Science and Technology Observatory (OST)

Analysis of the scientific and technological profile of the Institut Pasteur

Publications, European Research Council projects, and patents

Contribution to the assessment of the Institut Pasteur

May 2024

Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur

TABLE OF CONTENTS

Foreword

This study is a contribution to the assessment of Institut Pasteur conducted by Hcéres. It analyses three types of productions of Institut Pasteur: scientific publications, participation in European Research Council projects, and patents. Institut Pasteur's indicators are benchmarked against those of a selection of other French and international research institutions. The scope of the analyses presented below has been defined by Hcéres in agreement with the CNRS. An initial version of this report was produced by the Science and Technology Observatory (OST) in 2023; it has led to an exchange with Institut Pasteur prior to the finalization of its self-assessment report.

Being a signatory of the San Francisco Declaration on Research Assessment (DORA), a contributor to the preparation of the 2022 Paris Call on Research Assessment, and a member of the Coalition for Advancing Research assessment (CoARA), Hcéres is particularly concerned about the attention given to the use of quantitative indicators in its assessments. Hcéres assessments are qualitative assessments that make a responsible use of quantitative indicators. With that in mind, this report aims to bring useful information to both the Institut Pasteur and the assessment committee.

Executive summary

This report analyzes Institut Pasteur's scientific publications, its patents and participation in European Research Council (ERC) projects. For these three types of productions, indicators are compared to the French average and to a peer group of research institutions: Institut Curie, Francis Crick Institute, Rockefeller University, Scripps Research Institute, Weizmann Institute, Ecole Polytechnique Fédérale de Lausanne (EPFL), and Karolinska Institutet. Comparisons with Inserm are also provided for some indicators.

Number of scientific publications and international copublications

The number of participations to scientific articles by Institut Pasteur has increased from over 1,200 in 2017 to nearly 1,400 in 2021, but decreased slightly in 2022, after the main Covid period.

In order to account for copublications and the fact that numerous authors may contribute to one publication, the report calculates indicators in fractional counting. Fractional counting allocates a portion of the publication to each of the affiliation addresses by counting 1/*n* for each of them, where *n* is the total number of addresses listed for the publication. The fractional count is additive; it also makes it possible to account for different collaboration practices in different research fields and to eliminate bias when comparing between fields and institutions. In fractional counting, the number of contributions by Institut Pasteur has been relatively stable over the period 2017-21. Contributions from Institut Curie, Karolinska Institutet, Francis Crick and Weizmann institute have increased, while the trend of the other benchmark institutions have been closer to that of Institut Pasteur – Scripps Research institute experiences a 20% decline though.

Institut Pasteur represents about 1.5% of French publications in Life sciences. Karolinska Institutet and Inserm represent between 15 and over 20% of the national publications in Life sciences, while the other benchmark institution are much smaller.

The share of international co-publications ranges from 47% for Scripps Research Institute to 67% for Institut Pasteur and 75% for EPFL. These variations can be explained both in terms of national specificities (large countries tend to have lower shares) and by the fact that applied research is generally conducted on a more local level.

Scientific profiles

The institutions being compared cover varying scientific fields. Biochemistry, molecular biology, and cellular biology are key fields for five of the seven institutions. Karolinska Institutet is primarily concerned with research in medicine and public health, while EPFL has a varied profile with a tendency toward physical sciences. Institut Pasteur's top four research fields fall into the category of fundamental research. The fifth, Infectious Diseases, is associated with medical research.

Using the ERC panel classification, Institut Pasteur is very strongly specialized in LS6, Immunity, Infection and Immunotherapy and to a lesser extent in LS3, Cellular, Developmental and Regenerative Biology.

Measure of scientific impact

For the entire panel of institutions covered, the normalized citation scores in the field of Life Sciences exceed the world average, ranging from 10% higher for Inserm to 110% higher for Rockefeller University. Institut Pasteur impact score is nearly 50% higher than the world average.

Impact varies from one field to the next, with the exception of Inserm and Scripps Research Institute, which show little difference between research areas. Institut Pasteur, EPFL, Institut Curie, and the Weizmann Institute of Science enjoy their highest impact index score in LS3, Cellular, Developmental and Regenerative Biology. Institut Pasteur has its lowest citation score in LS6, Immunity, Infection and Immunotherapy.

Participation in the European Research Council projects

Participation in ERC depends on the size of the institutions. The report also provides a calculation of success rates. Over the period, Crick Institute had the highest success rate among the group – a rate that was more than twice that of its home country, the United Kingdom. It was followed by Weizmann Institute with a success rate in excess of 33%. Institut Pasteur had a success rate of 18%, against a national rate of 14% for France. Institut Curie had a success rate of 32%.

Patent filing

During the 2012-21 period, Institut Pasteur filed 221 priority applications. The number of priority applications varied between 13 and 36 per year. EPFL, Scripps Research Institute, and the Weizmann Institute each filed more than 2,000 applications over the period.

Institut Pasteur first technology field by the number of patent filings is Biotechnology, accounting for 41% and 44% of the total at the EPO (European patent Office) and USPTO (United States patent and trademark Office) respectively. The second most important field is Pharmaceuticals, with 37% and 35%. The third-most significant field, Analysis of Biological Materials, is again the same for both offices with 12%. Thus, in total, these three major fields accounted for approximately 90% of the filings.

With the notable exception of EPFL, Institut Pasteur shares the same top two major technology fields (Biotechnologies and Pharmaceuticals) with each of the benchmark institutions. However, Pasteur's profile is more concentrated; its top two fields account for 78% of its filings, compared to 57% for the Weizmann Institute and 72% for Institut Curie. Scripps, Curie and Rockefeller, for instance, are more specialized in Organic Fine Chemistry than Pasteur. Crick Institute, for its part (along with EPFL), is more specialized than Pasteur and other benchmark institutions in Medical Technology (18% of its applications in 2017-21). Weizmann institute has a slightly more diversified profile than the other benchmark institutions except for EPFL.

Co- filings represent 63% of Institut Pasteur's overall filings with the EPO. About 57% of them are with other French institutions. Companies account for 10%, public and not-for-profit institutions for 57%. Between 2012-2016 and 2017-2021, the share of Institut Pasteur joint filings submitted to the EPO rose significantly from 60% to 67%.

Institut Pasteur's French partners are primarily R&D Institutions (43% of its filings in 2012-2021) and Higher Education Institutions (23%). Foreign institutions are involved in 16% of the filings. The CNRS is Institut Pasteur's most important partner, accounting for 31% of all applications. Inserm is the second-most important partner (16%). Universities such as Université Paris Cité, Paris Saclay University, and Sorbonne University also participate in joint filings (accounting for at least 10 joint applications). APHP (*Assistance Publique des Hôpitaux de Paris*), a healthcare institution, appears in fourth position. Over the 2012-21 period, three private companies submitted 5 or more co-ilings with Institut Pasteur, among them the top foreign co-applicant (Hoffman La Roche).

The report finally calculates a patent grant rate on the basis of "cohorts" of patents according to the year of filing and 6 years and a 8 years windows after EPO filing. For all fields, Institut Pasteur's 6-year grant rate was 32% for 2012-16 applications, below the average rate for EPO applications on the whole. However, it is necessary to take into account the specificities of technologies in grant rates. In Biotechnologies, Institut Pasteur's 6-year grant rate is the same as the overall EPO average, while in Pharmaceuticals, Pasteur's grant rate is below the EPO average.

Introduction

This report analyzes Institut Pasteur's scientific publications, its patents and participation in European Research Council (ERC) projects. For these three types of data, indicators are compared to the French average and to a peer group of research institutions: Institut Curie, Francis Crick Institute, Rockefeller University, Scripps Research Institute, Weizmann Institute, Ecole Polytechnique Fédérale de Lausanne (EPFL), and Karolinska Institutet. There is some variance in the size of these institutions and the range of scientific fields they cover, and this is reflected in the assessment. Comparisons with Inserm are also provided for some indicators. A brief description of each of these institutions is provided in Appendix 1.

1. Institut Pasteur's scientific publications in the national and international context

Bibliometric indicators are calculated using OST publication database, an enhanced version of the Web of Science (WoS) that is presented in the methodological appendix (Appendix 2). The version of the database used is incomplete for the 2021 publication year, and the WoS online interface was used to provide more complete aggregate figures for 2021 and 2022.

1.1 Types of publications

The corpus contains 7,475 publications. It is constituted on the basis of an annual validation of affiliation adresses carried out by Institut Pasteur with OST. This corpus includes all publications having an author in one of the Institut Pasteur's research units, no matter if this author is an employee of Institut Pasteur or an employee of a partner institution like CNRS, Inserm or a university[1].

Articles published in Scientific Journals and Conference Proceedings have been peer reviewed. Table 1 shows the distribution of the corpus by type of document. It is primarily made up of publications in scientific journals, nearly three quarters of which are original articles (73%) and 11% of which are review articles.

Table 1. Distribution of Institut Pasteur records by production type, full counting, 2017-2021*

Document type	2017	2018	2019	2020	2021*	2017-21*	%
Publications in scientific journals and Proceedings	**1,228**	**1,218**	**1,298**	**1,328**	**1,384**	**6,456**	
Article	1,050	1,008	1,076	1,113	1,178	5,425	72.6%
Review	133	172	165	163	161	794	10.6%
Letter	39	32	50	50	43	214	2.9%
Proceedings Paper	6	6	7	2	2	23	0.3%
Meeting Abstracts	**181**	**163**	**155**	**59**	**54**	**612**	
Meeting Abstract	181	163	155	59	54	612	8.2%
Book Chapters	**1**		**1**		**1**	**3**	
Book Chapter	1		1		1	3	0.0%
Other productions	**64**	**84**	**89**	**91**	**76**	**404**	
Editorial Material	50	66	67	76	58	317	4.2%
Correction	9	16	17	12	14	68	0.9%
Biographical-Item	2	1	2	2	4	11	0.1%
News Item	3	1	3			7	0.1%
Retraction				1		1	0.0%
Total publications*	**1,474**	**1,465**	**1,543**	**1,478**	**1,515**	**7,475**	**100.0%**

* Data for 2021 is approximately 95% complete

Source: OST database, computed by OST using the Web of Science.

[1] The staff of the Institut Pasteur comprised roughly 2,400 persons in 2023 (source: self-assessment report). In addition, roughly 500 persons employed by partner institutions worked in the Institut Pasteur's research units in 2023, on permanent or non-permanent positions.

The version used for this study was updated in 2022, and the data is not entirely comprehensive for 2021. Accordingly, for 2020, 2021, and 2022, OST also supplies the number of publications obtained from the WoS online database[2], which was more up to date at the time of the study (Table 2). The corpus in the online WoS database is made by querying the address field with Institut Pasteur institutional names or by searching the Organization-Enhanced field containing the information attributed to Institut Pasteur by Clarivate Analytics.

The total number of publications between Tables 1 and 2 is essentially identical for 2020 and 2021. However, the OST database is only 95% complete for 2021, meaning that the corpus obtained with the WoS online platform is more exhaustive than the one made by searching for institutional names and via the Organization-Enhanced field. However, WoS figures show a decline in the number of publications in 2022 compared to 2021. This is not specific to Institut Pasteur, instead reflecting a general trend in French biomedical research after increases in 2020 and 2021 due to the COVID-19 pandemic.

Table 2. WoS on line publications of Institut Pasteur by production type, full counting, 2020-2022

Document type	2020	2021	2022
Scientific journals and Proceedings	**1,336**	**1,372**	**1,140**
Article	1,116	1,162	992
Review	162	158	109
Letter	50	41	27
Proceedings Paper	8	11	12
Meeting Abstracts	**60**	**66**	**115**
Meeting Abstract	60	66	115
Book Chapters	**7**	**6**	**6**
Book Chapter	7	6	0
Other productions	**94**	**81**	**100**
Editorial Material	76	61	65
Correction	11	14	10
Early access	3	1	20
Data paper	2	0	1
Biographical-Item	2	4	4
News Item	0	1	0
Retraction	1	0	
Total number of publications*	**1,480**	**1,518**	**1,333**

** In on line version of Web of Science, publications can belong to more than one type of document: summing the lines could imply double counting*

Source: on line Web of Science extraction (end October 2023)

In this part, indicators are calculated using OST publications database. The corpus includes articles (including conference proceedings) and review articles (see Appendix 2). The period covered is from 2017 to 2021. For some indicators, the entire period is covered, while for others only some years are.

Table 3 shows that the share of document types considered as "articles", when compared to the total output produced by the peer institutions, can differ from that of Institut Pasteur. Because of this, the share of publications accounted for in the calculation of indicators varies from one institution to another, from 66% of all publications for Institut Curie to 90% for the Weizmann Institute of Science. Among other factors, this divergence can be explained by the fact that the institutions most involved in medical research produce more "meeting abstract" type of documents than those more involved in fundamental research. This is notably the case for Institut Curie, which accounts for over a quarter of publications of this type, as well as Karolinska Institutet and Scripps Research Institute, which account for over 15%.

[2] Identified by querying the WoS address field using the institutional names approved by Institut Pasteur (AD=((("Inst Pasteur" or "Pasteur Inst") same (Paris or lyon or french guiana or guadeloupe)) or "UMR 3523" or "UMR 3525" or "UMR 3528" or U668 or U760 or U786 or U818 or U874 or U994 or "ERL 3526" or UMR3523 or UMR3525 or UMR3569 or URA3012 or URA3015 or URA2582 or URA2581 or UMR604 or UMR668 or UMR760 or UMR818 or UMR874 or (("Inst Audit" or "Hearing Inst") same paris)), in addition to the Organization-Enhanced field (OG = (Institut Pasteur Paris))

Table 3. Distribution of document type used the calculation of indicators, by institution, 2017-21*

Institution	Article	Proceedings Paper	Review	Share of documents used for calculations (%)
Institut Pasteur (FR)	**72.6%**	**0.3%**	**10.6%**	83.5%
Institut Curie (FR)	56.0%	0.6%	9.2%	65.7%
EPFL (CH)	73.4%	16.7%	3.9%	93.9%
Francis Crick Institute (GB)	68.8%	0.4%	10.7%	79.9%
Karolinska Institutet (SE)	68.7%	0.3%	8.3%	77.3%
Rockefeller University (US)	69.1%	0.5%	7.4%	76.9%
Scripps Research Institute (US)	67.3%	0.2%	8.0%	75.5%
Weizmann Institute (IL)	78.5%	5.6%	5.7%	89.8%

* Data for 2021 is approximately 95% complete

Source: OST database, computed by OST using the Web of Science.

1.2 Trends in publications between 2017 and 2021

Changes in the number of publications produced by different institutions are analyzed both in terms of overall publications and in terms of life science publications specifically. The field classification system used is based on the European Research Council panels in the area of Life Sciences (LS).

In order to account for the fact that publications are, to a large extent, co-publications (see Section 1.3 below), the indicators in this report are generally calculated on the basis of a fractional count, as described in Text Box 1.

Text Box 1. Counting scientific publications

A publication is counted in its entirety (1) for an institution when the institution appears in the list of the affiliation addresses. Whole counting takes into consideration the participation of each of the institutions. Given that a publication is counted as many times as there are addresses of affiliation, the sum of individual participants leads to duplicates, and the whole count is not additive.

