Chapter 4

PATENT ACTIVITY AT THE IP5 OFFICES

This chapter presents trends in patent application filings and grants at the IP5 Offices only, including also some breakdowns by technologies. While in Chapter 3 the latest data were for2019, most of the information that appears here includes data for2020[33]. The patent office statistics for Europe in this chapter are for the EPO only and do not include statistics from the EPC states' national offices. Whereas the EPO is indicated from the viewpoint of an office, the EPC states are still indicated as a bloc of origin.

The activities at the IP5 Offices are demonstrated by counts of the patent applications that were filed. For patent applications, the representations are analogous to those appearing in Chapter 3 (Figs. 3.5, 3.6, 3.7, and 3.14) which show the numbers of requests for patents as patent applications[34]. Direct applications to the offices are counted at the date of filing. PCT applications are counted at the moment they enter the national or regional phase. Direct national and direct regional filings are counted only once. PCT national/regional phase filings are replicated over the numbers of procedures that are started.

The demand at the EPO is given in terms of applications rather than in terms of designations.

For granted patents, the statistics combine information by office and bloc of origin, displaying comparisons by year of grant. The representations here are similar to those for Fig. 3.11, where granted patents are counted only once, except that, for EPC states, only the EPO is considered as the granting authority. Hereinafter, "patent grants" will signify the number of grant actions (issuances or publications) by the IP5 Offices.

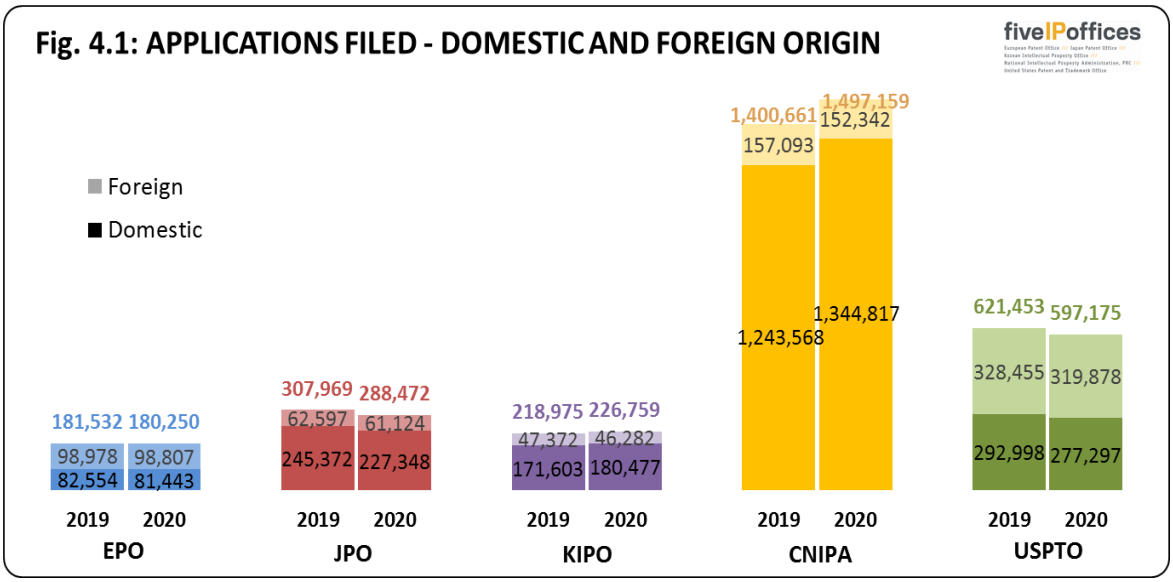
For information about specific terminology and associated definitions used in Chapter 4, please refer to Annex 2.

[33] The statistical tables file found in the web version of this report includes extended time series for much of the data included in this chapter. https://www.fiveipoffices.org/statistics/statisticsreports.html
[34] See the section "Guide to figures in Chapter 3" at the beginning of Chapter 3.

PATENT APPLICATIONS FILED

ORIGIN

Fig. 4.1 shows the number of patent applications that were filed at each of the IP5 Offices during the two most recent years, broken down by domestic and foreign origin (based on the residence of first-named applicants or inventors). For the EPO, domestic applications correspond to those filed by residents of the EPC states.



In 2020, a total of 2,789,815 patent applications were filed at the IP5 Offices, an increase of 2 percent from 2019 (2,730,590).

