Technology, extends the Observatory's 2024 analysis of university patenting to encompass public research organisations (PROs) and research hospitals across all 39 EPO member states. By adopting the academic-patent methodology, tracking applicants as well as inventors, it captures the true innovation footprint of European PROs, universities and research hospitals. Direct academic patents are European patent applications filed by the research institution, while indirect academic patents occur when researchers from these institutions are named as inventors on European patent applications filed by industry or other entities.

This project builds on the policy imperatives set out in the [Letta](#) and [Draghi](#) reports which called for deeper integration of Europe's research systems, stronger cross-border collaboration, and tighter links between public research and industrial innovation. It also draws on the European Commission's recent EU Startup and Scale-up Strategy, which emphasises the need to make Europe more attractive for technology-driven ventures by improving regulatory frameworks, access to finance and support for research commercialisation.

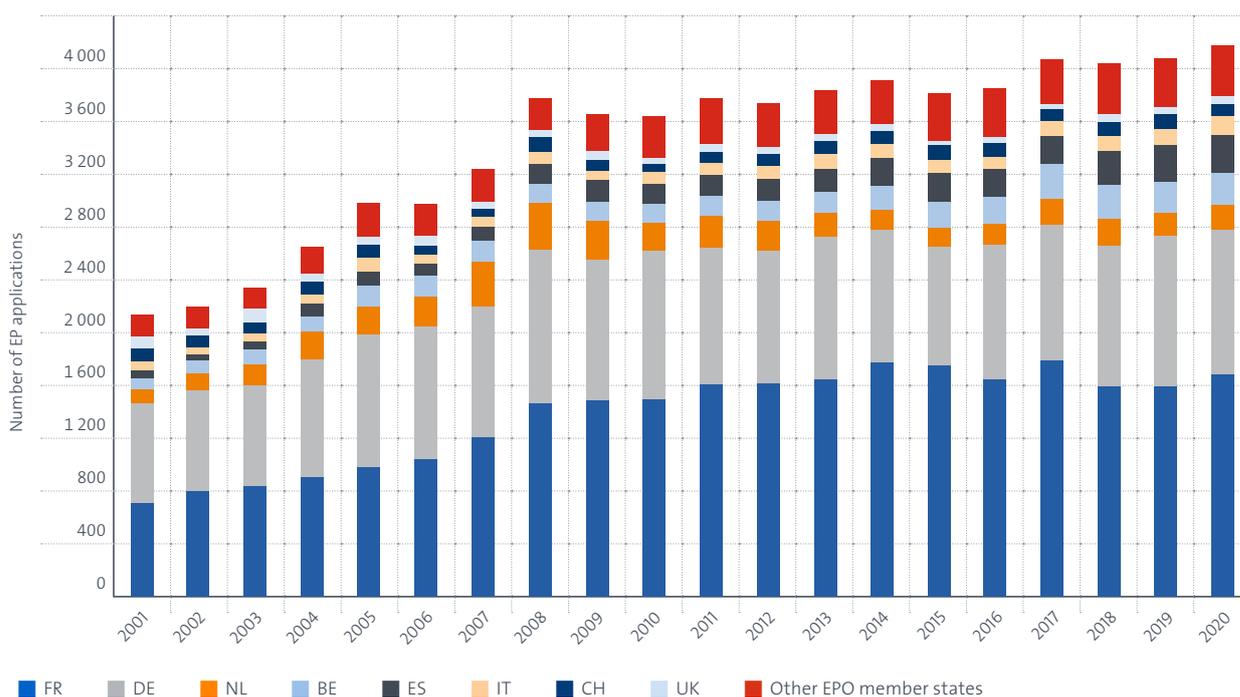
Developed in close co-operation with Fraunhofer ISI and support from experts from 24 national patent offices, the study offers both quantitative metrics and contextual insights, reinforcing its relevance for stakeholders across Europe. Firstly, it provides a detailed assessment of PRO contributions to EPO patenting activity through both direct academic patents and filings where PRO researchers are only listed as inventors. Secondly, it benchmarks the patenting activity of PROs against universities and research hospitals in Europe by comparing patent volumes, temporal trends and the ratio of direct versus indirect filings, thereby illuminating differences in institutional strategies and collaboration models. Thirdly, it evaluates these institutions' roles in European research integration and the broader innovation ecosystem by analysing co-applicant collaborations with industry, cross-border partnerships and links to startup creation and technology transfer.