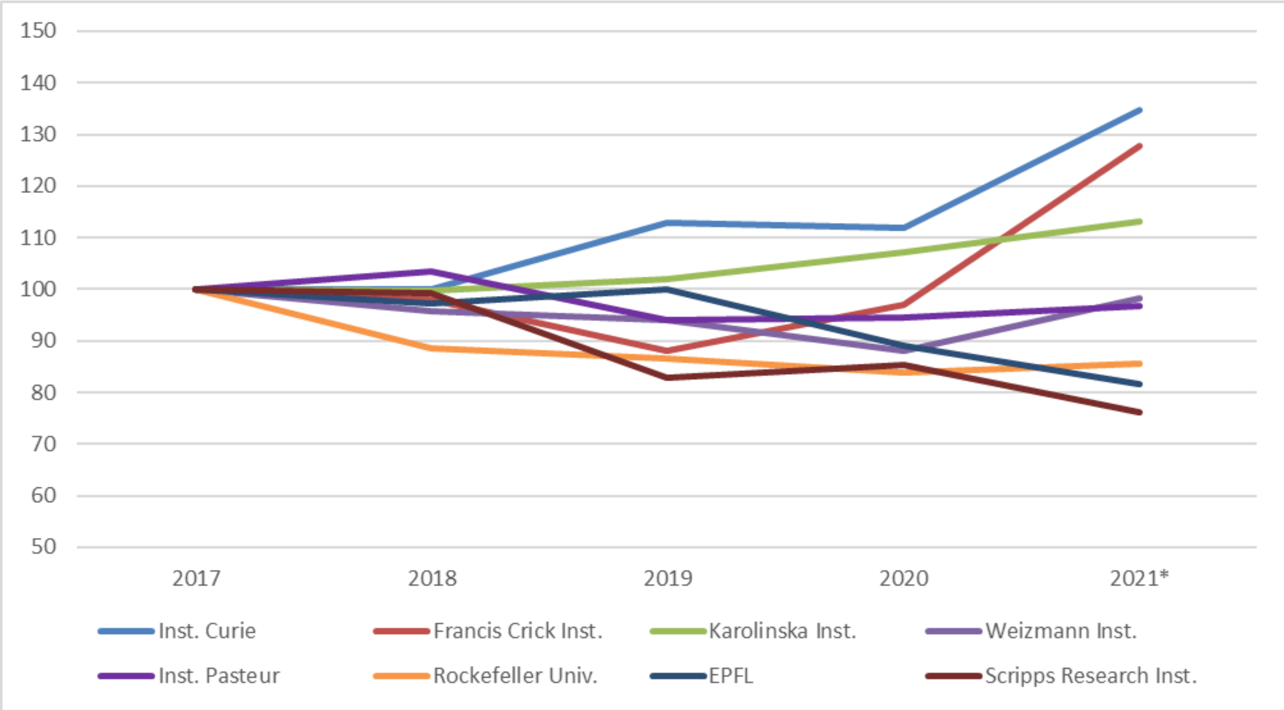
In order to account for the various contributions, fractional counting allocates a portion of the publication to each of the affiliation addresses by counting 1/*n* for each of them, where *n* is the total number of addresses listed for the publication. The fractional count is additive, rendering it possible to calculate shares of publications – in a single country, for instance – without yielding any duplicates. It also makes it possible to account for different collaboration practices in different research fields and to eliminate bias when comparing between fields (fields with numerous collaborations have more publications, but not necessarily more individual contributions).

Fractional counting is also used between different fields or disciplinary categories to adjust for the fact that publication media can be attributed to multiple categories.

Source and additional information: methodology in Appendix 2.

Figures 1 and 2 show that the change in the number of publications between institutions is similar for all fields and for the field of Life Sciences alone. Institut Curie, Francis Crick Institute, and Karolinska Institutet saw an increase in publications of 15% to 45% in both cases. Institut Pasteur and the Weizmann Institute occupy a middle position with relatively stable publication numbers. The three remaining institutions saw a decline in their publications numbers over the period. It should be noted that, given the fact that these numbers concern contributions to publications using fractional counting, this decline may in some cases be partially due to an increase in co-publications and a higher number of authors per publication.

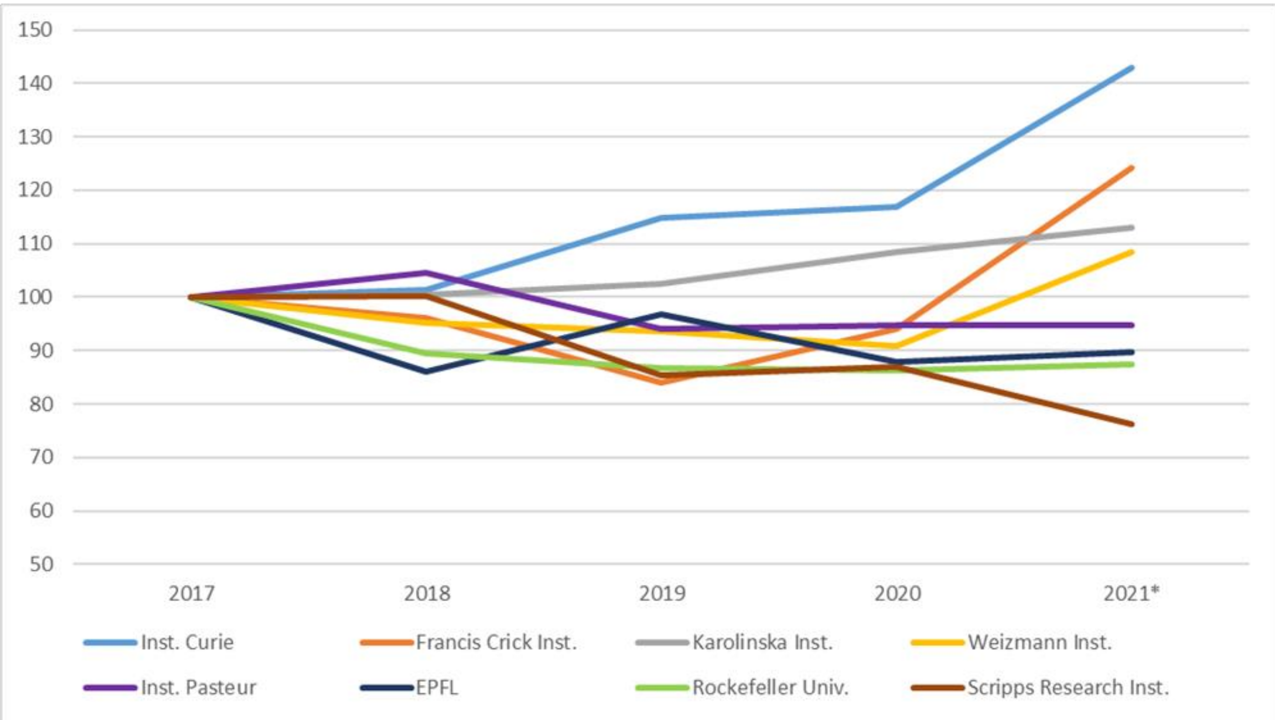
Figure 1. Evolution of the number of publications, Institut Pasteur and benchmark institutions, fractional counting, 2017-21*



* Data for 2021 is approximately 95% complete

Source: OST database, computed by OST using the Web of Science.

Figure 2. Evolution of the number of publications, Institut Pasteur and benchmark institutions, in Life Sciences (LS), fractional counting, 2017-21*



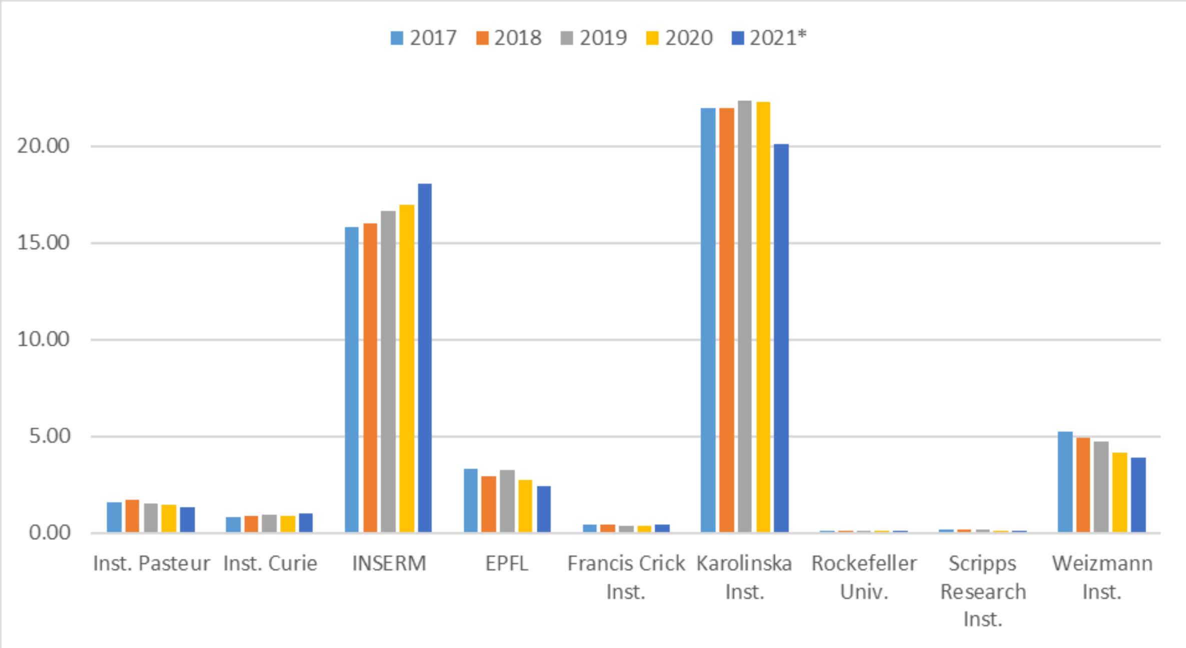
* Data for 2021 is approximately 95% complete

Source: OST database, computed by OST using the Web of Science.

Figure 3 shows the national share of publications by institutions in the field of life sciences. It underscores the diversity of the institutions being compared, with Institut Pasteur, Inserm, and (to a lesser extent) the Weizmann Institute accounting for a much higher national share than the other institutions.

Between 2018 and 2021, Institut Pasteur's share fell from 1.7% to 1.3% of overall life science publications in France, while Institut Curie's national share in this field rose from 0.8% to 1%.

Figure 3. National share of scientific publications, Institut Pasteur and benchmark institutions, in Life Sciences (LS), fractional counting, 2017-21*



* Data for 2021 is approximately 95% complete

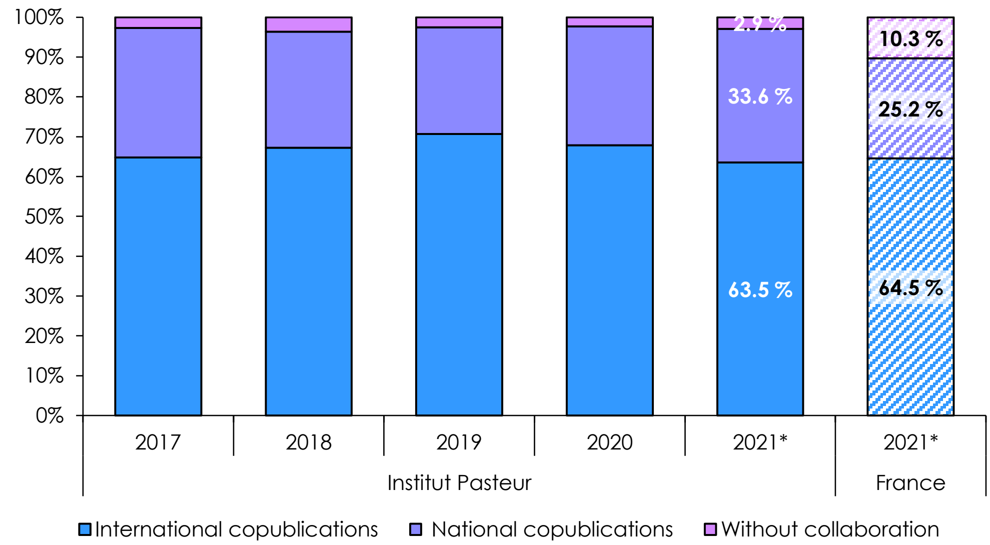
Source: OST database, computed by OST using the Web of Science.

1.3 National and international co-publications

Publications generally have multiple authors, including foreign co-authors. Most of Institut Pasteur's publication output consists of joint publications. Less than 3% of its publications were not jointly authored in 2020, far below the figure of 10% for France as a whole in all research fields during the same year (Figure 4).

The share of international co-publications was lower than that of the rest of France in 2021, and it decreased in 2020 and 2021. However, Institut Pasteur's share of national co-publications has been on the rise since 2020, representing nearly 34% of its output in 2021 – 8% higher than the rest of France.

Figure 4. Proportion of co-publications, Institut Pasteur and France, full counting, 2017 à 2021*

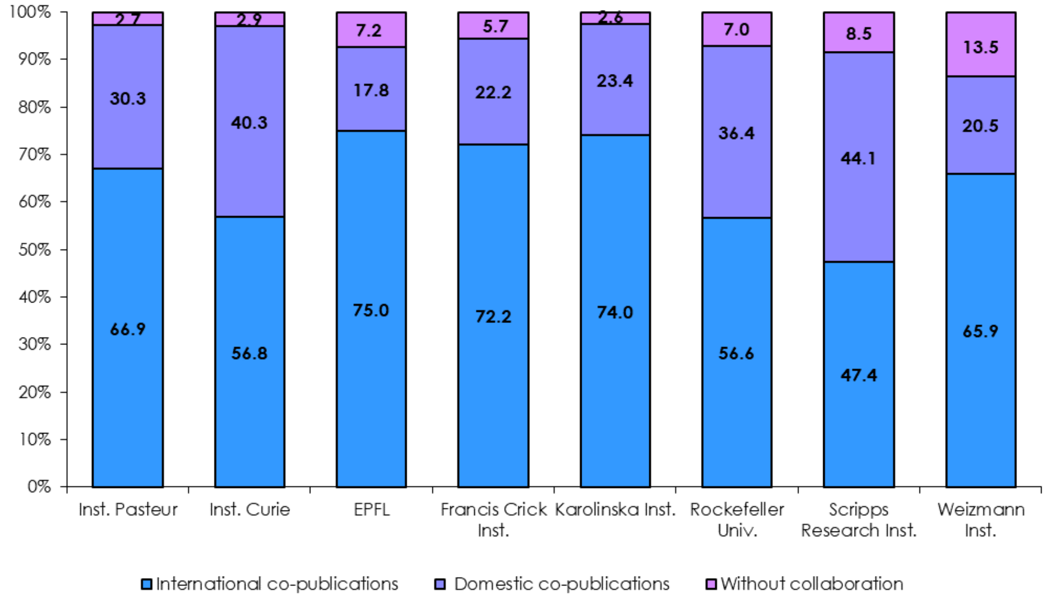


* Data for 2021 is approximately 95% complete

Source: OST database, computed by OST using the Web of Science.