Patent applications increased by 0.7 percent at the CNIPA, and by 4 percent at the KIPO, whereas, at the EPO the JPO, and the USPTO applications decreased by 0.1 percent, 6 percent and 4 percent respectively.

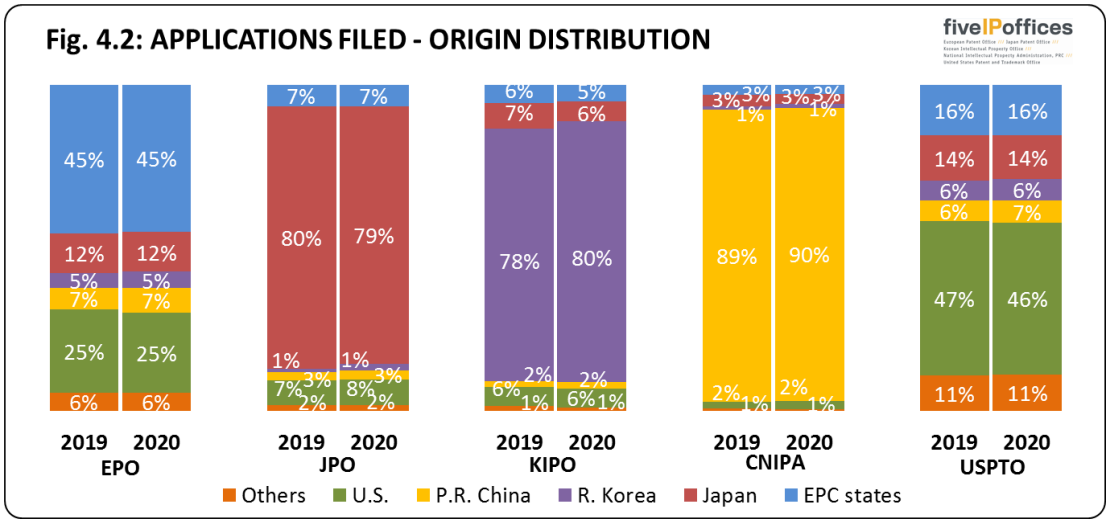
While at the CNIPA and KIPO, domestic applications increased by 8 and 5 percent, at the EPO, JPO and USPTO it decreased by 0.1 percent, 7 percent and 5 percent. Foreign applications decreased at the IP5 Offices.

Table 4.1 shows the number of patent application filings by origin (residence of first-named applicants or inventors) relative to total filings at each office for 2019.

Table 4.1: 2020 APPLICATIONS FILED – ORIGIN

Office Origin	EPO	JPO	KIPO	CNIPA	USPTO	Total
EPC States	81,443	19,272	11,450	40,521	92,746	245,432
Japan	21,841	227,348	14,026	47,862	80,029	391,106
R. Korea	9,106	5,881	180,477	16,725	38,314	250,503
P.R. China	13,432	8,406	4,282	1,344,817	42,115	1,413,052
U.S.	44,293	22,451	13,326	37,880	277,297	395,247
Others	10,135	5,114	3,198	9,354	66,674	94,475
Total	**180,250**	**288,472**	**226,759**	**1,497,159**	**597,175**	**2,789,815**

Fig. 4.2 shows the respective shares of patent applications filings by origin (residence of the first-named applicant or inventor) relative to the total number of applications filed at each office, for 2019 and 2020.



The shares of patent application filings by bloc of origin vary between Offices, but are generally consistent for 2019 and 2020 within each Office.