Key findings

1. European PROs contributed to almost 63 000 European patent applications between 2001 and 2020, yet play vastly different roles across national innovation landscapes

Figure E1

Trend in PRO-related patent applications at the European Patent Office, 2001-2020



Source: EPO - PATSTAT, Elsevier Scopus

European PROs demonstrate substantial contributions to patenting activity, with nearly 63 000 patent applications at the EPO involving PRO as applicants or their researchers as inventors between 2001 and 2020, representing 4.9% of all patent applications with European applicants. PRO-related academic patents are highly concentrated and specialised in science-based technologies – particularly biotechnology and pharmaceuticals, which together account for 27.6% of all PRO-related academic patents – but also in measurement, semiconductors, and computer technology. However, in the most recent period 2016-2020, a technological rebalancing can be observed, with life sciences maintaining dominance, while specialisation in telecommunication and digital communication has increased.

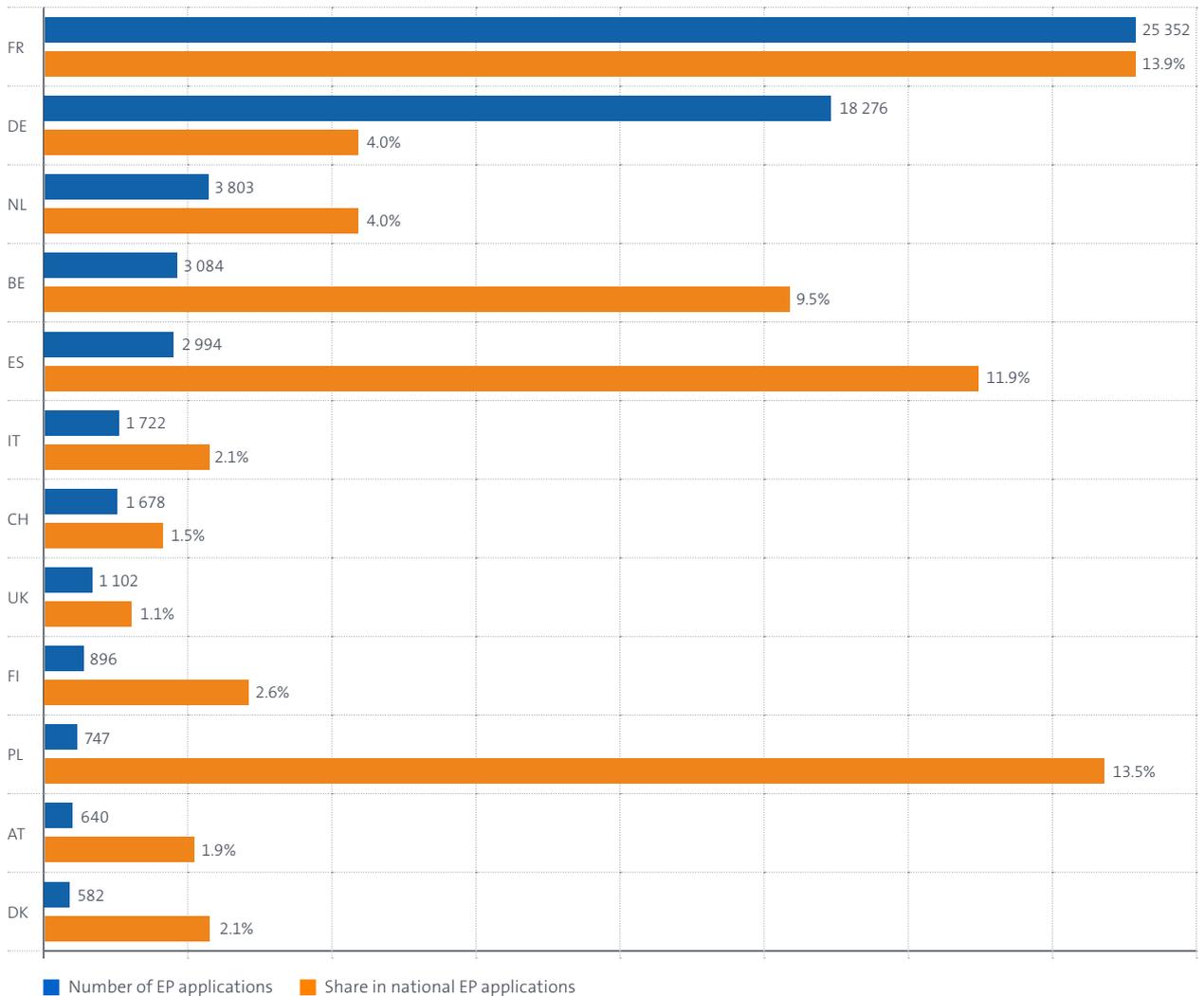
PRO patenting activity in Europe exhibited rapid growth during the 2000s that outpaced overall European patenting (rising from 1 950 European patent applications in 2001 to 3 450 in 2008, or from 3.6% to over 5.4% of all European patent applications), followed by stabilisation above 5% after the global financial crisis, and ultimately reaching a peak of 3 815 EP applications in 2020. However, these aggregate statistics hide major differences between countries, highlighting the heterogeneous role of PROs within different European innovation ecosystems. While France leads in absolute PRO patent volumes (25 352) followed by Germany (18 276), the strategic importance varies significantly across countries – France, Spain, Poland and Belgium show PRO contributions between 9% and 14% of national patent output, whereas Germany and the Netherlands maintain PRO shares at 4% despite substantial absolute volumes. Co-filing patterns vary also considerably across countries.