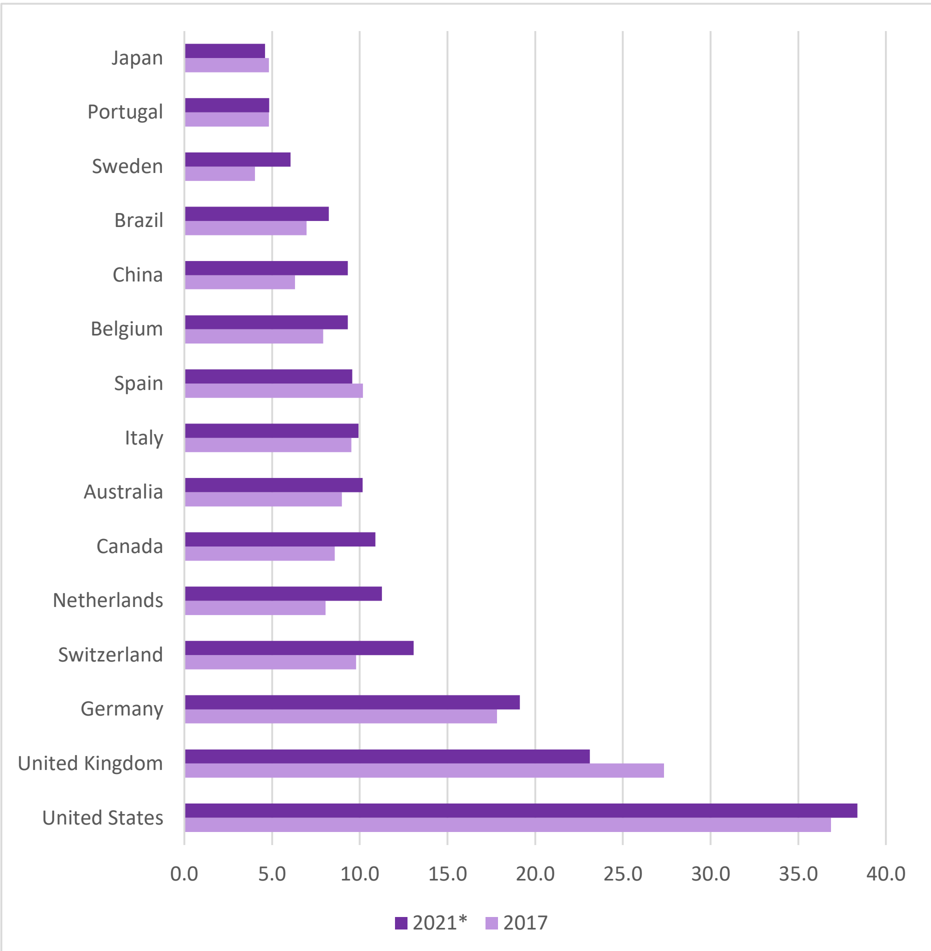
The share of international co-publications fluctuates widely between research institutions. It ranges from 47% for Scripps Research Institute to 75% for EPFL (Figure 5). These variations can be explained both in terms of national specificities (large countries tend to have lower shares) and by the fact that applied research is generally conducted on a more local level. This helps explain why Scripps Research Inst. and Rockefeller University have an international co-publication rate that is far lower than those of EPFL, Karolinska Institutet, or Francis Crick Inst.

Figure 5. Share of co-publications, Inst. Pasteur and benchmark institutions, Life Sciences, full counting, 2017-21*



* Data for 2021 is approximately 95% complete; *Source: OST database, computed by OST using the Web of Science.*

Figure 6. Top 15 scientific partner countries of Institut Pasteur, 2017 and 2021*, in Life Sciences, full counting



* Data for 2021 is approximately 95% complete; *Source: OST database, computed by OST using the Web of Science.*

The top countries that Institut Pasteur co-publishes with in the field of Life Sciences are the United States (38% of its co-publications– followed by the United Kingdom (23%) and Germany (19%, Figure 6). Among the top 15 partner countries, only the United Kingdom showed a marked decline in its share of co-publications between 2017 and 2020, likely due to the country's departure from the European Union.

1.4 Open-access publication

Open-access publication has seen significant expansion, but it continues to vary widely between different scientific fields. To compare countries and institutions, the open access index normalizes the share of open access publications by the world average for each research field; the worldwide neutral value used for this index is equal to 1.

Institut Pasteur's share of open-access publications was on the rise until 2020, when it reached 87%, before going on to fall to 84% in 2021 (Table 4). However, Institut Pasteur's open access index score remained stable over the 2017-21 period, a full 30% higher than the world average.

Table 4. Open access publications, Institut Pasteur, 2017-21*, full counting

	2017	2018	2019	2020	2021*	2017-21*
Open acces shares (%)	80,7	83,2	85,7	87,2	84,0	83,9
Open access index	1,3	1,3	1,3	1,3	1,3	1,3

** Data for 2021 is approximately 95% complete*
Source: OST database, computed by OST using the Web of Science.

2. Scientific profile of Institut Pasteur publications

The institutions being compared cover varying scientific fields. Biochemistry, molecular biology, and cellular biology are key fields for five of the seven institutions (Table 5). Among the other two, EPFL has a varied profile that with a tendency toward physical sciences, and Karolinska Institutet is primarily concerned with research in medicine and public health.
Institut Pasteur's top four research fields fall into the category of fundamental research. The fifth, Infectious Diseases, is associated with medical research. Among its top publication areas, Institut Pasteur boasts a particularly strong specialty in Microbiology, Immunology, and Infectious Diseases.

Institut Curie has a more clinical profile, with Oncology and Radiology, Nuclear Medicine, and Medical Imaging accounting for almost a third of its publication output. Institut Curie is also heavily specialized in Cellular Biology (14%), even if Francis Crick Institute is to an even greater extent (19%). Rockefeller University, Scripps Research Institute, and the Weizmann Institute of Science are also specialized in Cellular Biology, but have more varied profiles.

Figures 7 and 8 use the field classification system of the European Research Council panels to offer a more synthetic view of the profile of Institut Pasteur and its peers in the comparison group. Appendix 2 provides the names of the sub-domains of the Life Sciences (LS) domain. The four sub-domains in Figures 7 and 8 are LS1 (Molecules of life: biological mechanisms, structures and functions), LS2 (Integrative biology; from genes and genomes to systems), LS3 (Cellular, developmental and regenerative biology), and LS6 (Immunity, infection and immunotherapy).

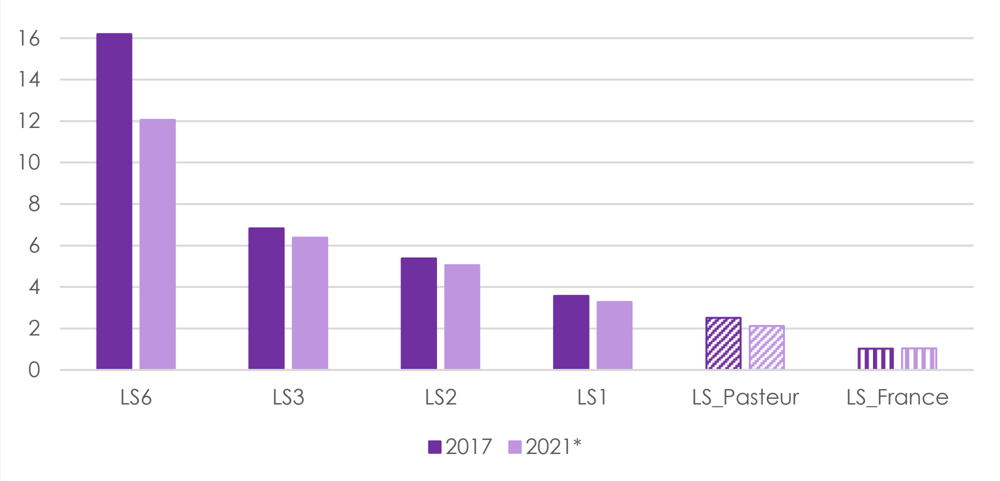
Over 90% of Institut Pasteur's publications fall into the category of Life Sciences, for which it is twice as specialized as France overall (Figure 7). It is in the field of Immunity and Infection (LS6) that Institut Pasteur is most specialized, with indices of 16 in 2017 and 12 in 2021. Institut Pasteur is also highly specialized in Cellular Biology (LS3) and Integrative Biology (: from Genes and Genomes to Systems) (LS2), with indices ranging from 5 to 7.

Table 5. Distribution and specialization index of publications for 5 top WoS categories by institution, 2017-21* (fractional counting)

WoS category	Number of publications	Mean annual number	Shares	Specialization index
	Institut Pasteur			
Microbiology	**305**	**61**	**15.8%**	**17.4**
Biochemistry and Molecular Biology	**211**	**42**	**11.0%**	**5.9**
Immunology	**176**	**35**	**9.2%**	**11.0**
Cell Biology	**144**	**29**	**7.5%**	**7.3**
Infectious Diseases	**130**	**26**	**6.8%**	**13.7**
	Institut Curie			
Oncology	329	66	26.7%	13.6
Cell Biology	173	35	14.1%	13.7
Biochemistry and Molecular Biology	107	21	8.7%	4.6
Radiology, Nuclear Medicine & Medical Imaging	64	13	5.2%	6.7
Immunology	48	10	3.9%	4.7
	EPFL			
Engineering, Electrical & Electronic	937	187	10.4%	2.5
Chemistry, Multidisciplinary	552	110	6.1%	2.5
Material Science, Multidisciplinary	488	98	5.4%	1.8
Physics, Applied	337	67	3.7%	2.1
Chemistry, Physical	304	61	3.4%	2.1
	Francis Crick Institute			
Biochemistry and Molecular Biology	162	32	20.3%	10.9
Cell Biology	152	30	19.0%	18.6
Biology	59	12	7.4%	15.9
Immunology	58	12	7.2%	8.7
Developmental Biology	46	9	5.8%	45.5
	Karolinska Institute			
Oncology	670	134	6.1%	3.1
Public, Enviromental & Occupational Health	577	115	5.2%	3.8
Neurosciences	540	108	4.9%	3.6
Immunology	437	87	4.0%	4.8
Cardiac & Cardiovascular Systems	417	83	3.8%	4.2
	Rockefeller University			
Biochemistry and Molecular Biology	154	31	15.0%	8.0
Cell Biology	120	24	11.7%	11.4
Neurosciences	104	21	10.1%	7.4
Immunology	73	15	7.1%	8.5
Biology	64	13	6.3%	13.43
	Scripps Research Institute			
Biochemistry and Molecular Biology	352	70	18.2%	9.7
Chemistry, Multidisciplinary	292	58	15.1%	6.0
Cell Biology	121	24	6.3%	6.1
Neurosciences	115	23	5.9%	4.3
Immunology	98	20	5.1%	6.1
	Weizmann Institute			
Biochemistry and Molecular Biology	259	52	8.0%	4.3
Chemistry, Multidisciplinary	212	42	6.6%	2.6
Physics, Multidisciplinary	183	37	5.7%	5.5
Cell Biology	173	35	5.4%	5.2
Mathematics	133	27	4.1%	3.7

* Data for 2021 is approximately 95% complete; *Source: OST database, computed by OST using the Web of Science.*

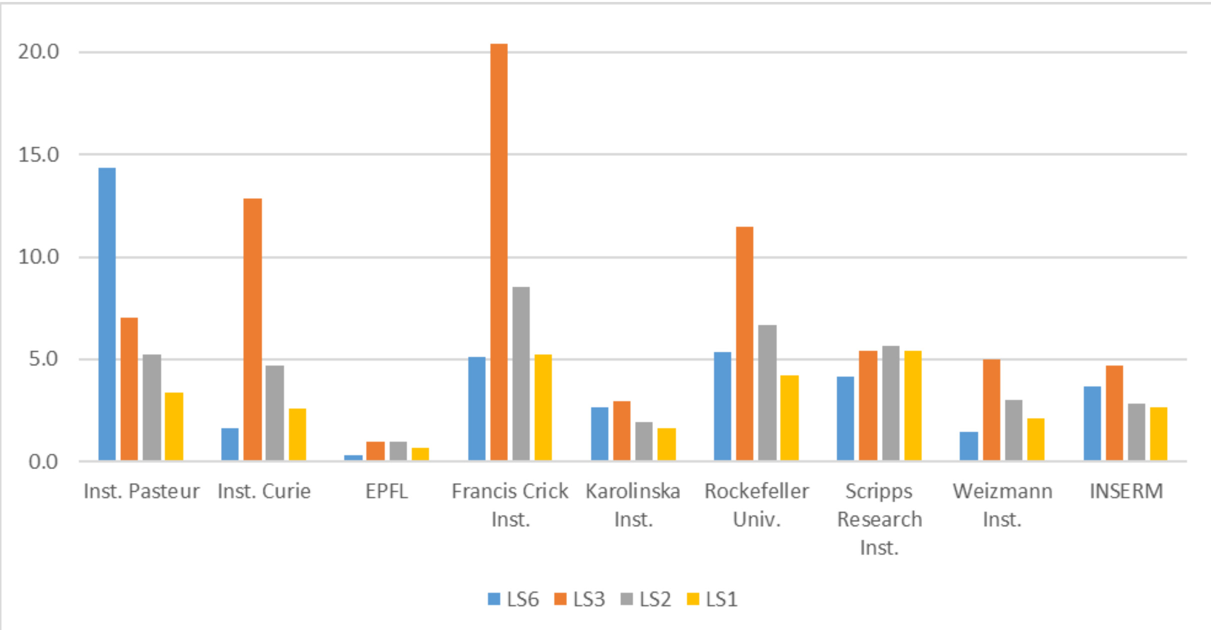
Figure 7. Specialization index of Institut Pasteur publications, LS and main sub-domains, 2017 et 2021*



* Data for 2021 is approximately 95% complete
Source: OST database, computed by OST using the Web of Science.

Figure 8 shows that, with the exception of EPFL, the institutions in the comparison group are all specialized in Institut Pasteur's strongest fields of specialization. Institut Pasteur had the highest specialization index in LS6 for the 2017-21 period, followed by Rockefeller University and Francis Crick Institute with indexes of 5. Three institutions are more specialized in LS3 than Institut Pasteur: Francis Crick Institute, Institut Curie, and Rockefeller University, each with indexes that exceed 10.