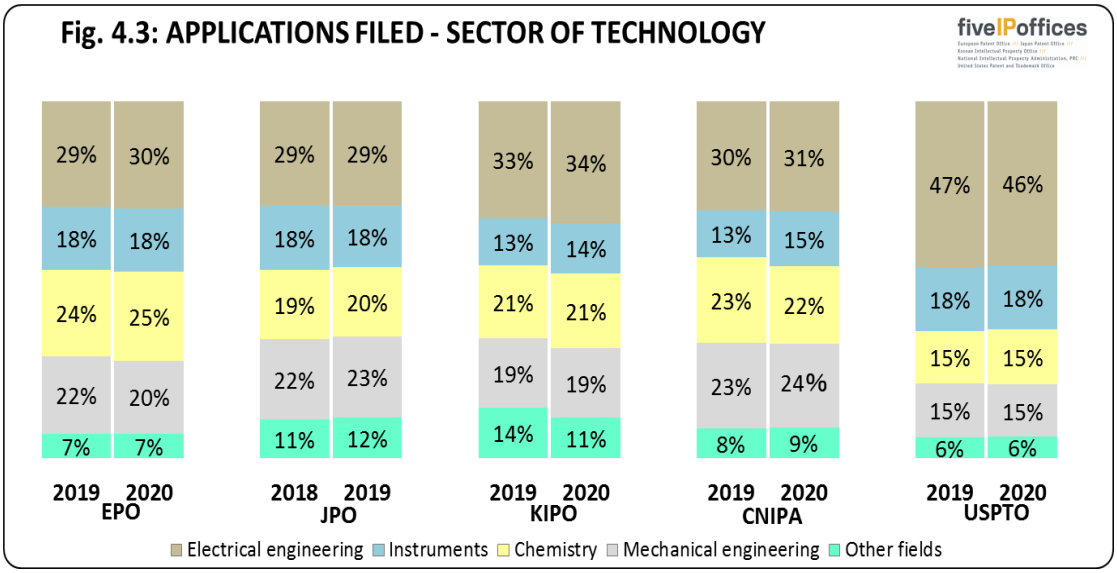
Caution should be used when comparing the numbers of applications between the IP5 Offices, due to the fact that the average number of claims contained in individual applications varies significantly. On average, in 2020, an application filed at the EPO contained 15.1 claims, (15.0 in 2019) while an application filed at the JPO contained an average of 11.4 claims (11.0 in 2019), and an application filed at the KIPO contained an average of 11.2 claims (11.1 in 2019). At the CNIPA, an application contained an average of 9.7 claims (9.5 in 2018), while one filed at the USPTO had 17.8 claims (17.8 in 2019) on average.

See the annexed statistical tables for longer trends.

SECTORS AND FIELDS OF TECHNOLOGY

Patents are classified by the IP5 Offices according to the IPC. This provides for a hierarchical system of language independent symbols for the classification of patents and utility models according to the different areas of technology to which they pertain. The WIPO established a concordance table to link the IPC symbols with thirty-five fields of technology grouped into five sectors[35]. Fig. 4.3 shows the distribution of applications at each office according to the five main sectors of technology.

The classification takes place at a different stage of the procedure in the offices. As a result, data are shown for the EPO, the KIPO, the CNIPA, and the USPTO for the filing years 2018 and 2019, while for the JPO the breakdown is given for the filing years 2017 and 2018[36].



The Electrical engineering sector is more prominent at the USPTO than in the other IP5 Offices. A higher proportion of applications are filed in the Chemistry sector at the CNIPA and at the EPO than in the other IP5 Offices. At each office, the distribution between sectors of technology was fairly stable between the two years reported. On the longer term, there are some slow variations that can be seen in the statistical annex. For example, at JPO there was a slow decline in the proportion for the Electrical engineering sector since 2011.

[35] https://www.wipo.int/meetings/en/doc_details.jsp?doc_id=117672
https://www.wipo.int/export/sites/www/ipstats/en/statistics/patents/xls/ipc_technology.xls

[36] JPO data for 2019 are the most recent available figures because the IPC assignment is completed just before the publication of the Unexamined Patent Application Gazette (18 months after the first filing). Percentages may not total 100 due to rounding.

Fig. 4.4 describes the distribution of the 2019[37] applications by the more detailed fields of technology at each office (left column for each IP5 Office), and the change in application counts compared to 2018 (right column). Actual shares and percentage changes in application counts are shown for the top 10 leading fields at each Office. The distribution of applications is represented by a colour scale: the darker the shade of a colour, the greater the share. The extent of change is reflected by a red–to-green colour scale, the dark red indicates a marked decrease and dark green indicates a marked increase.