France and Spain show high multi-applicant rates for their academic patents, with multiple universities, PROs, and research hospitals frequently appearing as co-applicants, while Germany and the UK display lower multi-applicant rates, with academic patents more commonly filed by single institutions. These differences

reflect varying institutional collaboration frameworks and distinct national practices regarding patent ownership structures.

Figure E2

Number of PRO-related EP applications for the top European countries and their shares in national EP applications in the period 2001-2020

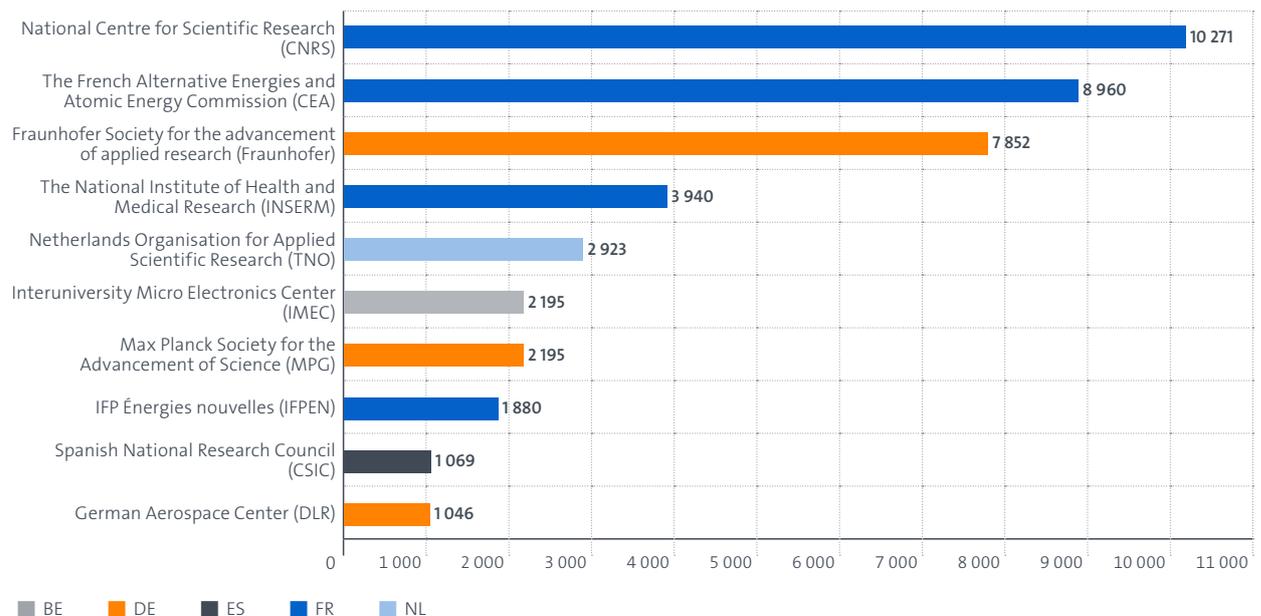


Source: EPO - PATSTAT, Elsevier Scopus

2. A small number of leading European institutions account for most PRO-related academic patenting.

Figure E3

Contributions of leading European PROs to academic patents at the EPO, 2001-2020



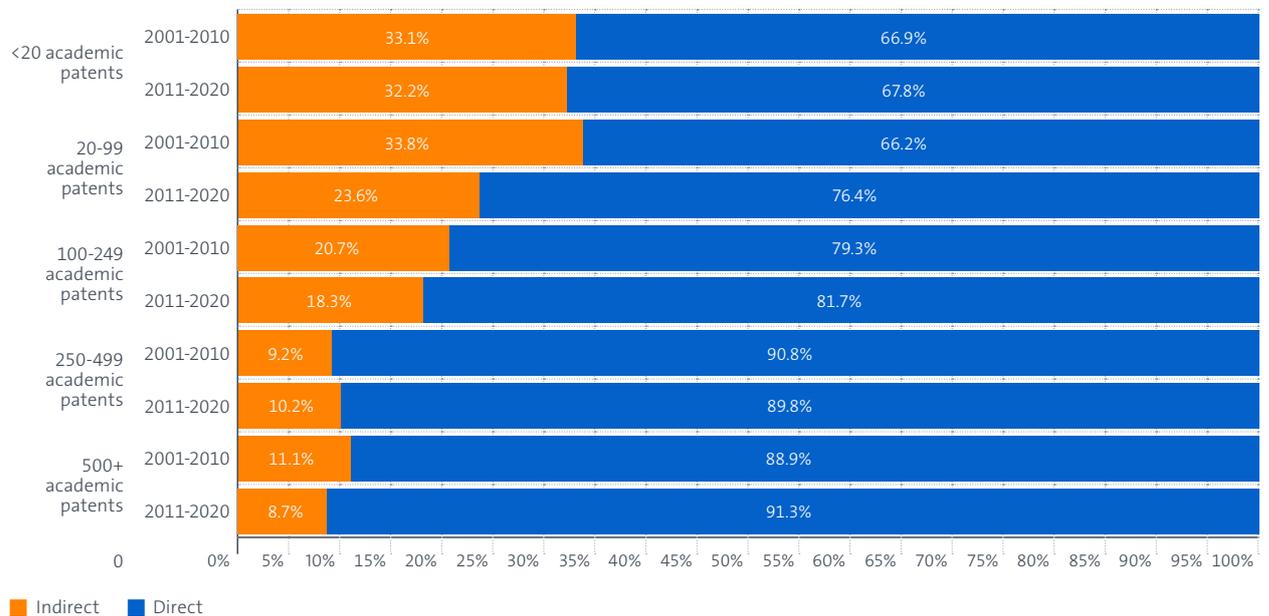
Source: EPO - PATSTAT, Elsevier Scopus

The top ten European PROs stand out with nearly two-thirds (63%) of all PRO-related academic patents between 2001 and 2020. These institutions include four French, three German, one Dutch, one Belgian and one Spanish institution, led by France's CNRS (10 271 applications), CEA (8 960) and Germany's Fraunhofer Society (7 852). While all of them have a major impact on innovation ecosystems, they show different positions in the innovation value chain with differing institutional mandates and national innovation strategies. Computing EP patent applications-to-STEM publication ratios for these ten PROs reveals that institutions with basic science orientation like Max Planck Society, CNRS, INSERM and CSIC maintain lower ratios in line with their research missions. By contrast, application-oriented organisations such as CEA, Fraunhofer, TNO and IMEC exhibit relatively high EP patent applications-to-STEM publication ratios, thus signalling closer proximity to market. Notably, French PROs have shown upward momentum in their ratios, while German organisations have generally experienced flat or declining trends.

In general, European PROs show distinct patterns in patent filing approaches and technology focus that vary not only by country, but also systematically with organisational size. The data reveal that smaller PROs maintain higher proportions of indirect patent filing and tend towards concentrated technology portfolios in specific domains. They typically focus on specific technological domains where concentrated expertise and resources can yield competitive advantages, which may reflect their participation in local industry ecosystems and regional innovation partnerships. Larger PROs demonstrate higher rates of direct patent filing and appear to contribute to more diversified patent portfolios across multiple technology domains, while medium-sized organisations exhibit characteristics that fall between these patterns, suggesting different organisational approaches to technology development and commercialisation within the European research landscape.

Figure E4

Share of direct (blue) and indirect (orange) academic patents by PRO size group and time period (2001-2010 vs 2011-2020)