Figure 8. Specialization index of Institut Pasteur and benchmark institutions publications for Pasteur's main panels, 2017-21* (fractional counting)



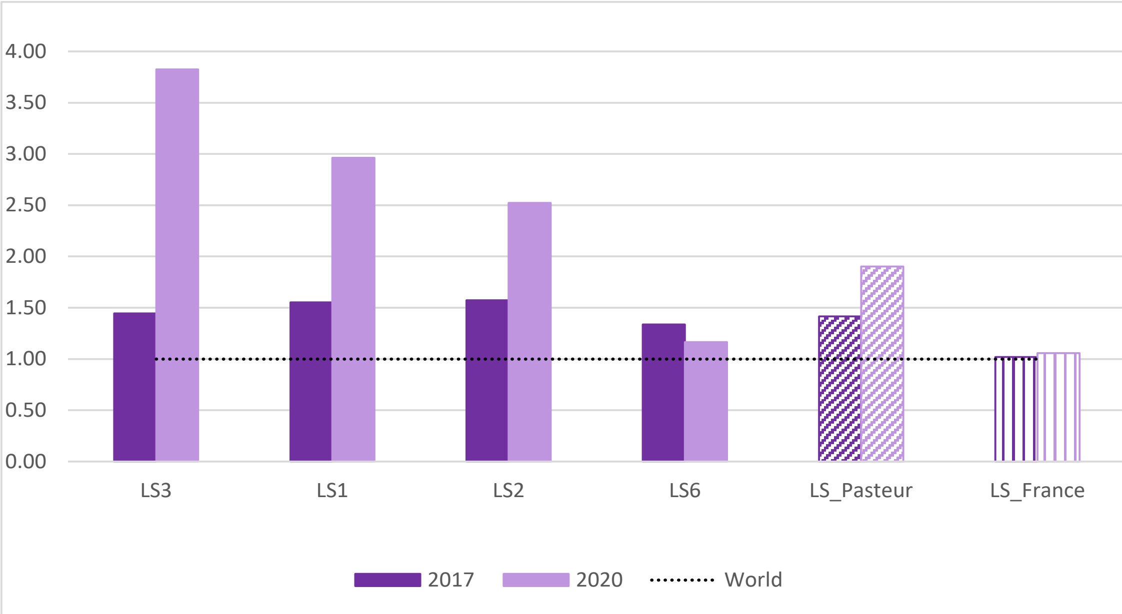
** Data for 2021 is approximately 95% complete*
Source: OST database, computed by OST using the Web of Science.

3. Measure of the scientific impact of publications

This part presents the impact indicators as they have been calculated when this report was produced. Recently an updated version of the data base has become available and appendix 6 provides updated impact indicators. They are slightly different for the whole field of life sciences, but more so for some sub-domains. This is not only due to the update, but also to the fact that the data base is both larger and has a more precise classification of publications. The results and changes in the data base are presented in Appendix 6.

Institut Pasteur's publication impact index in Life Sciences rose from 1.4 in 2017 to 1.9 in 2020 (Figure 9). At 90% above the world average, Institut Pasteur index far exceeds that of France as a whole. The impact index for the LS3 sub-domain saw the most significant increase, reaching 3.8 in 2020. The impact index for LS6 has on the contrary slightly decreased to reach 1.2 in 2020.

Figure 9. Impact index of Institut Pasteur publications by LS* panels for 2017 and 2020 (fractional counting)



Source: OST database, computed by OST using the Web of Science.

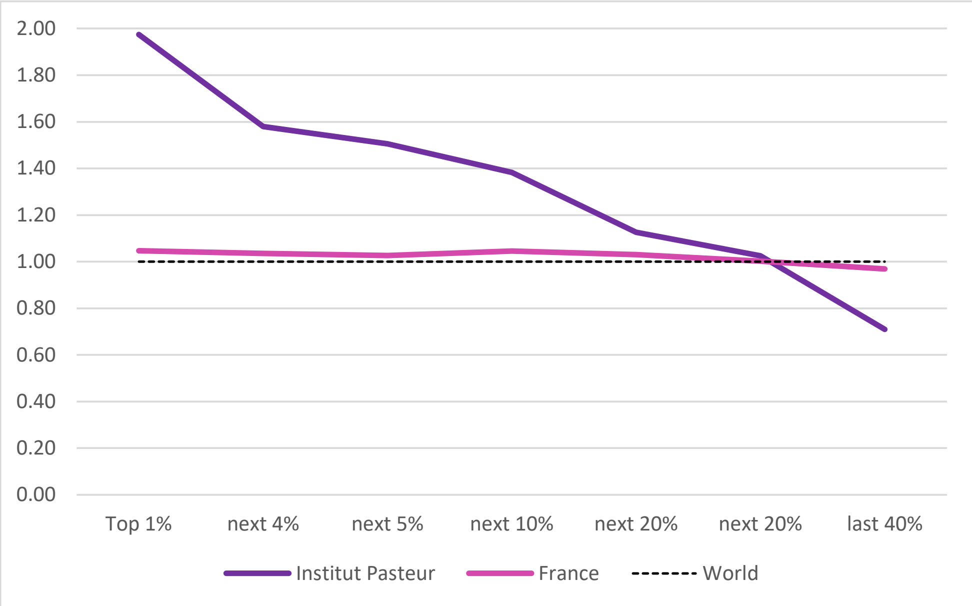
For the entire panel of institutions covered, all of the impact index in the field of Life Sciences exceed the world average, ranging from 10% higher for Inserm to 110% higher for Rockefeller University (Figure 10). Their impact varies from one field to the next, with the exception of Inserm and Scripps Research Institute, which show little to no variation between the four research areas. Institut Pasteur, EPFL, Institut Curie, and the Weizmann Institute of Science enjoy a higher impact index in LS3 (compared to 1.9 for Institut Pasteur, 1.8 for the Weizmann Institute, and 1.7 for the others). Karolinska Institutet's impact index is strongest in LS2 (1.4), Francis Crick Institute's in LS1 (2), and Rockefeller University's in LS6 (1.4).

Figure 10. Impact index of Institut Pasteur publications and of benchmark institution publications, for Pasteur's main panels, 2017-20

Source: OST database, computed by OST using the Web of Science.

Figure 11 shows that, for the most frequently cited class of publications in the field of Life Sciences, Institut Pasteur has an activity index score higher than both the world average (represented in this index as 1) and the French average. It also shows Institut Pasteur's high activity index score in the top three classes, particularly in the Top 1%, which is 100% higher than the global average.

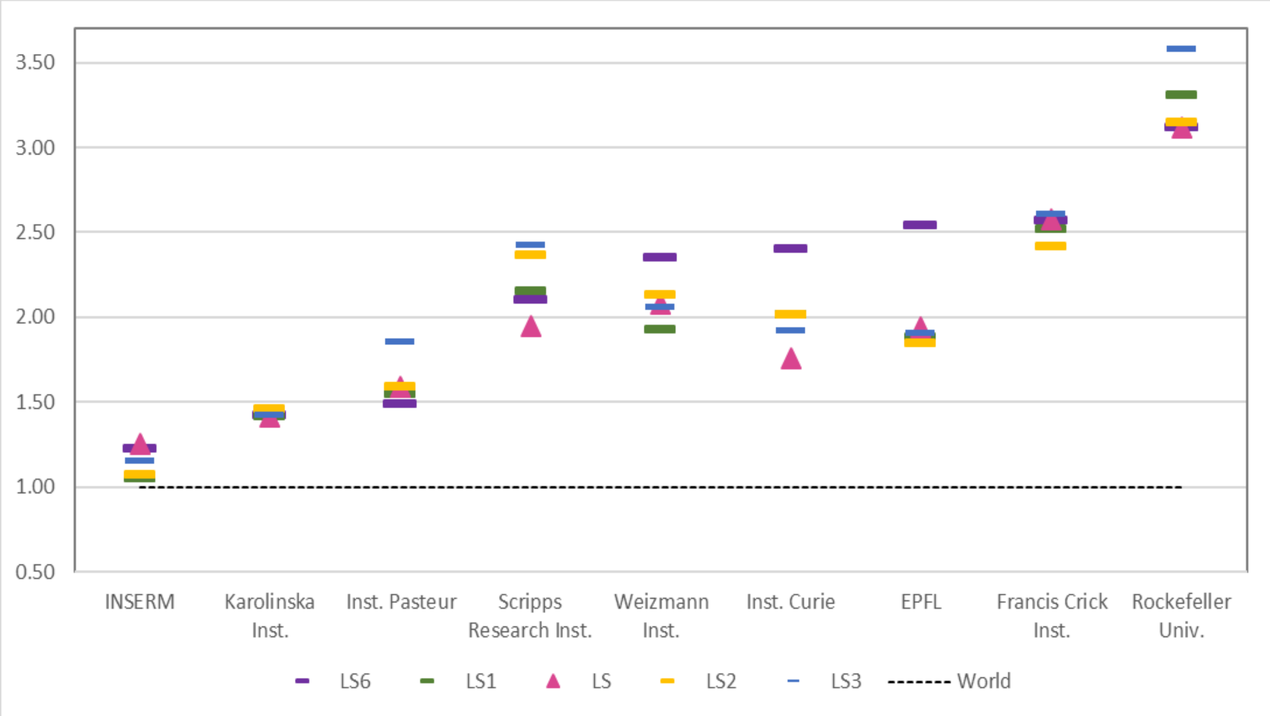
Figure 11. Activity index in citation classes for Institut Pasteur and France in Life Sciences, 2017-20 (fractional counting)



Source: OST database, computed by OST using the Web of Science.

Each compared institution has an activity index score in the Top 10% that is higher than the world average for the Life Sciences field, ranging from 40% higher for Karolinska Institutet to 210% higher for Rockefeller University (Figure 12). The highest activity index score for Institut Pasteur is for LS3, at 1.8. The others are between 1.5 (LS6) and 1.6 (LS2). Scripps Research Institute, Francis Crick Institute, and Rockefeller University also have the highest activity index scores in LS3. Institut Curie, the Weizmann Institute of Science, and EPFL have the highest activity index scores in LS6.

Figure 12. Activity index in Top 10% publications for Institut Pasteur and benchmark institutions, for Pasteur's main panels, 2017-20 (fractional counting)



Source: OST database, computed by OST using the Web of Science.

4. Participation in European Research Council projects

The European Commission's e-Corda database details participation from both public- and private-sector entities in all funding programs offered under the H2020 program (8th "European Framework Program for Research and Innovation" or FP8) and the Horizon Europe program (FP9). This database can be used to measure the success rate per applicant, the number of projects for which funding has been secured, the amount of funding obtained by each applicant, and the breakdown of applicants' results by ERC panel, type of instrument, pillar/program, etc.

This analysis is based on the June 2023 version of database (for H2020 and Horizon Europe) and focuses on projects funded by the European Research Council or ERC.

The calculations only take beneficiaries[3] into consideration. The numbers used cover projects and participation for beneficiaries alone (participants can fall into different categories: BENEFICIARY, THIRDPARTY, PARTNERORGANIZATION, ASSOCIATEDPARTNER, etc.). The term "beneficiary" refers to the legal entity that enters into a Grant Agreement with the European Union (EU), represented by the European Commission or any other European Union funding agency.

The assessment covers the period from 2018 to 2022; projects are considered to belong to the year in which their Call for Proposals was closed. Canceled projects and "blocked" participants (such as those in bankruptcy proceedings) are not included in the assessment. Participants whose partner_removal_status is not empty (participants who have left a project) are also excluded.

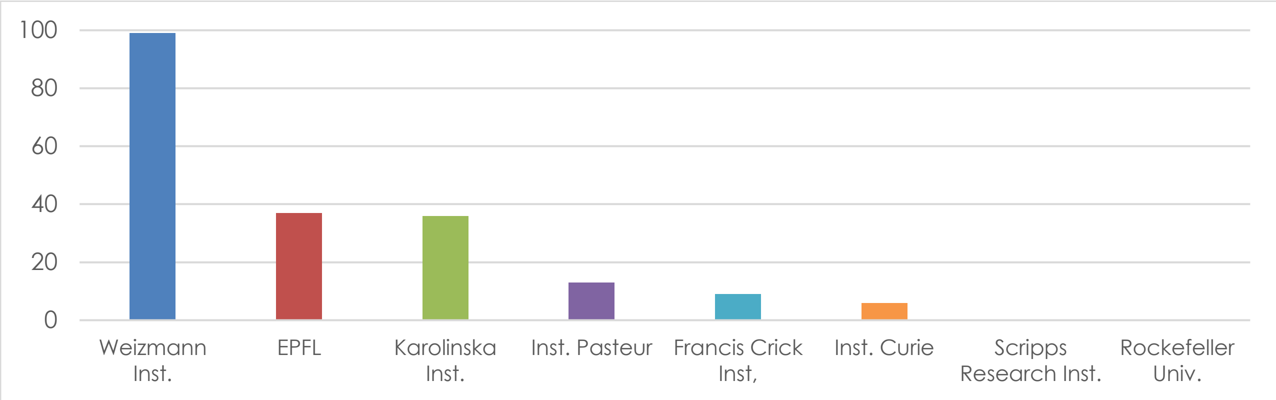
Figure 13 shows the number of grants awarded to Institut Pasteur and its peers in the comparison group. Weizmann Institute received 99 grants, followed by EPFL with 37 grants and Karolinska Institutet with 36. Institut Pasteur was awarded only 13 grants[4] between 2018 and 2022, representing just 6.6% of the total. Scripps Research Institute and Rockefeller University did not receive ERC funding for projects between 2018 and

[3] The attribution of a project to a beneficiary is based on the latest information entered in the "BENEFICIARY" field in the data table. The withdrawal of a given entity from an ERC project for any reason, as well as its replacement by a new beneficiary, results in the suspension of the attribution of this project to the entity (see, for example, the following Institut Pasteur project: https://cordis.europa.eu/project/id/804744).

[4] On this point, Institut Pasteur points out that the number of grants is higher (21 grants) if we count researchers receiving an ERC grant who conduct their research at Institut Pasteur, but for whom the institute did not submit an application. These grants are managed within the framework of an agreement signed between the beneficiary entity (generally the CNRS or INSERM) and Institut Pasteur.

2022 – though this is understandable, given that they are American institutions. Some explanations for these significant discrepancies can be found in the size of certain institutions (such as Karolinska Institutet), the range of themes on offer (Institut Curie), and the diversity of the institutions' disciplinary profile (EPFL, Karolinska Institutet, etc.).

Figure 13. Number of ERC grants by beneficiary, 2018-2022



Notes: Grants are assigned to the closing year of the corresponding call for proposals. For 2021, sum of applications under H2020 and Horizon Europe.
Data processing is based on the last update of the beneficiary field in the database.
The projects "article 185" (P2P) are not included.
Source: e-corda database (consulted in Jun. 2021 for H2020 and Horizon Europe), computed by OST.

In terms of ERC panels (Table 6), 77% of Institut Pasteur's grants fall under the umbrella of Life Sciences (LS) and 8% are in Social Sciences and Humanities (SH). All of Francis Crick Institute's grants are in the LS domain. A significant share of grants (73%) in the field of Physical Sciences and Engineering (PE) set EPFL apart from the other institutions in the group. Stepping back, a broad overview of the various institutions reveals that 54% of the total (107 grants) belong to the LS domain, while a further 31% belong to the PE domain and a mere 3% to the SH domain. There was no ERC panel information in the database used for the remaining 13% of grants.