Fig. 4.4: DISTRIBUTION OF APPLICATIONS FILED BY FIELD OF TECHNOLOGY - 2020

	EPO		JPO		KIPO		CNIPA		USPTO	
	Share	Change	Share	Change	Share	Change	Share	Change	Share	Change
1. Electrical machinery, apparatus, energy	6%	+0%	9%	-7%	8%	+5%	6%	+3%	6%	-5%
2. Audio-visual technology			3%	-5%					4%	-2%
3. Telecommunications										
4. Digital communication	8%	+1%			4%	-12%	4%	+9%	9%	-3%
5. Basic communication processes										
6. Computer technology	7%	+2%	6%	-4%	6%	+8%	12%	+17%	15%	-4%
7. IT methods for management					6%	+17%			4%	-1%
8. Semiconductors			4%	-5%	5%	+1%			5%	-3%
9. Optics			5%	-8%						
10. Measurement	5%	-5%	5%	-9%	4%	+12%	7%	+0%	4%	-5%
11. Analysis of biological materials										
12. Control										
13. Medical technology	8%	+3%	5%	-2%	5%	+18%	4%	+17%	8%	+3%
14. Organic fine chemistry	3%	-1%								
15. Biotechnology	4%	+6%								
16. Pharmaceuticals	5%	+10%							3%	+5%
17. Macromolecular chemistry, polymers										
18. Food chemistry										
19. Basic materials chemistry										
20. Materials, metallurgy										
21. Surface technology, coating										
22. Micro-structural and nano-technology										
23. Chemical engineering							4%	+13%		
24. Environmental technology										
25. Handling			3%	0%			4%	+11%		
26. Machine tools							5%	+15%		
27. Engines, pumps, turbines										
28. Textile and paper machines										
29. Other special machines	3%	-2%			4%	+6%	4%	+2%		
30. Thermal processes and apparatus										
31. Mechanical elements										
32. Transport	5%	-5%	5%	-8%	5%	+6%			4%	-1%
33. Furniture, games			7%	+4%						
34. Other consumer goods										
35. Civil engineering					5%	+6%	5%	+15%		

Three fields are leading fields at all the IP5 Offices: *1.Electrical machinery, apparatus, energy*, *6.Computer technology* and *10.Measurement*.

Six of the leading fields at the USPTO and five of the leading fields at the KIPO are related to the Electrical engineering sector (1 to 8). At the JPO, KIPO and USPTO, most of leading fields are related to the Electrical engineering sector (1 to 8) or to Instruments sector (9 to 13). At the CNIPA and the EPO, the leading fields are more spread between sectors, with EPO a little more concentrated in the Electrical engineering (1 to 8) and in the Mechanical engineering (25 to 32) sectors.

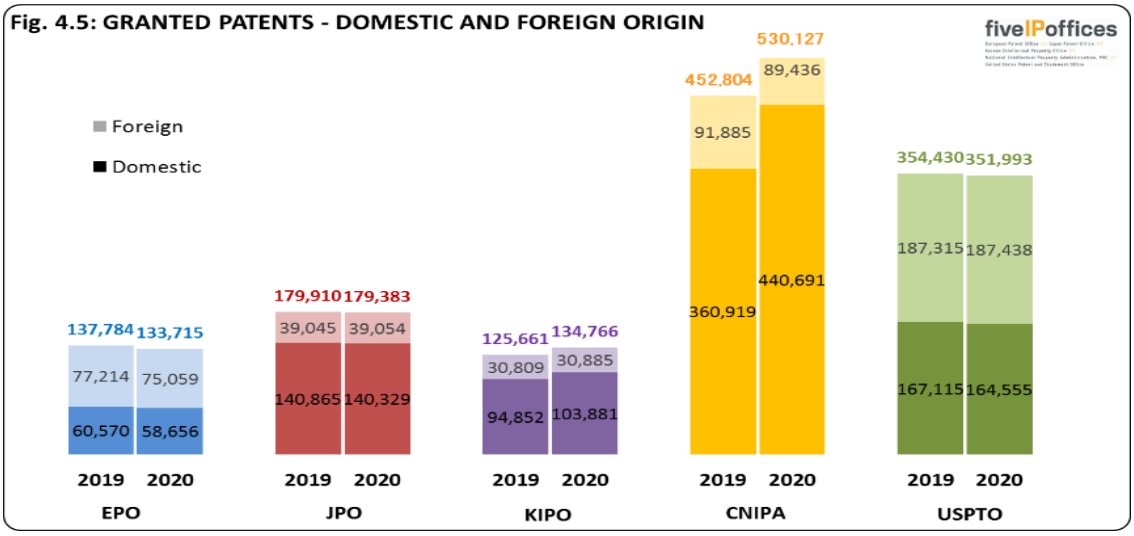
The highest share in a field can be found in *6.Computer technology* receiving 15 percent of all applications at the USPTO and 11 percent at the CNIPA.

[37] In the case of JPO data for 2019 are reported and compared to data for 2018.

GRANTED PATENTS

ORIGIN

Fig. 4.5 shows the numbers of granted patents by the IP5 Offices, according to the bloc of origin (residence of first-named owner or inventor).