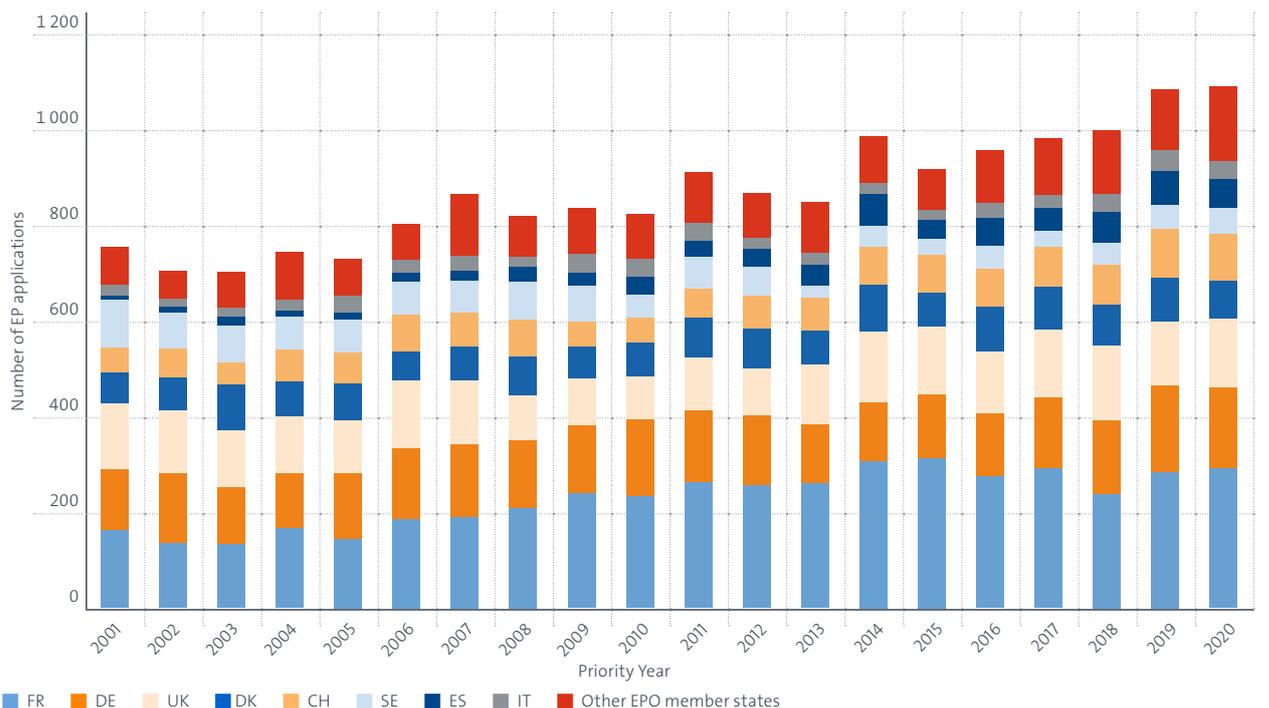


Source: EPO - PATSTAT, Elsevier Scopus

3. European research hospitals drive over 17 400 EP applications with concentration in four core medical research fields

Figure E5

Trend in research hospital-related patent applications at the European Patent Office, 2001-2020