Table 6. Share of ERC grants by ERC domain, 2018-22

	LS	**PE**	**SH**	**Panel not specified**	**Total**
Weizmann Institute	51%	33%	1%	15%	100%
EPFL	14%	73%	3%	11%	100%
Karolinska Institutet	78%	3%	6%	14%	100%
Institut Pasteur	77%	0%	8%	15%	100%
Francis Crick Institute	100%	0%	0%	0%	100%
Institut Curie	83%	0%	0%	17%	100%
Total	**54%**	**31%**	**3%**	**13%**	**100%**

Note: Some grants don't have ERC panel information. The percentage is calculated on the total number of grants
Source: e-corda database (consulted in Jun. 2021 for H2020 and Horizon Europe), computed by OST.

Table 7 provides the success rate[5] over the period in question for the institutions and their home country. Francis Crick Institute had the highest success rate among the group – a rate that was more than twice that of its home country (the United Kingdom). It was followed by Weizmann Institute and Rockefeller University, which each had success rates in excess of 33%. Institut Pasteur beat the national success rate by 3%, while Institut Curie did so by a margin of over 15%. With the exception of Scripps Research Institute, each of the institutions had a success rate higher than the national average of all countries participating in ERC projects (Karolinska Institutet achieved slightly better results than the observed average). The table also shows which institutions submitted the most grant applications in response to ERC calls for proposals. The most prolific applicants are, in order, Weizmann Institute, Karolinska Institutet, and d'EPFL. Together, these three institutions singlehandedly account for 84% of the total applications submitted between 2018 and 2022.

[5] Due to changes that can occur during the life of a research project (the arrival of a new beneficiary, the departure of an existing beneficiary, mergers between two or more institutions, etc.), calculating this indicator between both the "Projects" and "Proposals" tables can prove to be a complex undertaking. Accordingly, for calculation purposes, a clear choice was made to use only the "Proposals" dataset.

Table 7. ERC success rates* for institutions and country of origin 2018-22

	Success rate 2018-22	Success rate of home country	Number of applications from the institution
Francis Crick Institute	38.3%	14.6%	47
Weizmann Institute	33.7%	20.2%	261
Institut Curie	31.8%	14.1%	22
EPFL	21.2%	18.2%	208
Institut Pasteur	17.6%	14.1%	68
Karolinska Institutet	13.1%	11.9%	251
Total	**23.4%**	**13.1%****	**854**

* Success rate is calculated as the rate between accepted applications (on main list) on the total applications in the same "Proposals" dataset (but not in Grants dataset).
** Average success rate for ERC projects, all countries
Source: e-corda database (consulted in Jun. 2021 for H2020 and Horizon Europe), computed by OST.

5. Institut Pasteur patent applications

The OST patent database is a home version of the PatStat database from the European patent office (EPO). It is supplemented with information from the Organization for Economic Co-operation and Development's RegPat database and from the French patent office INPI (*Institut National de la Propriété Industrielle*).[6] The analysis is based on the spring 2023 version of PatStat.

The PatStat database includes priority filings, as well as extension filings for published applications. The priority filing of a patent application is the first application filed to protect an invention. The Paris Convention for the Protection of Industrial Property provides a period of one year from the date of priority filing (priority date) to extend the application to other countries that have signed the Convention. Each initial filing generates a family, which may consist of a single filing or of several patents filed in different patent offices. OST enriches the PatStat database and fills in some missing information (inventors, applicants, technology fields) using information either from the family or from previous updates to the database. If the data cannot be completed, the application is not included in the final OST database; this situation mainly occurs for Asian offices.

5.1. Priority applications and patent extensions

Patent filings from Institut Pasteur were identified in the OST patent database using its various spellings in the applications. In line with the overall evaluation process, foreign Institut Pasteur sites were excluded from the analysis. The list of identified patents was then checked by Institut Pasteur's *Direction des Applications de la Recherche et des Relations Industrielles*.

Indicators were compared with those of the set of benchmark institutions:

- Institut Curie (FRA)
- Francis Crick Institute (UK)
- EPFL (Ecole Polytechnique Fédérale de Lausanne) (CH)
- Rockefeller University (USA)
- Scripps Research Institute (USA)
- Weizmann Institute (ISR)

Due to a specificity of the Swedish patent law system, OST has been unable to identify patent applications from Karolinska Institutet.

During the 2012-21 period, Institut Pasteur filed 221 priority applications. The number of priority applications varied between 13 and 36 per year, with the highest number filed in 2020 (Table 8). The decrease observed in 2021 is due to the fact that the database is incomplete. In total, Institut Pasteur recorded 861 extensions to its priority filings between 2012 and 2021. Institut Pasteur does not file applications (even priority applications) with the French patent office (INPI).

Table 8. Institut Pasteur priority patent applications, 2012-2021 and extensions, priority year (full counting)

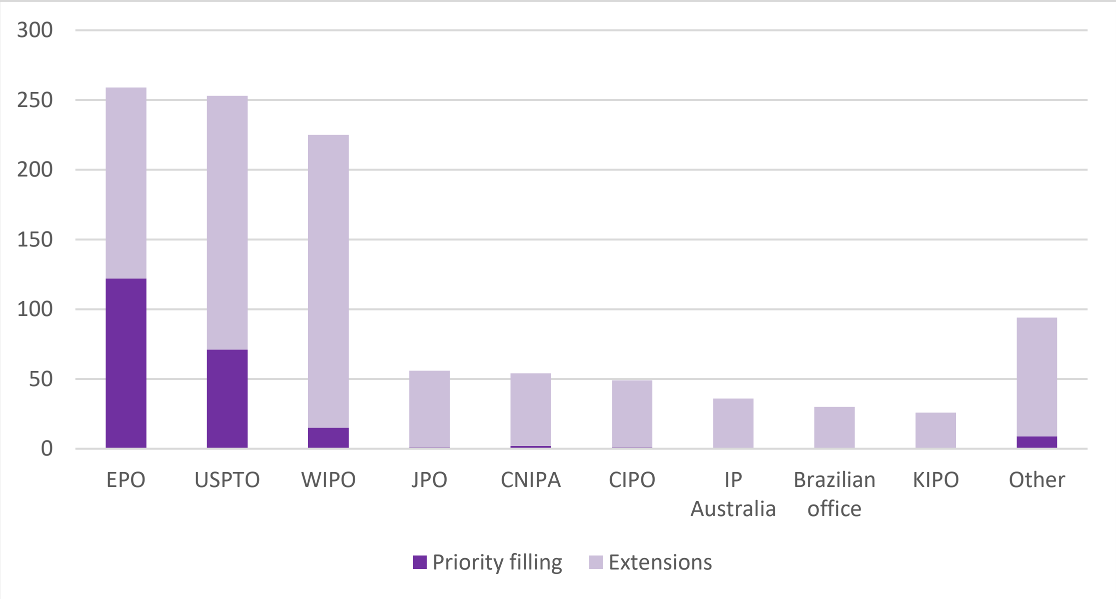
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021*	*2012-21*
Priority filing	16	19	33	26	24	25	15	14	36	13	***221***
Extensions	77	115	143	110	112	107	53	55	75	14	***861***

[6] The methodology used is presented in the appendices.

* For 2021, the version of PatStat that was used had not included all data, especially for extensions.
Source: OST database, computed by OST using PatStat.

Figure 14 shows that Institut Pasteur's total applications (priority and extensions) are primarily filed with the EPO (259) and the USPTO (253). Institut Pasteur also filed over 200 applications with the WIPO (World Intellectual Property Organization) during the period. The other offices accounting more than 25 filings are the Japanese office (JPO), the Chinese office (CNIPA), the Canadian office (CIPO), the Australian office (IP Australia), the Brazilian Office, and the Korean office (KIPO).

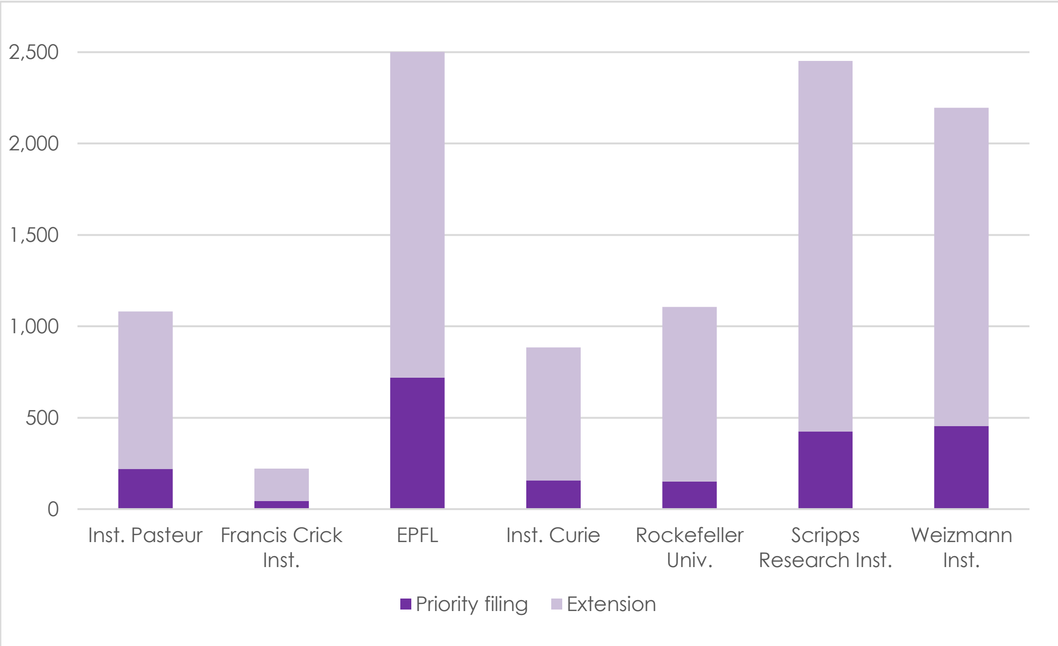
Figure 14. Institut Pasteur patent applications per office, priority year, 2012-2021 (full counting)



Source: OST database, computed by OST using PatStat.

EPFL, Scripps Research Institute, and the Weizmann Institute each filed more than 2,000 applications over the 2012-21 period (Figure 15).

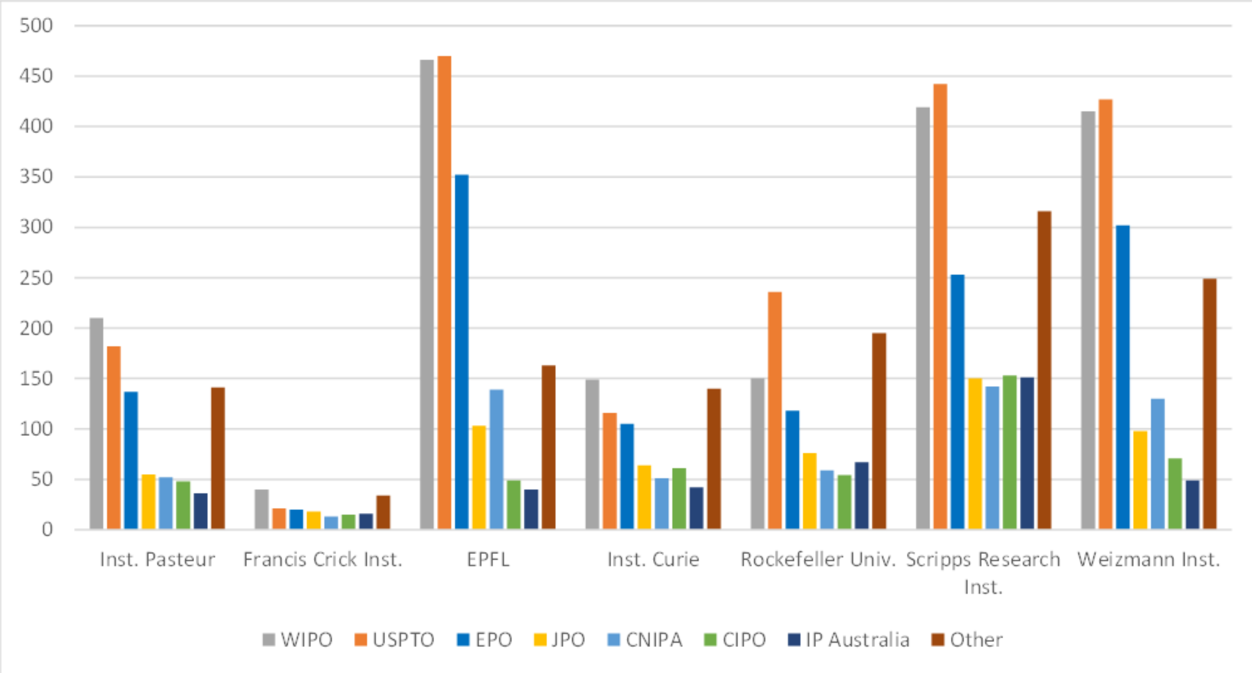
Figure 15. Number of patent applications, Institut Pasteur and benchmark institutions, priority year 2012-2021 (full counting).



Source: OST database, computed by OST using PatStat.

All of the benchmark institutions file the majority of their priority applications with the WIPO, the EPO, and the USPTO, except for the Weizmann Institute, which first files applications with the Israel Patent Office (ILPO). The WIPO and the USPTO were the most important extension offices, followed by the EPO (Figure 16).

Figure 16. Number of patent extensions by benchmark institution, priority year 2012-2021 (full counting).



Source: OST database, computed by OST using PatStat.

5.2. Technological profile of patent filings

a. Institut Pasteur's distribution of patent filings with the EPO and the USPTO

This section analyzes the distribution of Institut Pasteur patent filings among technology fields. Only published filings for which information on technology classes and applicants is available are taken into account. The analysis is conducted by year of filing.[7]

Figures 17a and 17b show the distribution of Institut Pasteur's respective EPO and USPTO patent filings over the 2012-21 period. In the case of both the EPO and the USPTO, the technology field with the most filings was Biotechnology, respectively accounting for 41% and 44% of the total. The second most important field was Pharmaceuticals, with 37% and 35%. The third-most significant field, Analysis of Biological Materials, is again the same for both offices with 12%. Thus, in total, these three major fields accounted for approximately 90% of the filings. The two fields with the next-highest number of filings (Computer Technology and Organic Fine Chemistry) were also the same for both offices, but with a higher share at the EPO than at the USPTO.

The distribution of patent filings by technology fields was also calculated over two subperiods: 2012-16 and 2017-21. Overall, the results indicate, at both the EPO and the USPTO, a fairly stable share of the two major fields.

Moreover, at the EPO, the Analysis of Biological Materials field fell to 5% during the latter period, while the proportion of filings in the fields of Computer Technology and Organic Fine Chemistry simultaneously rose. At the USPTO, the shares of these fields were more stable.

[7] Filings of extensions occur during the year following the first filing (or priority filing); filings of extensions from the year 2012 primarily refer to the priority year 2011.

Figure 17a. Distribution (%) of Institut Pasteur patent filings at the EPO by technology field, 2012-2021 (fractional counting).