Together the IP5 Offices granted a total of 1,329,984 patents in 2020. This was 79,935 more than in 2019 and represents an increase of 6 percent.

The numbers of granted patents increased in 2020 at the KIPO and the CNIPA. At the KIPO, there was an increase of approximately 7 percent, by 17 percent at the CNIPA. In contrast, the number of granted patents slightly decreased at the EPO, JPO and the USPTO.

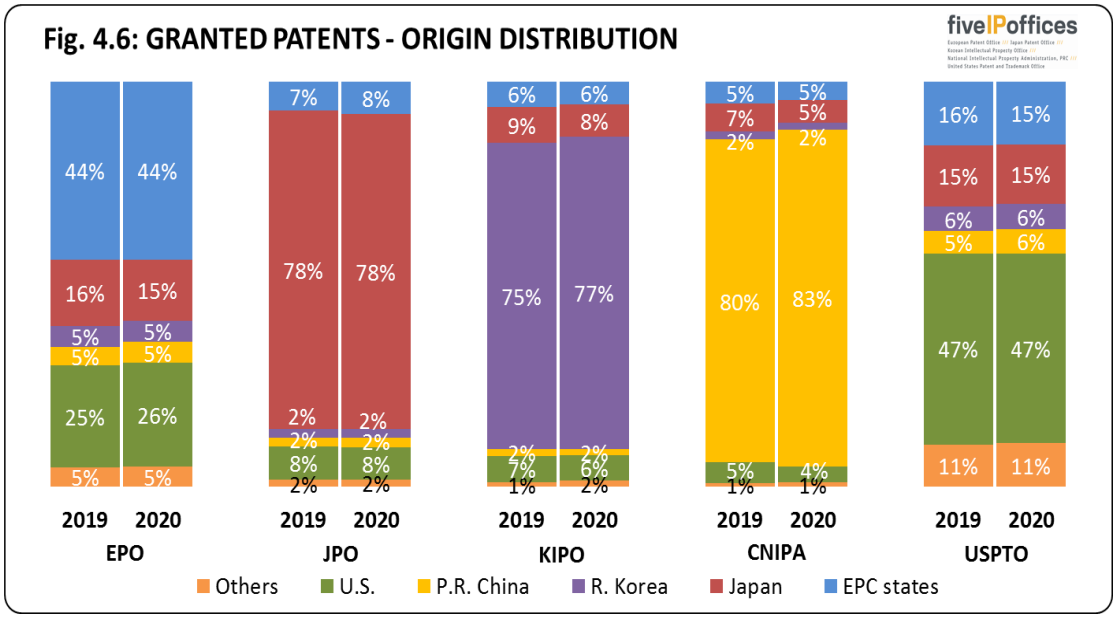
The differences between the IP5 Offices regarding the absolute numbers of granted patents can only be partly explained by differences in the numbers of corresponding applications. These numbers are also affected by differing grant rates and durations to process applications by the IP5 Offices (see the section below "Statistics on Procedures").

Table 4.2 shows the number of granted patents by origin (residence of first-named owner or inventor) at each office for 2020.

Table 4.2: 2020 GRANTED PATENTS – ORIGIN

Office / Origin	EPO	JPO	KIPO	CNIPA	USPTO	Total
EPC States	58,656	13,266	7,478	24,144	54,377	157,921
Japan	20,230	140,329	10,819	28,955	51,619	251,952
R. Korea	7,049	3,960	103,881	9,311	21,977	146,178
P.R. China	6,863	4,331	2,041	440,691	21,428	475,354
U.S.	34,162	14,165	8,504	21,084	164,555	242,470
Others	6,755	3,332	2,043	5,942	38,037	56,109
Total	**133,715**	**179,383**	**134,766**	**530,127**	**351,993**	**1,329,984**