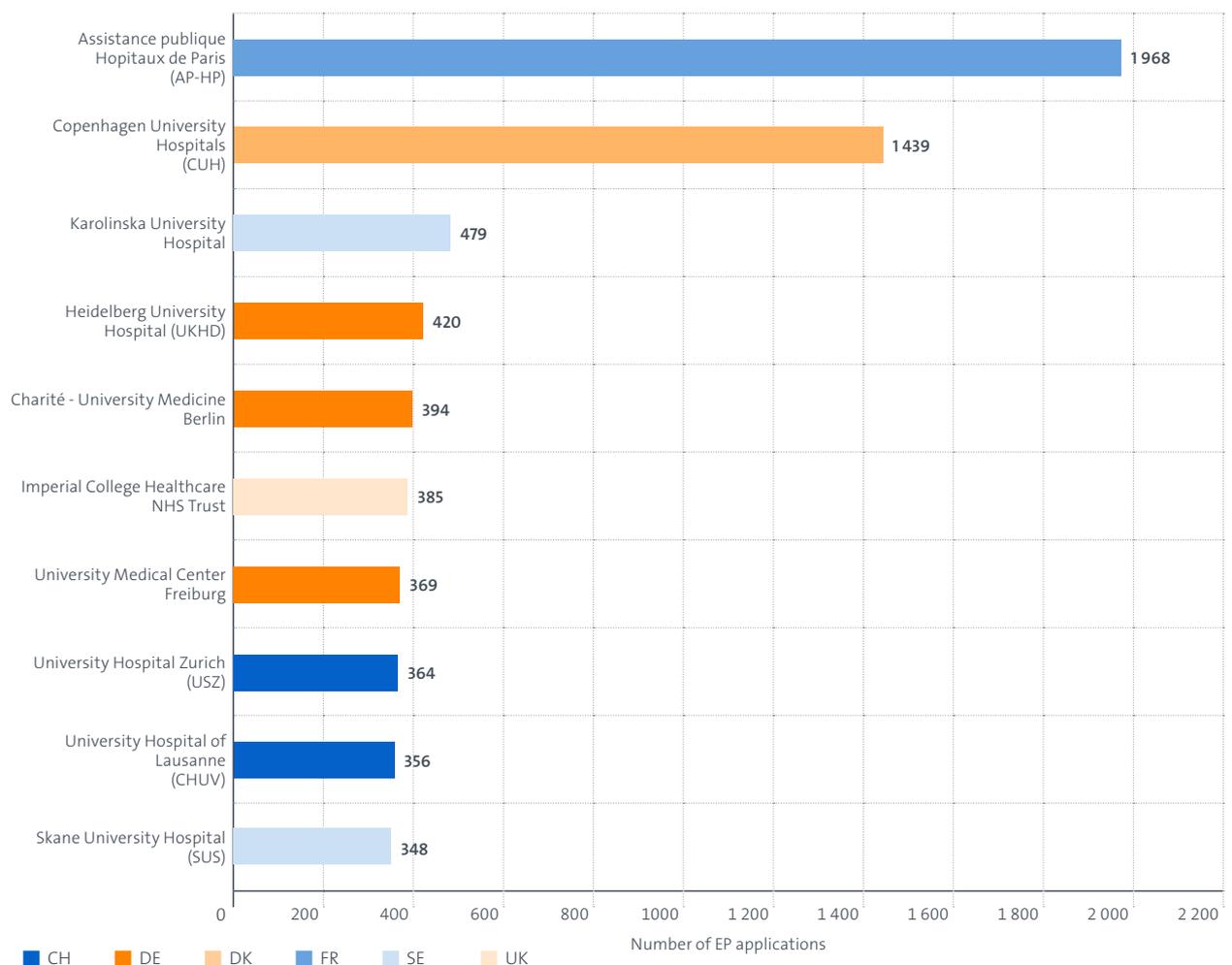
Source: EPO - PATSTAT, Elsevier Scopus

European research hospitals contributed to 17 434 EP applications between 2001-2020, demonstrating sustained growth from 700-750 applications in the early 2000s to nearly 1 100 in 2020, with indirect applications dominating. France leads the landscape with 4 575 applications, followed by Germany (2 858) and the UK (2 500), collectively representing over 56% of all research hospital academic patents, while Assistance Publique Hôpitaux de Paris (AP-HP) alone accounts for 1 968 applications between 2001 and 2020; or over 11% of the European total.

Research hospitals exhibit extreme technological specialisation, with almost 90% of patents concentrated in just four fields: pharmaceuticals (31.3%), biotechnology (25.4%), medical technology (24.0%) and analysis of biological materials (8.4%). This concentrated profile reinforces their role as specialised medical innovation hubs within the European research ecosystem, distinct from the broader PRO landscape that shows greater technological diversification.