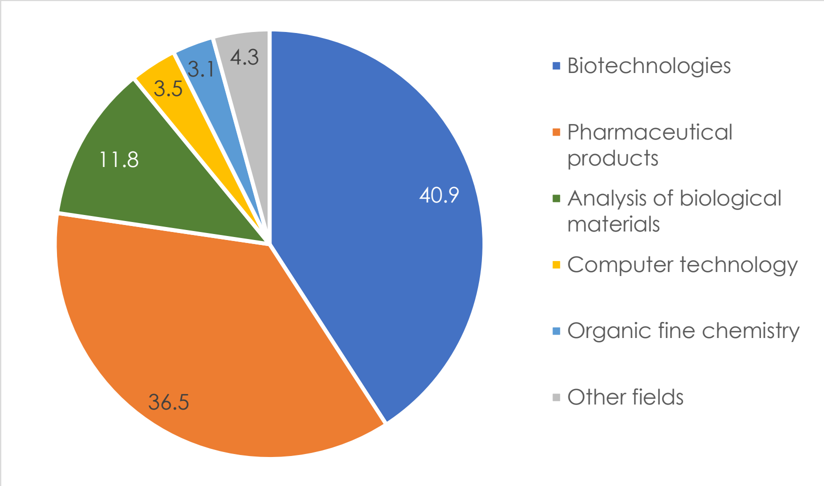
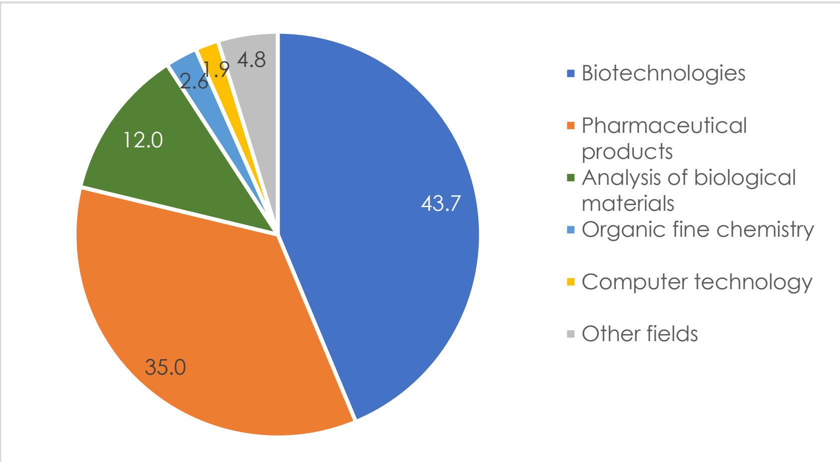


Figure 17b. Distribution (%) of Institut Pasteur patent filings at the USPTO by technology field, 2012-2021 (fractional counting).



Source: OST database, computed by OST using PatStat.

b. Comparison of Institut Pasteur and France patent profiles

Table 9a shows the distribution of Institut Pasteur patent filings and of total French patent filings – i.e. all patent applications filed by French public or private institutions – with the EPO in Institut Pasteur's 5 major technology fields: Biotechnology, Pharmaceuticals, Computer Technology, Organic Fine Chemistry and Analysis of Biological Materials – are higher for Institut Pasteur than for France as a whole.

Institut Pasteur patent filings with the USPTO compared to France USPTO patent filings is similar for the first three fields. In the two remaining fields (Organic Fine Chemistry and Computer Technology), the shares of filings for France is higher than that Institut Pasteur, in particular for Computer Technology, which accounted for 10% for France as a whole versus 2% for Institut Pasteur. (Tablel 9b)

Table 9a. Distribution of Institut Pasteur and French filings at EPO, Pasteur main technology fields, 2017-21 (fractional counting)

	Institut Pasteur		France	
	Nb Patent filings	**Share (%)**	**Nb of patent filings**	**Share (%)**
Biotechnologies	36	39.9	956	2.5
Pharmaceutical products	34	37.8	1,329	3.5
Computer technology	6	6.7	2,460	6.4
Organic fine chemistry	6	6.6	1,065	2.8

Analysis of biological materials	4	4.8	305	0.8
Other fields	4	4.3	32,093	84.0
All fields	**90**	**100.0**	**38,208**	**100.0**

Source: OST database, computed by OST using PatStat

Table 9b. Distribution of Institut Pasteur and French filings at USPTO, Institut Pasteur main technology fields, 2017-21 (fractional counting)

	Institut Pasteur		France	
	Nb. Patent filings	**Share (%)**	**Nb. Patent filings**	**Share (%)**
Biotechnologies	54	44.9	1,092	2.9
Pharmaceutical products	44	36.8	1,693	4.4
Analysis of biological materials	13	10.4	298	0.8
Organic fine chemistry	3	2.4	1,193	3.1
Computer technology	3	2.2	3,885	10.2
Other fields	4	3.3	27,042	78.6
All fields	**120**	**100.0**	**35,203**	**100.0**

Source: OST database, computed by OST using PatStat

c. Comparison of Institut Pasteur technological profile with benchmark institutions

With the notable exception of EPFL, Institut Pasteur shares the same top two major technology fields (Biotechnologies and Pharmaceuticals) with each of the benchmark institutions (Table 10). However, Pasteur's profile is more concentrated; its top two fields account for 78% of its filings, compared to 57% for the Weizmann Institute and 72% for Institut Curie. Scripps, Curie and Rockefeller, for instance, are more specialized in Organic Fine Chemistry than Pasteur. Crick Institute, for its part (along with EPFL), is more specialized than Pasteur and other benchmark institutions in Medical Technology (18% of its applications in 2017-21). Weizmann institute has a slightly more diversified profile than the other benchmark institutions (except for EPFL).

Table 10. Distribution of Institut Pasteur and compared institutions filings at the EPO, Institut Pasteur main technology fields, 2017-21 (fractional counting)

	Inst. Pasteur	**Inst. Curie**	**Weizmann Inst.**	**Rockefeller Univ.**	**Scripps Research Inst.**	**EPFL**	**Francis Crick Inst.**
Biotechnologies	39.9	39.0	26.5	31.3	29.0	6.0	41.3
Pharmaceutical products	37.8	32.8	30.8	36.9	41.5	6.2	25.1
Computer technology	6.7	0.0	4.5	1.9	0.4	4.3	0.0
Fine organic chemistry	6.6	13.7	3.4	12.4	21.1	2.7	0.0
Analysis of biological materials	4.8	7.8	6.0	4.6	7.2	1.9	3.0
Other fields	4.3	6.6	28.8	13.0	0.8	78.8	30.6
All fields	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: OST database, computed by OST using PatStat.

Institut Pasteur's 5 major fields account for only 22% of EPFL's technological production. EPFL's production is much more diversified than other institutions. For instance, semiconductors and measurement account for 18% of its applications, while medical technology accounts for 19%.

5.3. Institut Pasteur's participation in co-filings

Co- filings represent 63% of Institut Pasteur's overall filings with the EPO (Table 11). About 57% of them are with other French institutions. Companies account for 10%, public and not-for-profit institutions for 57%. Between 2012-16 and 2017-21, the share of Institut Pasteur joint filings submitted to the EPO rose significantly from 60% to 67%.

OST has developed a classification system to classify French applicants into institutional sectors: the "Higher Education" category refers to universities and other higher education institutions, while the "R&D Institutions" category covers national research organizations and private not-for-profit foundations such as *Institut Pasteur*. Lastly, the Healthcare Institutions category covers both public and private hospitals, including hospitals with a higher education mission.

Table 11. Institut Pasteur's co-filings with the EPO for 2012-21 and for two sub-periods: 2012-16 and 2017-21 (full counting)

	2012-21		2012-16		2017-21	
	Number of co- filings	**Share (%)**	**Number of co-filings**	**Share (%)**	**Number of co-filings**	**Share (%)**
All co-filings	**141**	**62.9**	**81**	**60.0**	**60**	**67.4**
Co-filings with French institutions	**126**	**56.3**	**71**	**52.6**	**55**	**61.8**
- companies	22	9.8	9	6.7	13	14.6
- public and not-for-profit	117	52.2	68	50.4	49	55.1
- R&D	*96*	*42.9*	*50*	*37.0*	*46*	*51.7*
- Higher education	*52*	*23.2*	*38*	*28.1*	*14*	*15.7*
- Healthcare	*25*	*11.2*	*17*	*12.6*	*8*	*9.0*
Co-filings with foreign institutions	**35**	**15.6**	**25**	**18.5**	**10**	**11.2**

Source: OST database, computed by OST using PatStat.

Institut Pasteur's French partners are primarily R&D Institutions (43% of its filings in 2012-21) and Higher Education Institutions (23%). Foreign institutions are involved in 16% of the filings.

Between 2012-16 and 2017-21, the share of R&D Institutions and companies in co-applications increased, while the shares of Higher Education, Healthcare Institutions and foreign institutions decreased.

Table 12. Institut Pasteur's co-filings with the USPTO for 2012-21 (full counting)

	2012-21	
	Number of co-filings	**Share (%)**
Co-filings	**188**	**71.5**
Co-filings with French institutions	**166**	**63.1**
- companies	23	8.7
- public and not-for-profit institutions	156	59.3
- R&D institutions	*132*	*50.2*
- Higher education	*59*	*22.4*
- Healthcare institutions	*31*	*11.8*
Co-filings with foreign institutions	**45**	**17.1**

Source: OST database, computed by OST using PatStat.

Table 13 shows the list of Institut Pasteur's main co- applicants for the 2012-21 period (with at least 5 joint applications). The CNRS is Institut Pasteur's most important partner, accounting for 31% of all applications. Inserm is the second-most important partner (16%). Universities such as Université Paris Cité, Paris Saclay University, and Sorbonne University also participate in joint filings (accounting for at least 10 joint applications). APHP (*Assistance Publique des Hôpitaux de Paris*), a healthcare institution, appears in fourth position. In that list of partners, three private companies submitted 5 or more co-ilings with Institut Pasteur, among them the top foreign co-applicant (Hoffman La Roche).

Table 13. Top Institut Pasteur co-applicants at the EPO, 2012-2021 (full counting)

Co-applicants*	Institutional sector	Number of co-filing	Share of Pasteur's filings (%)
CNRS	R&D institution	69	30.8
INSERM	R&D institution	36	16.1
UNIVERSITE PARIS CITE	Higher education	27	12.1
ASSISTANCE PUBLIQUE HOPITAUX DE PARIS	Healthcare institution	19	8.5
UNIVERSITE PARIS SACLAY	Higher education	11	4.9
SORBONNE UNIVERSITE	Higher education	10	4.5
CEA	R&D institution	6	2.7
ECOLE NATIONALE VETERINAIRE D'ALFORT	Higher education	6	2.7
F HOFFMAN LA ROCHE AG (CHE)	Company	6	2.7
INRAE	R&D institution	6	2.7
DNA SCRIPT	Company	5	2.2
INSTITUT GUSTAVE ROUSSY	Healthcare institution	5	2.2
PATHOQUEST	Company	5	2.2

** Applicants with 5 or more joint filings with Institut Pasteur*
Source: OST database, computed by OST using PatStat.

5.4. Institut Pasteur's EPO patent grant rate

Some applications are never granted, while others are abandoned. To calculate a patent grant rate, it is necessary to define "cohorts" of patents according to the year of filing and to specify a time window. Grant rates at 6 years and at 8 years after EPO filing were calculated for the period in question.

For all fields, Institut Pasteur's 6-year grant rate was 32% for 2012-16 applications, below the average rate for EPO applications on the whole (Table 14). However, it is necessary to take into account the specificities of technologies in grant rates (different technological fields have extremely divergent grant rates). In Biotechnologies, Institut Pasteur's 6-year grant rate is the same as the overall EPO average, while in Pharmaceuticals, Pasteur's grant rate is below the EPO average.

In two of Institut Pasteur's major fields, 8-year grant rates were lower than the corresponding EPO averages (respectively 38% and 33%, compared to an overall EPO grant rate of around 51% for these two fields).

Table 14. Grant rate for Institut Pasteur patent applications filed with the EPO (full counting)

	6-year grant rate (%) (2012-16)		8-year grant rate (%) (2012-14)	
	Institut Pasteur	EPO average	Institut Pasteur	EPO average
Biotechnologies	36.7	36.7	38.0	51.2
Pharmaceutical products	31.9	36.9	33.3	51.0
Average for all fields	**31.6**	**47.6**	**32.5**	**58.1**

Source: OST database, computed by OST using PatStat

Appendices

Appendix 1 – Research institutions compared with Institut Pasteur

This appendix gives a brief presentation of the institutions that are compared with Institut Pasteur. Information comes from various sources that are accessible online. It should be treated with caution; it has not been validated by the institutions and the data is sometimes incomplete.

École Polytechnique Fédérale de Lausanne (EPFL)

https://www.epfl.ch/en/

EPFL, located in Lausanne, CH, is a leading European institute for science and technology research attracting students, top researchers and staff from over 120 different countries. EPFL's researchers work across diverse fields as engineering, computer science, life sciences, and environmental studies. EPFL's main strengths lie in nanotechnology, robotics, renewable energy, biotechnology, and data science. Its interdisciplinary approach and its facilities foster collaboration, industry connections and innovation.

In 2023, EPFL's annual budget was **M€ 1,188** of which 34% from external (non-governmental) sources. Total EPFL full-time equivalent staff was about **6,050** including 350 professors, 3,500 scientific personnel, 2,200 technical and administrative personnel, apprentices and trainees.

Francis Crick Institute

https://www.crick.ac.uk/

The Francis Crick Institute is a biomedical research center in London, UK. Specializing in areas like cancer biology, infectious diseases, neurobiology, and genetics, the institute fosters interdisciplinary collaboration. Its cutting-edge facilities and diverse expertise facilitate groundbreaking research to advance understanding and treatment of diseases. The Crick Institute's work contributes significantly to scientific knowledge and medical innovation on a global scale.

In 2022, the Francis Crick Institute budget was about **M€ 230**, it was home to **1,500** scientists and support staff.

Institut Curie

https://curie.fr/

The Institut Curie is a French charitable foundation situated in Paris; it hosts a hospital and a research center. Focused on cancer biology and treatment, it is renowned for its expertise in oncology, genetics, immunology, and radiobiology. The Institut Curie research center is made of 88 research teams and translational research groups. Its multidisciplinary approach and state-of-the-art facilities drive innovation in diagnosis and therapy.

In 2022, the Institut Curie's revenue was around **M€ 475**, 73% of which came from grants and other public revenues. About **3,000** staff work at the Institute of which 1,200 people in the research center.

Institut national de la santé et de la recherche médicale (Inserm)

https://www.inserm.fr/en/

Inserm is a French public scientific and technological institute which operates under the joint authority of the French Ministries of Health and Research. Inserm is dedicated to biomedical research and human health, and is involved in the entire range of activities from the laboratory to the patient's bedside. Its research is carried out in 269 joint research units – shared with universities, with other research organizations such as the CNRS, and with university hospitals –, 48 service units and 34 clinical investigation centers.

In 2023, Inserm budget was around **M€ 1150**, of which 38% correspond to external (non-governmental) resources. Inserm staff consists in **5,025** civil servants, including 2,166 researchers, 2,859 engineers and technicians, as well as **3,423** contract staff and temporary employees. In addition, **5,732** researchers, university staff and university hospitals practitioners employed by partner institutions are affiliated to Inserm joint research units.