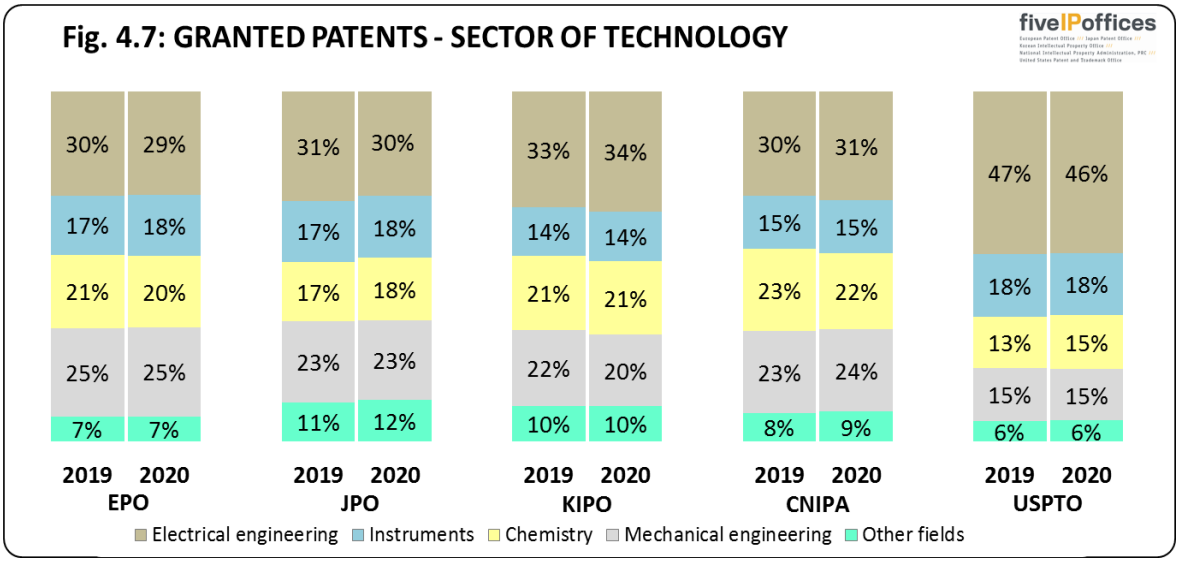
Fig. 4.6 shows the shares of granted patents by origin (residence of first-named owner or inventor) at each office for 2019 and 2020.



At all offices except the USPTO, the share of domestic granted patents in 2019 is lower than the share of domestic applications that is shown in Fig. 4.2. For CNIPA, the difference is larger than for the other offices, which can be partially explained by the strong growth in domestic applications observed during the past few years. That is not yet reflected in the distribution of granted patents.

SECTORS AND FIELDS OF TECHNOLOGY

Fig. 4.7 shows the distribution of the granted patents in 2019 and 2020 at each office according to the five main sectors of technology.



The distribution of granted patents by sectors is fairly consistent with that shown in Fig. 4.3 for applications. At the CNIPA, the share of Chemistry in granted patents is noticeably lower than the share in applications.

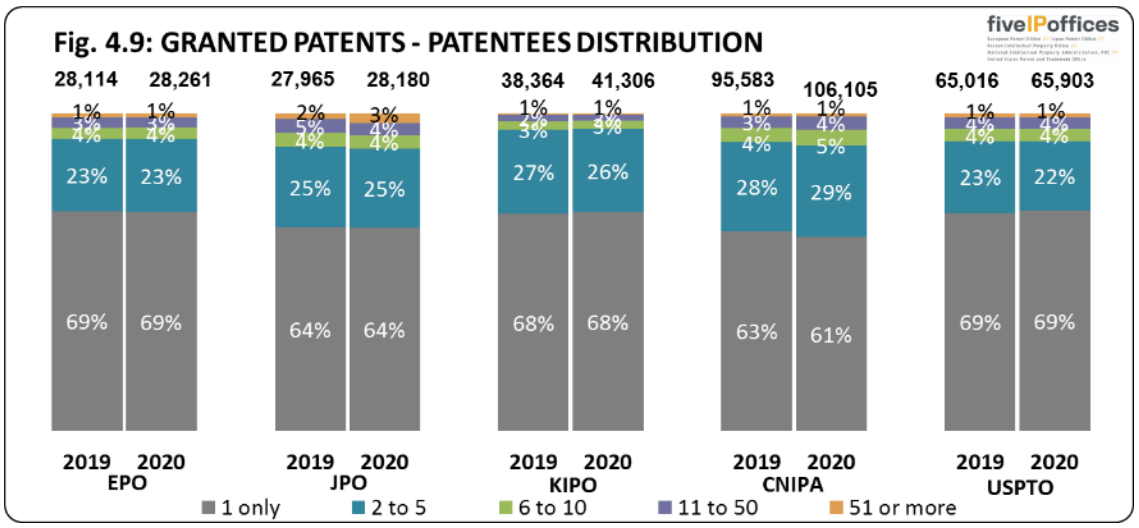
Fig.4.8 describes the distribution of the 2019 granted patents by the more detailed fields of technology at each office (left column for each IP5 Office), and the change in granted patents counts compared to 2018 (right column). Actual shares and percentage changes in patent counts are shown for the top 10 leading fields at each Office. The distribution of applications is represented by a colour scale: the darker the shade of a colour, the greater the share. The extent of change is reflected by a red–to-green colour scale, the dark red indicates a marked decrease and dark green indicates a marked increase.