Figure E6

Contributions of leading European research hospitals to academic patents at the EPO, 2001-2020



Source: EPO - PATSTAT, Elsevier Scopus

4. European research institutions shift from indirect to direct patent filing as universities drive academic patent growth, with consistent contributions from PROs and research hospitals

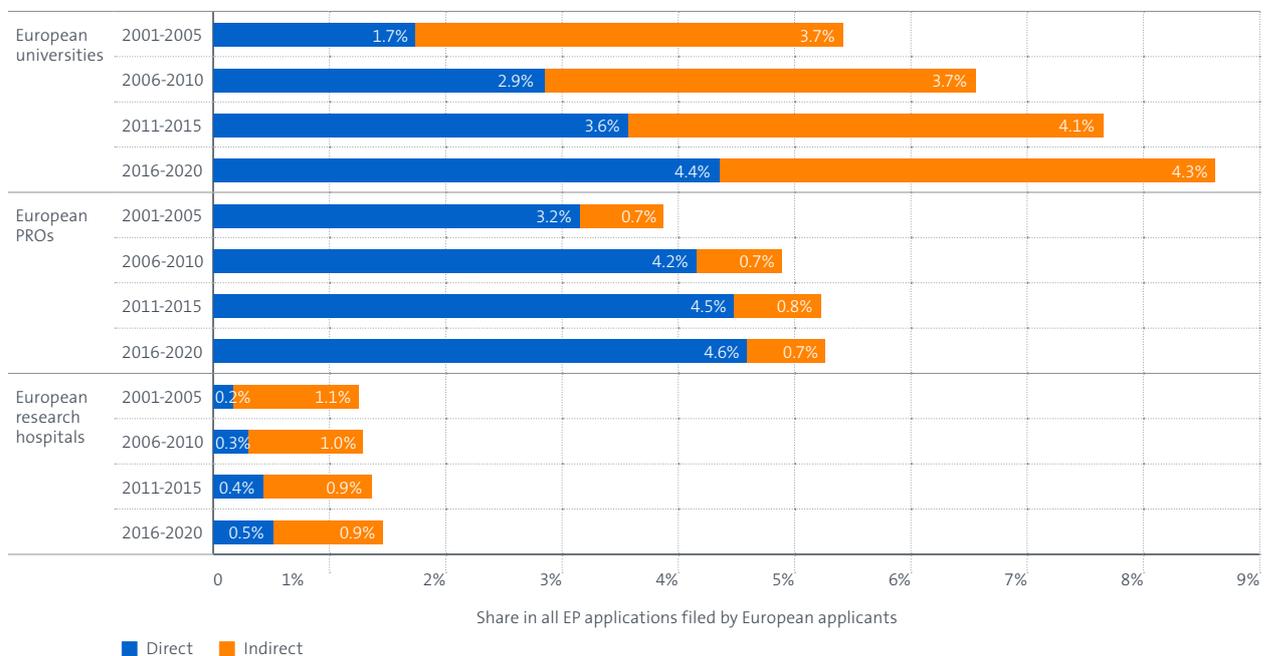
European research institutions combined contributed to almost 137 000 EP applications between 2001-2020, with total involvement growing 87.8% from 4 628 in 2001 to 8 691 in 2020. This growth in academic patenting was primarily driven by universities, achieving 129.2% expansion between 2001-2020 while PROs (95.6% growth) and research hospitals (44.5% growth) demonstrated a more modest surge. PRO contributions to total European academic patenting stabilised around 44-47% and research hospital shares remained steady at approximately 12-14%, while the share of university-related academic patents surged.