Karolinska Institutet

https://ki.se/en

The Karolinska Institutet, located in Stockholm, Sweden, is a medical university and research center. Renowned for its expertise in medicine, biomedicine and public health, the Karolinska Institutet conducts cutting-edge research in fields such as cancer, neuroscience, regenerative medicine and infectious diseases. Its contributions to medical science, including the Nobel Assembly which awards the Nobel Prize in physiology or medicine, make it a reference institute for innovation and education in healthcare.

In 2023, the Karolinska Institutet revenue was around **M€ 723** of which 36% from external (non-governmental) sources. It employs over **5,000** full-time employees, including 341 professors and 1,600 teaching staff.

Rockefeller University

https://www.rockefeller.edu/

Rockefeller University, situated in New York City, is a biomedical research institution. Specializing in areas such as molecular biology, genetics, neuroscience, and immunology, Rockefeller University conducts pioneering research to unravel fundamental biological mysteries. Its interdisciplinary approach and state-of-the-art facilities foster groundbreaking discoveries, driving advances in medicine and biotechnology. The university has a rich history of scientific achievements (26 Nobel Prizes, 25 Lasker Awards).

In 2023, the Rockefeller University budget was about **M€ 400** of which M€ 227 for research. The faculty included **71** members of which 35 members of the National Academy of sciences and 5 Nobel laureates, as well as **1,325** research and support staff.

Scripps Research Institute

https://www.scripps.edu/

The Scripps Research Institute, headquartered in California, is a biomedical research organization. Known for expertise in chemistry, immunology, neuroscience, and structural biology, Scripps conducts cutting-edge research to address critical health challenges. Its interdisciplinary approach fosters collaboration and innovation, leading to breakthroughs in drug discovery, vaccine development, and understanding disease mechanisms.

In 2022, the Scripps Research Institute annual budget was **M€ 575**. About **2,600** staff work at Scripps Research including **160** faculty members of which 30 members of the National Academiesof sciences, engineering and medicine and 6 Nobel laureates as well as 200 independent investigators.

Weizmann Institute

https://www.weizmann.ac.il/

The Weizmann Institute of Science, situated in Israel, is a multidisciplinary research institution. The Institute has five faculties, Mathematics and computer science, Physics, Chemistry, Biochemistry and Biology, which are divided into 17 scientific departments. Weizmann Institute conducts groundbreaking research in areas such as cancer, neuroscience, and renewable energy. Its collaborative environment and state-of-the-art facilities foster innovation and attract top talent worldwide.

The operating budget of the Weizmann Institute of Science is around **M€ 372** per year of which 66% from external (non-governmental) sources. It employs over **2,700** staff, including **1,300** scientists and support personnel.

Appendix 2 – Database and methodology used for publications

Database

The assessment is based on data from the OST database, which expands upon the source database, Clarivate Analytics' Web of Science (WoS), with additional classification and institutional identification data. The OST database was updated in 2022. The most recent available publication year is 2021, for which the data is 95% complete on average. Conference proceedings tend to be entered into the WoS database after journal articles, and it is likely that the 2021 data is less complete in particular for this type of publication.

WoS catalogues scientific journal publications and conference proceedings that meet a series of criteria in terms of editorial quality, such as peer review and global influence in academia. It provides good coverage for more internationally oriented disciplines and less coverage for certain applied disciplines and disciplines with strong national traditions. However, WoS's coverage is continually evolving, and new journals are added each year, in line with the Clarivate Analytics's selection process.

Publications from the OST database corresponding to the SCI-Science Citation Index Expanded, the SSCI-Social Sciences Citation Index, the A&HCI-Arts & Humanities Citation Index, and the CPCI-Conference Proceedings Citation Index (S et SSH), are taken into account.

Indicators are only calculated using documents classified as "articles," "reviews," and "proceedings papers." Documents that are missing information (WoS category, country, etc.) or have been retracted are not taken into account.

Classification system used to calculate indicators

Indicators are calculated using the ERC panel classification system. These panels (or domains) are divided into 27 sub-domains. Each sub-domain is the result of an aggregation of the 254 subject categories inventoried by Clarivate Analytics.

The table below provides the names of the research domains associated with each code.

Code ERC	Panel structure		
	LS – Life Sciences		
LS1	Molecules of Life: Biological Mechanisms, Structures and Functions	LS6	Immunity, Infection and Immunotherapy
LS2	Integrative Biology: from Genes and Genomes to Systems	LS7	Prevention, Diagnosis and Treatment of Human Diseases
LS3	Cellular, Developmental and Regenerative Biology	LS8	Environmental Biology, Ecology and Evolution
LS4	Physiology in Health, Disease and Ageing	LS9	Biotechnology and Biosystems Engineering
LS5	Neuroscience and Disorders of the Nervous System		
	PE – Physical Sciences and Engineering		
PE1	Mathematics	PE7	Systems and Communication Engineering
PE2	Fundamental Constituents of Matter	PE8	Products and Processes Engineering
PE3	Condensed Matter Physics	PE9	Universe Sciences
PE4	Physical and Analytical Chemical Sciences	PE10	Earth System Science
PE5	Synthetic Chemistry and Materials	PE11	Materials Engineering
PE6	Computer Science and Informatics		
	SH - Social Sciences and Humanities		
SH1	Individuals, Markets and Organisations	SH5	Cultures and Cultural Production
SH2	Institutions, Governance and Legal Systems	SH6	The Study of the Human Past
SH3	The Social World and Its Diversity	SH7	Human Mobility, Environment, and Space
SH4	The Human Mind and Its Complexity		

Source : traduction à partir du site de l'ERC,
https://erc.europa.eu/sites/default/files/document/file/ERC_Panel_structure_2021_2022.pdf

Journals can be assigned to one or more research domains and, through consolidation, to one or more overarching disciplines. Articles in interdisciplinary journals (such as *Nature*, *PNAS USA*, and *Science*) are distributed into different research fields on the basis of their subject matter.

Identification of research institutions

The identification of publications from Institut Pasteur and Institut Curie relied on the survey conducted by these two institutions as part of the annual preparation of indicators by OST for the Ministry of Higher Education and Research's budget documents.[8] For foreign institutions, OST used the WoS's "Organization-Enhanced" field after discussing its reliability with the publisher.

Type and number of publications

From an institutional and geographical perspective, a given scientific publication often contains several address lines, as it is produced by researchers from different institutions or laboratories. This begs the question of how the publication can be attributed to each of the institutions that contribute to producing it.

Whole counting emphasizes an institution's role in scientific output: each publication an institution contributes to is counted as 1 full publication, regardless of the total number of author-affiliated institutions.

Fractional counting emphasizes the contribution to scientific publications. It gives equal weight to contributions in proportion to the number of addresses of affiliation attributed to an institution in light of all the addresses listed for each publication. The total weight attributed to institutional affiliations for a publication is represented as 1. This calculation method renders it possible to compare the number of publications between institutions, which is not possible using a whole count, as it results in duplicates between institutions. Because the fractional-count method applies to the number of addresses of affiliation, it does not account for joint coordination, as jointly coordinated research units appear on a single address line.

Likewise, in terms of research domains, publications often fall into multiple fields, and there are two possible ways to count them: the first consists of fully counting publications for each category they belong to, and the second consists of counting them as 1/*n*, where *n* is the number of fields that a publication is listed as belonging to. The WoS distinguishes between over 254 "subject categories" – the most granular level of scientific field classification contained in the database. More often than not, publications are assigned to the subject categories of the journal or media in which they are published. For instance, a publication from a journal listed in two categories will either be counted as 1 whole publication in each of the fields (whole count), or be counted for half of a publication in each field (fractional count applied to scientific fields).

From the perspective of an institution, it can prove advantageous to favor actual participation through whole counting. This is what is generally done to count jointly authored publications and account for an institution's participation in a joint project. In other cases, whole counting can make it harder to draw comparisons between fields, countries, or institutions. In such cases, fractional counting is preferable.

The total number of publications provided at the start of this report uses the whole-count method. Thereafter, with the exception of joint publication indicators, which are stated as whole counts, all indicators are calculated fractionally. The fractional count combines fractional figures for addresses of affiliation and disciplinary categories. Fractional counting is cumulative at every level and for all tiers of the classification system used.

Indicators

The indicators calculated in this report are defined as follows.

National / international share of publications	Percentage of publications attributed to the institution, taking into account the total weight of its contribution for each publication. This calculation can only be made through the whole-count method, as the whole-count method would result in duplicates (see Number of publications).
International co publications	Publications signed by an institution or country and at least one foreign institution. The whole count is used.
Share of publications from a field for an institution	Distribution of publications by scientific field within the corpus of publications identified for each establishment (fractional count). The corresponding distribution can be compared to that of another institution or to the rest of the world.
Disciplinary specialization index score	The ratio between the percentage of publications in a given scientific discipline for the institution and that same percentage for a benchmark geographic area (in this report, the world). The count used is a fractional count. An index score greater than 1 is a sign of specialization in a given sub-field (and, vice versa, a score of less than 1 reflects an area in which the institution is not specialized).

[8] Indicators for French Organic Budget Act program no. 172 ("Multidisciplinary scientific and technological research").

Publication impact index score	An institution's publication impact index score is the average of the normalized citation scores for its publications. The method utilized consists of calculating a normalized score (per WoS category, type of document, and year) for each publication, in order to obtain a comparable value for all articles. An impact index score greater than 1 means that the institution's publications are, on average, more frequently cited than publications in the same field across the world, taking into account the same time period for citations (time elapsed up to the last year taken into consideration).
Activity index score in the top 10% of the most frequently cited class of publications	The share of an institution's publications in the top 10% of the most frequently cited documents is determined by the share of its publications belonging to the top 10% of the most frequently cited publications in the world. Due to tie scores, including non-cited documents, the global share differs marginally by ±10%. An activity index score in the top 10% of the most frequently cited publications is determined by the share of an institution's publications falling into the 10% most frequently cited class of publications, as compared to the share of publications worldwide falling into that same class. An institution with 15% of its publications in the top 10% most frequently cited documents will have an activity index score of 1.5 for that class. The neutral value used for this index is equal to 1.

Appendix 3 – Full indicator tables

Table A.2.a: Number of publication of Institut Pasteur and benchmark institutions, LS and major Pasteur sub-pandomainesels, 2017 -2021*, fractional and full counting

	LS-Life Sciences, fractional counting						Full counting
	2017	2018	2019	2020	2021*	2017-21*	2017-21*
Inst. Pasteur	**367**	**384**	**346**	**348**	**348**	**1,794**	**6,044**
Inst. Curie	189	192	217	221	270	1,090	3,859
INSERM	3,612	3,595	3,709	4,129	4,814	19,859	72,154
EPFL	296	255	286	260	266	1,363	4,927
Francis Crick Inst.	152	146	127	143	188	756	2,540
Karolinska Inst.	1,832	1,838	1,877	1,987	2,072	9,606	31,521
Rockefeller Univ.	208	186	181	180	182	937	2,973
Scripps Research Inst.	312	313	266	271	238	1,400	3,946
Weizmann Inst.	252	239	236	229	273	1,228	3,071
World	775,541	800,434	842,483	939,308	1,100,124	4,457,890	5,170,051

	LS1 - Molecules of Life: Biological Mechanisms, Structures and Functions, fractional counting						Full counting
	2017	2018	2019	2020	2021*	2017-21*	2017-21*
Inst. Pasteur	**38**	**39**	**32**	**35**	**36**	**180**	**1,484**
Inst. Curie	18	19	17	18	17	89	724
INSERM	306	302	308	352	388	1,656	13,461
EPFL	40	29	32	29	32	162	1,175
Francis Crick Inst.	23	23	18	24	28	116	891
Karolinska Inst.	97	103	95	105	101	501	4,233
Rockefeller Univ.	30	22	23	21	24	121	925
Scripps Research Inst.	59	68	55	58	52	291	1,663
Weizmann Inst.	40	35	39	31	47	192	1,070
World	55,852	57,563	60,343	66,966	74,055	314,780	880,003

	LS2 - Integrative Biology, fractional counting						Full counting
	2017	2018	2019	2020	2021*	2017-21*	2017-21*
Inst. Pasteur	**44**	**46**	**47**	**45**	**46**	**228**	**1,433**
Inst. Curie	27	25	28	23	28	131	797
INSERM	260	257	282	298	352	1,449	10,213
EPFL	49	37	41	34	36	197	1,211
Francis Crick Inst.	28	26	29	31	41	155	1,020
Karolinska Inst.	86	92	100	104	102	483	3,371
Rockefeller Univ.	36	28	27	36	27	156	977
Scripps Research Inst.	52	56	50	49	39	247	1,347
Weizmann Inst.	50	41	44	39	48	221	1,146
World	43,523	45,332	51,410	55,479	61,385	257,128	636,795

	LS3 - Cellular, Developmental and Regenerative Biology, fractional counting							Full counting
	2017	2018	2019	2020	2021*	2017-21*		2017-21*
Inst. Pasteur	**35**	**36**	**33**	**32**	**31**	**167**		**637**
Inst. Curie	40	34	44	40	37	195		689
INSERM	244	236	242	278	302	1,302		5,316
EPFL	29	19	26	18	16	108		437
Francis Crick Inst.	41	45	35	38	42	201		779
Karolinska Inst.	81	72	82	84	79	399		1,845
Rockefeller Univ.	35	32	24	27	28	145		555
Scripps Research Inst.	32	29	30	21	16	128		540
Weizmann Inst.	50	42	31	34	42	199		627
World	27,032	24,434	26,242	29,107	32,926	139,741		220,923

	LS6 -Immunity, Infection and Immunotherapy, fractional counting							Full counting
	2017	2018	2019	2020	2021*	2017-21*		2017-21*
Inst. Pasteur	**176**	**172**	**163**	**151**	**154**	**816**		**2,981**
Inst. Curie	8	11	14	12	13	59		225
INSERM	474	454	444	502	567	2,440		10,471
EPFL	16	19	17	24	16	92		341
Francis Crick Inst.	28	25	19	18	30	121		474
Karolinska Inst.	173	162	175	182	184	875		3,532
Rockefeller Univ.	35	32	40	25	31	162		660
Scripps Research Inst.	58	55	40	46	40	239		720
Weizmann Inst.	31	28	27	26	26	139		365
World	57,607	59,770	61,207	71,280	85,500	335,363		442,139

** Data for 2021 is approximately 95% complete*
Source: OST database, computed by OST using the Web of Science.

Table A.2.b: Impact index publications, selected countries, 2017-20 (fractional counting)

	LS1	LS2	LS3	LS6	LS
France	**0.97**	**0.99**	**1.07**	**1.00**	**1.04**
Israel	1.03	1.03	1.05	0.97	0.92
United Kingdom	1.32	1.41	1.24	1.23	1.28
Sweden	1.10	1.17	1.10	1.03	1.15
Switzerland	1.40	1.43	1.38	1.23	1.24
United States	1.28	1.31	1.36	1.23	1.22

Source: OST database, computed by OST using the Web of Science.