Fig. 4.8: DISTRIBUTION OF GRANTED PATENTS BY FIELD OF TECHNOLOGY - 2020

	EPO		JPO		KIPO		CNIPA		USPTO	
	Share	Change	Share	Change	Share	Change	Share	Change	Share	Change
1. Electrical machinery, apparatus, energy	7%	+1%	9%	-2%	8%	+7%	7%	+8%	6%	-5%
2. Audio-visual technology			4%	-5%	4%	+13%			4%	-2%
3. Telecommunications										
4. Digital communication	9%	-1%			4%	+8%	7%	+8%	9%	-3%
5. Basic communication processes										
6. Computer technology	6%	-7%	6%	-2%	6%	+15%	10%	+26%	15%	-4%
7. IT methods for management									4%	-1%
8. Semiconductors			5%	-4%	6%	+13%			5%	-3%
9. Optics			4%	-7%						
10. Measurement	5%	+1%	5%	+1%	4%	+2%	8%	+14%	4%	-5%
11. Analysis of biological materials										
12. Control										
13. Medical technology	8%	+0%	5%	+4%	4%	+24%			8%	+3%
14. Organic fine chemistry										
15. Biotechnology										
16. Pharmaceuticals									3%	+5%
17. Macromolecular chemistry, polymers										
18. Food chemistry										
19. Basic materials chemistry										
20. Materials, metallurgy							3%	+17%		
21. Surface technology, coating										
22. Micro-structural and nano-technology										
23. Chemical engineering							3%	+26%		
24. Environmental technology										
25. Handling			4%	+4%						
26. Machine tools							4%	+15%		
27. Engines, pumps, turbines	4%	-5%								
28. Textile and paper machines										
29. Other special machines	4%	+7%			4%	+5%	3%	+38%		
30. Thermal processes and apparatus										
31. Mechanical elements	3%	-4%								
32. Transport	6%	-4%	5%	-6%	5%	-4%	4%	+16%	4%	-1%
33. Furniture, games			6%	+10%						
34. Other consumer goods										
35. Civil engineering	3%	-2%			5%	+16%	4%	+21%		

At the EPO 3.Telecommunications, 27.Engines, pumps, turbines and 35. Civil engineering are leading fields in granted patents but not in applications. At the JPO, 35.Civil engineering is a leading field in granted patents but not in applications. At the KIPO 2.Audio-visual technology is a leading field in granted patents but not in applications. At the CNIPA, 2.Audio-visual technology, 20. Material, metallurgy are leading fields in granted patents but not in applications. At the USPTO 27. Engines, pumps, turbines is leading field in granted patents but not in applications.

Fig. 4.9 shows the breakdown of patentees by their numbers of granted patents in 2019 and 2020.



This diagram shows that the distribution of grants to patentees is similar at each office in that it is highly skewed at all of them, because there are many more grantees that receive low numbers of grants rather than high numbers of grants. The proportions are generally consistent between 2019 and 2020 for each office. See the annexed statistical tables for longer term trends. These data are static.

At the CNIPA there is a slightly higher share of the “2 to 5” category than at the other IP5 Offices.

Most of the patentees received only one grant in a year. In 2020, the proportion was between 61 percent (CNIPA) and 69 percent (EPO, USPTO). The proportion of patentees that received less than six patents was between 89 percent for the JPO and 95 percent for the KIPO. The proportion of patentees receiving 11 or more patents was higher at the JPO (7 percent) than at the USPTO (5 percent), at the EPO (4 percent), at the CNIPA (5 percent), and at the KIPO (3 percent).

In 2020, the average number of granted patents received remained unchanged for most offices when comparing 2019 to 2020. The numbers were five for the EPO, six at the JPO, three at the KIPO, five at the CNIPA, and five at the USPTO. The greatest number of patents granted to a single applicant was 2,895 at the EPO, 3,680 at the JPO, 4,671 at the KIPO, 6,371 at the CNIPA, and 5,945 at the USPTO. This maximum number for 2020 was larger than for 2019 at the EPO, the KIPO, the CNIPA, and the USPTO.