The growth trajectory across all three institution types is fundamentally driven by direct patent filing rather than indirect academic patents. PROs maintained consistently high direct filing preferences throughout

the period, increasing from 3.2% in 2001-2005 to 4.6% in 2016-2020 while indirect contributions declined, resulting in direct-to-indirect ratios rising from 4.4 to 6.9. Research hospitals, while remaining predominantly indirect contributors (0.9% vs 0.5% direct in 2016-2020), showed the strongest growth in direct filing, increasing their direct-to-indirect ratio from 0.16 to 0.55. This reflects their gradual shift towards institutional patent ownership while maintaining collaborative roles. At the same time, universities transformed from predominantly indirect contributors (3.7% vs 1.7% direct in 2001-2005) to balanced participants (4.4% direct vs 4.3% indirect by 2016-2020), even overtaking European PROs as the largest direct patent filers in 2020.

Figure E7

Share of direct and indirect academic patents of European universities, PROs and research hospitals as percentage of EP applications from European applicants by five-year periods



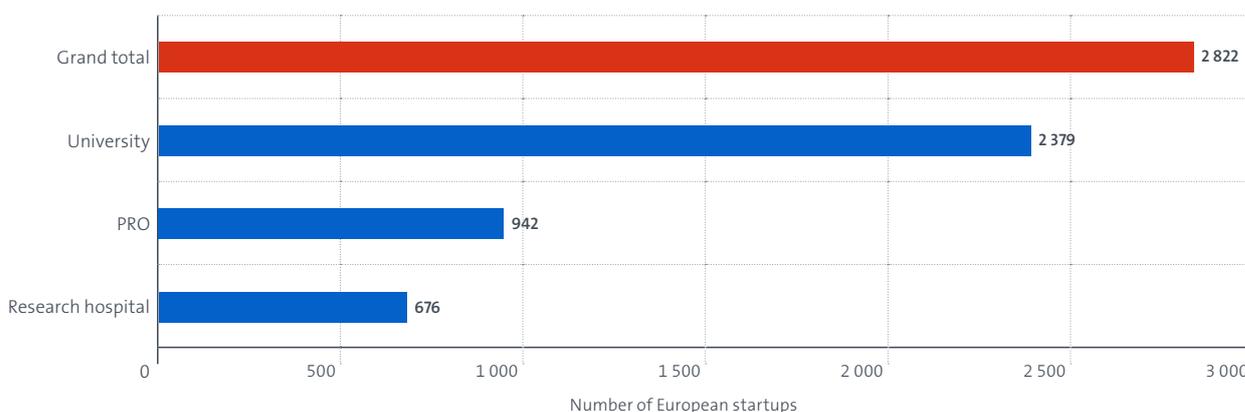
The most significant commonality between PROs and universities lies in their convergent biotechnology (14.3% PRO vs 14.9% universities in 2001-2020) and pharmaceutical (13.3% vs 16.2%) specialisation, indicating these fields represent a fundamental strength across European academic research. In contrast, PROs concentrate more heavily in advanced instrumentation and physical sciences (semiconductors, measurement

technologies, optics), while universities maintain stronger positions in medical applications and certain chemical domains. Over time, the most important divergent trend involves digital technologies, where PROs achieved noticeable gains, whereas universities advanced significantly in environmental technology, suggesting distinct strategic responses to emerging technological priorities.