Appendix 4 – Data source and methodology for ERC projects

Data source

This study is based on data from the e-Corda system processed by OST by integrating information from the "H2020" program (spanning the period from 2014 to 2020) and the "Horizon Europe" program (which extends from 2021 to 2027). The data comes from the last delivery of the database in June 2023. H2020 and Horizon Europe are European Union research and innovation support programs. The European Union allocated 79 billion euros to the first (including Euratom funding) and 95.5 billion euros to the second. These programs are organized into major pillars such as Excellent Science, European Industrial Competitiveness, Innovative Europe, etc. The implementation of these programs is achieved via calls for proposals to fund research projects, which are generally collaborative and European. This funding can go to both the public and the private sector.

The database is structured into two broad families of datasets. One is comprised of data on participants and the projects funded (the "Grants dataset") and the other is comprised of data on applicants and the projects submitted for calls for proposals (the "Proposals dataset").

Indicators

Three types of indicators are used to analyze institutional participation in ERC projects.

Number of grants: number of ERC grants obtained (all types of ERC funding combined) by the institution as a recipient in the Grants dataset over the period in question. This indicator can be broken down by ERC domain (PE, SH, and LS).

Number of applications: the number of times the institution participated in ERC calls for proposals in the Proposals dataset over the studied period.

Success rate: Ratio of successful grant applications (on "main" list) at the end of the selection process on the total applications for ERC grants for a given institution (or country), in the same "Proposals" dataset over the period in question. Occasionally, during the proposal evaluation process, the status of a project can switch from "main" to "rejected" or from "reserved" to "main."

Appendix 5 – Methodology for the analysis of Institut Pasteur patents

OST patent database

The patent data mobilizes information from the OST patent database, built from PatStat and enriched by OST. The PatStat database was created by the EPO with the help of the OECD. The EPO updates and publishes the entire database twice a year (April and October). The extracted information is based on the Spring 2023 version of PatStat, and takes into account all applications published until mid-February 2023. The PatStat data is used for the analysis of patent grants and extensions.

PatStat contains records of patent filings after publication of the application, i.e., 18 months after the date of the initial filing (priority filing). It covers 80 national and regional patent offices worldwide.

The version of the patent database used is not complete for the year 2021: extensions of priority filings are not published and therefore are not accessible. The following are included in priority data in the OST database.

Patent of invention

The patent is a title of ownership that confers to its owner or successors, for a limited period of time and on a limited territory, an exclusive right of exploitation of the invention. In exchange for the exclusive right granted to him/her, the patent applicant has the obligation to make the invention public. The patent is therefore not only a legal title of property right but also a technical publication.

Patents can be considered as one of the results of R&D activity. As patents are one of the few sources of information on these R&D outputs, they are frequently used as an indicator of inventive activity and a measure of technological capability.

National and regional offices

The **INPI** is the **French office for intellectual property** (patents, trademarks, designs, and models). It allows inventors to file a patent application to protect an invention on the national territory. Many patents filed by French institutions are first filed with the INPI before, if necessary, being extended to other offices. A patent application filed with the INPI is published eighteen months after its initial filing, and a patent may not be granted until after this occurs.

The **European patent Office (EPO)** establishes a unified system for filing and granting patents in the European countries, signatories of the Munich Convention (1973), called "European patent system." Through a single filing and granting procedure, it is possible to obtain a "European" patent which has the same effects in each country designated by the applicant as a national patent filed in several countries that are signatories of the Munich Convention.

The **United States Patent and Trademark Office (USPTO)** allows any individual or company wishing to protect their invention in the United States to apply for a U.S. patent. This office has many specificities. For example, unlike the EPO, the patent is granted to the first inventor and not to the first applicant.

Another procedure for simultaneous applications in several countries has existed since 1978: the **PCT (Patent Cooperation Treaty)** procedure allows any applicant to file a patent application simultaneously in 184 countries. This procedure is managed by the World Intellectual Property Organization (WIPO). It has many advantages compared to traditional application methods (a single step, lower cost, longer reflection period).

Priority filings and extensions

The priority filing of a patent application is the first filing to be made with a patent office to protect an invention.

The Paris Union Convention (PUC) for Intellectual Property provides for a period of one year (from the date of priority filing, the so-called priority date) to allow an applicant to extend his or her invention to other PUC contracting states.

Most French institutions file their priority applications with the INPI before eventually extending the protection of their invention internationally. Numerous international extension processes (in particular the European or PCT procedures) are then possible.

French applicants tend to use two international extension processes in particular. They are illustrated below:

Case of an INPI filing extended to the EPO: When a priority application is filed with the INPI, the institution may wish to extend its application to the EPO in order to protect itself at the European level. During the EPO filing procedure, the applicant is asked to designate the European countries to which the protection is to be extended. It is then possible to re-designate France, making the French priority application null and void, while keeping the initial priority date.

Case of an EPO filing extended to the WIPO: When a priority application is filed with the EPO, the institution may wish to extend its application to the WIPO level in order to protect itself in offices such as the USPTO or the JPO. When the WIPO filing procedure enters the regional phase, it is possible to re-designate the EPO, with the new EPO application replacing the priority application.

Consequently, in a significant number of cases, priority applications filed with the INPI or the EPO are abandoned even before their publication because they are replaced by non-priority EPO or WIPO applications. Specific procedures allow these abandoned priority applications to be pursued through EPO or WIPO applications, in particular through patent families.

Technology fields and sub-fields

In order to classify patents according to their technological content, the World Intellectual Property Organization (WIPO) created the International Patent Classification (IPC) system in the Strasbourg Agreement (1971). This classification system is very detailed and includes approximately 70,000 subdivisions. The same patent can be classified in different IPC classes. IPC fractional counting or thematic fractional counting is therefore possible to account for the relative weight of the different technologies contained in a patent, just as fractional counting can be applied to the different subject areas of a publication.

Over the last ten years, another classification system, the CPC, has been jointly developed by the European Patent Office and the United States Patent and Trademark Office. This system is based, in large part, on the IPC classification system, with some details and specific classes added, notably in relation to environmental concerns. At the aggregate level, IPC and CPC classifications are identical, so CPC codes can be used if IPC codes are missing in a patent.

An aggregated classification system was then developed by Schmoch (2008) for the WIPO[9] in order to group IPCs into 5 technology fields, which are further subdivided into 35 sub-fields (see below).

Counting method

In order to account for the participation of each partner, a whole-count method was used to calculate the total number of patents filed by Institut Pasteur, the total number of joint applications, and the number of joint applications per applicant.

Sub-fields were analyzed using fractional counting. A whole count was used to calculate the patent grant rate.

Patent indicators

- Grant rate

The approval of a patent application filed with the European Patent Office (EPO) follows a lengthy[10] process of examination of the application by experts who judge its novelty, inventiveness, and industrial applicability. Not every application will result in a patent being granted. Some will be refused by the examiners, while others will be abandoned in the process by the applicants. The grant rate measures the ratio of the number of applications actually granted to an applicant compared to its total number of applications for a given cohort of applications (for example, applications filed by Institut Pasteur between 2012 and 2016 with the EPO). This indicator requires the use of a time window, calculated between the date of filing with the EPO and the publication of the grant, in order to be able to compare the grant rates for different filing years. In this study, we used a 6-year window and an 8-year window so as to be consistent with the period being analyzed.

- Co-filings

The share of co- filings is the ratio of the number of co- filings to total Institut Pasteur filings. Due to the use of full counting method, the numbers and shares of co- filings cannot be added up.

- Sectoral classification of French applicants by OST

French applicants have been classified into institutional sectors, with the main classification criterion being the activity of the institution. The OST classification system has two levels. Only the first level is used in this report. Institut Pasteur joint filings with French applicants are placed into one of these five categories.

[9] Schmoch, U. (2008). *Concept of a Technology Classification for Country Comparisons – Final Report to the World Intellectual Property Organisation (WIPO)*. Karlsruhe, Germany.
[10] In recent years, the average time for approval of EPO applications has been 6 years.

Company	R&D Institution[11]	Administration & NPO	Higher Education	Healthcare
Entities whose primary activity is the production of market goods and services, whatever the origin of their equity capital, or the provision of R&D and innovation services to such companies (analysis, infrastructure, S&T skills)	Institutions whose primary activity is research, financed in whole or in part by public funds	Administrative or cultural establishments financed entirely or partially by public funds, international organizations, not-for-profit organizations (NPOs) with a national public service mission not classified elsewhere	Establishments whose primary activity is teaching under private or public supervision (except university hospitals classified under "Healthcare")	Public or private establishments whose primary activity consists of healthcare services. University hospitals are classified in this category.

For foreign institutions, OST used PatStat's international classification system. This classification is based on data from the OECD and other international organizations. OST has classified applicants into foreign private institutions (generally companies, but also private centers) and foreign public institutions (universities, public hospitals).

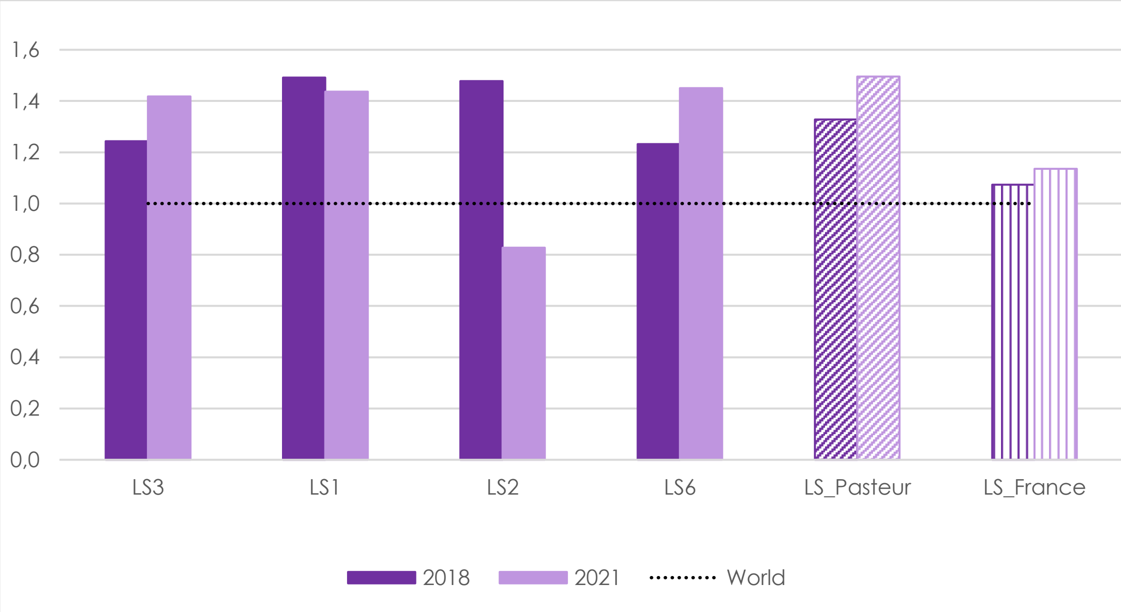
[11] These institutions are usually classified in the *R&D Organizations* subclass of the *Government and NPIs* class, but it encompasses a wide variety of institutions that go well beyond research organizations in the classical sense, including NPIs that are associations or foundations. The objective is to be able to distinguish between public research organizations within the *R&D Institutions* class, and to be able to aggregate them to the *Universities* subclass, due to the presence of joint research units and the fact that they belong to the ESRI system.

Appendix 6 – Update for the impact indicators of publications, 2018-2021

This appendix provides an update for the impact indicators by including the year 2021. This has been considered important because of the covid crisis and its consequences on publications, in particular in the field of infectious diseases/immunology (LS6). The comparison with the figures in the report should be cautious because the data base has slightly evolved.

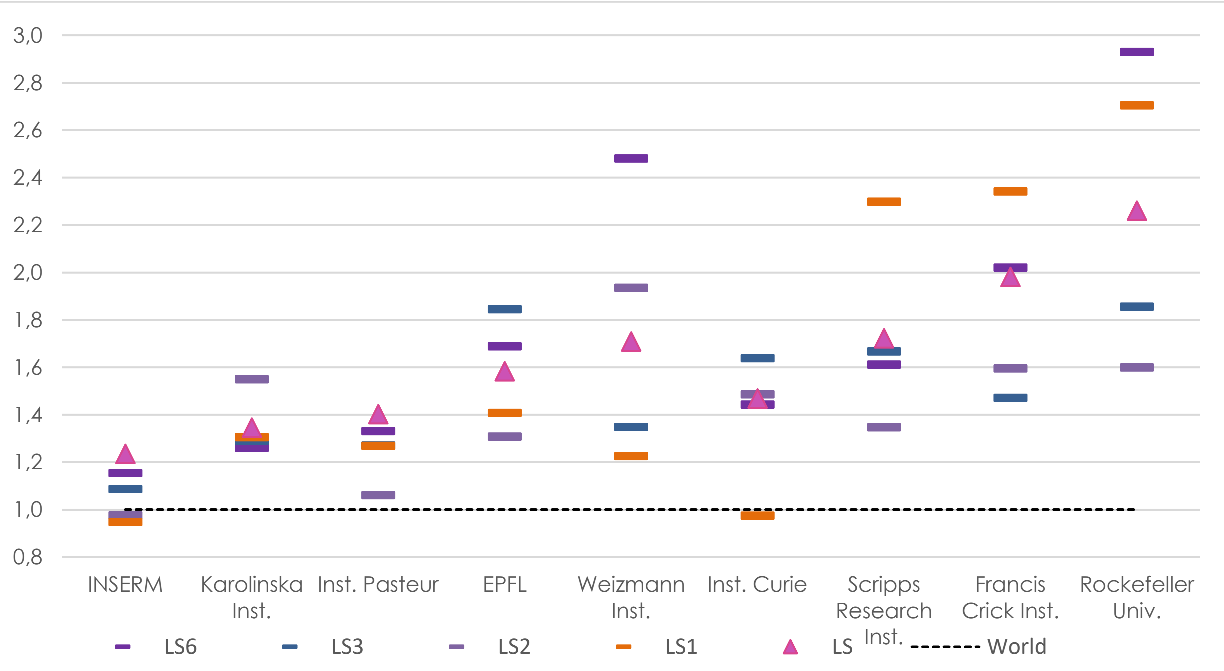
In 2023, OST integrated the WoS ESCI-Emerging Sources Citation Index, which includes a higher proportion of SSH and non-English-speaking publications. This integration increased the world corpus by nearly 10%. OST also revised its disciplinary classification. The revised classification assigns a single WoS category to each publication, based on the main category of cited references (including for multidisciplinary categories); as a result, it comprises 242 disciplinary categories. The classification into ERC sub-domains has also been revised, with each publication being directly assigned to a sub-domain, regardless of its classification into categories. Consequently, WoS categories overlap in the sub-domains.

Figure A6.1. Impact index of Institut Pasteur publications, LS and main sub-domains, 2018 and 2021



Source: OST database, computed by OST using the Web of Science.

Figure A6.2. Impact index, publications of Institut Pasteur and benchmark institutions, 2018-21



Source: OST database, computed by OST using the Web of Science.

2 rue Albert Einstein
75013 Paris, France
T. 33 (0)1 55 55 60 10
hceres.fr

High Council for the evaluation of research and higher education