5. Over 2 800 European startups linked to research institutions attract disproportionate investment and drive technology commercialisation

Figure E8

European startups with EP applications linked to European research institutions



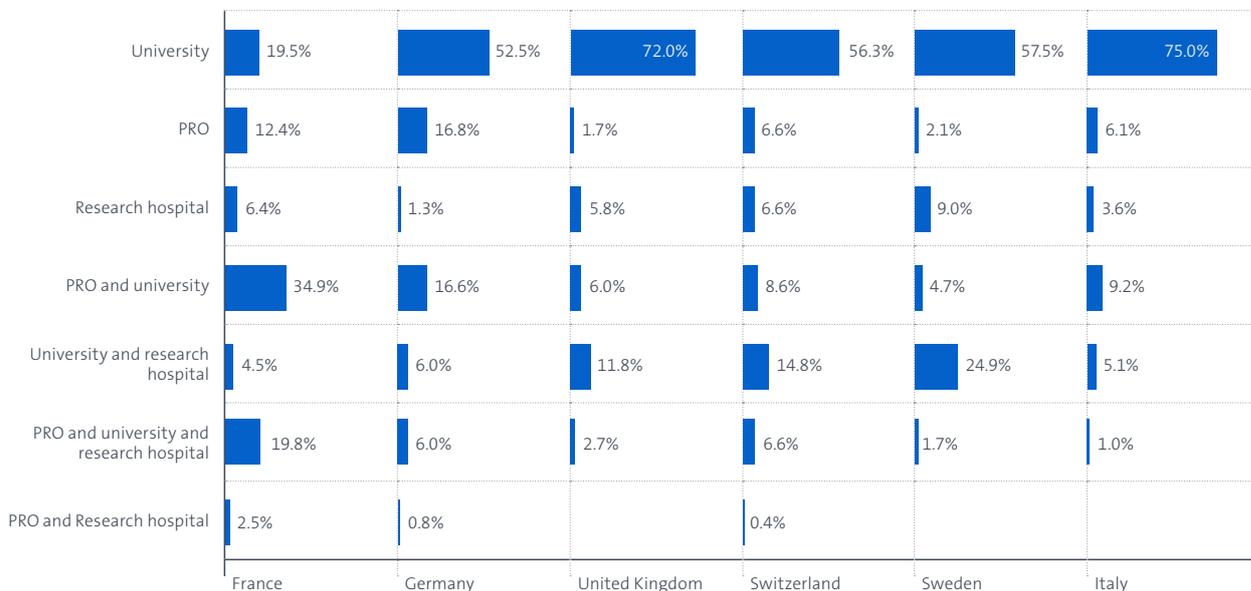
Source: EPO - PATSTAT, Elsevier Scopus, Dealroom

Out of all identified startups that have filed at least one European patent application, 27.2% have inventors linked to European research institutions (universities, PROs or research hospitals). This corresponds to over 2 800 European startups. At the country level, France (550), the UK (414) and Germany (398) host the largest numbers of such patenting startups. Sector-wise, healthtech dominates, representing more than 50% of all startups, followed by energy (8.2%), information technology (8.2%) and computer hardware (7.1%), which aligns with the technology profiles of European academic patents.

Most of these European startups are connected to universities (2 379, or 84.3%), with PROs (942) and research hospitals (676) playing important but smaller roles. However, a closer look at the co-applicant behaviour reveals distinct national collaboration patterns for European startup-research linkages. France demonstrates the most diversified approach with less than 20% of startups tied exclusively to universities and over 60% engaging in multi-institutional partnerships (34.9% PRO-university, 19.8% involving all three institution types). In contrast, the UK (72%) and Italy (75%) exhibit university-centric models with minimal institutional diversity. Sweden uniquely emphasises university-research hospital connections (24.9%), while Germany (52.5% university-only) and Switzerland (56.3%) occupy intermediate positions with moderate multi-institutional engagement, suggesting different national innovation ecosystem structures and collaboration preferences.

Figure E9

Distribution of European startups with EP applications by research institution relationship patterns for the top six European countries



Source: EPO - PATSTAT, Elsevier Scopus, Dealroom

Despite making up just over a quarter of all identified patenting startups in Europe, these research-linked startups accounted for a far greater share of startup success between 2021 and 2024: 50.3% of total funding raised, 30.6% of all funding deals and 30.9% of all successful exits. This evidence highlights that startup

creation has become a critical pathway for bringing European research inventions to market, validating policy efforts aimed at fostering deeper academic engagement in innovation.

Table E1

Comparison of Deep Tech Finder (DTF) indicators among European startups with EP applications based on data from 2021-2024

	Number of startups	Number of deals	Total funding	Net jobs created	Number of exits
DTF startups with links to European research institutions	2 822	2 049	€58.97 billion	16 830	172
Share of all DTF startups (in %)	27.2%	30.6%	50.3%	26.9%	30.9%

Source: EPO - PATSTAT, Elsevier Scopus, Dealroom

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Design

European Patent Office

The report can be downloaded from:

epo.org/public-research-study