MAINTENANCE

A patent is enforceable for a fixed term that depends on actions taken by the owner. In the IP5 Offices, the maximum term is usually twenty years from the date of filing the application. In order to maintain protection during this period, the applicant has to pay what are variously known as renewal, annual or maintenance fees in the countries for which the protection pertains. Maintenance systems differ from country to country. In most jurisdictions, including those of the IP5 Offices, protection expires if a renewal fee is not paid in due time.

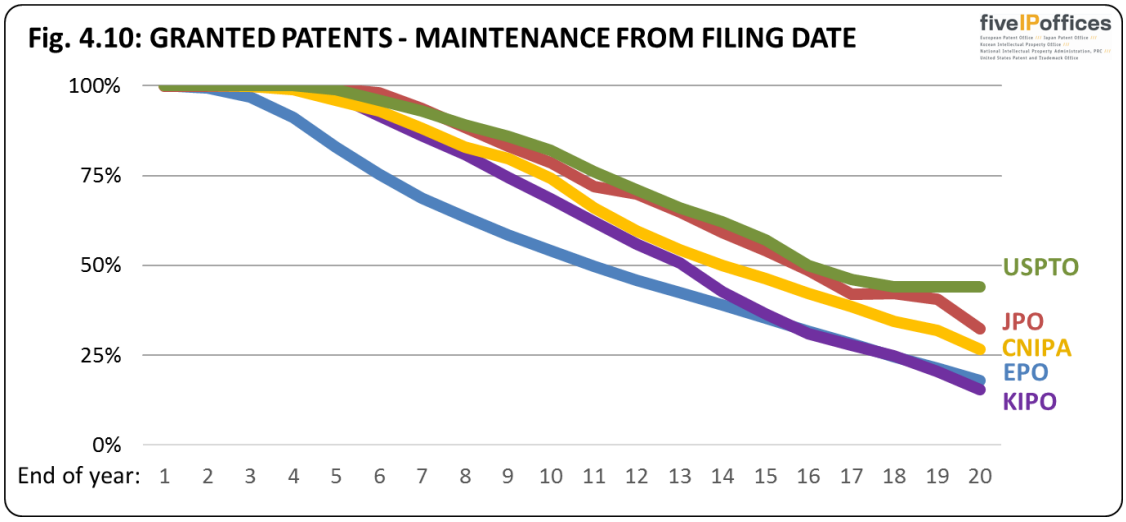
At the EPO, annual renewal fees are payable at the beginning of the year from the third year after filing in order to maintain the application. After the patent has been granted, renewal fees are then paid to the national office of each designated EPC contracting state in which the patent has been registered. These national patents can be maintained for different periods in the contracting states. Therefore, rather than maintaining one patent after grant, patentees have to deal with the maintenance of several patents and need to choose how long to maintain each one.

For a Japanese or Korean patent, the annual fees for the first three years after patent registration are paid as a lump-sum and for subsequent years there are annual fees. The applicant can pay either yearly or in advance.

At the CNIPA, the annual fee for the year in which the patent right is granted is paid at the time of going through the formalities of registration, and the subsequent annual fees are paid before the expiration of the preceding year. The date at which the time limit for payment expires is the date of the current year corresponding to the filing date.

The USPTO collects maintenance fees at 3.5, 7.5, and 11.5 years after the date of grant and does not collect an annually payable maintenance fee.

Fig. 4.10 shows the proportions of granted patents by each office that are maintained for differing lengths of time. It compares the rate of granted patent registrations existing and in force each patent year starting with the year of application. Figures are based on the most recent relevant data that are available at each IP5 Office. The EPO proportion represents a weighted average ratio of the maintenance of the validated European patents in the 38 EPC states[38].



At the USPTO, 44 percent of the granted patents are maintained for a full 20 years from filing. This compared to 32 percent at the JPO, 27 percent at the CNIPA, 18 percent at the EPO, and 15 percent at the KIPO.

More than 50 percent of the USPTO granted patent is maintained for at least 16 years, compared to 15 years at the JPO, 14 years at the CNIPA, 13 years at the KIPO and 11 years at the EPO.

In addition to patentees' behaviour, these differences can be partly explained by differences in the procedures, such as a multinational maintenance system (EPO), deferred examination (JPO, KIPO, CNIPA) and a stepped maintenance payment schedule (USPTO). Changes in patent laws and administrative processes also may have some effect on maintenance rates.

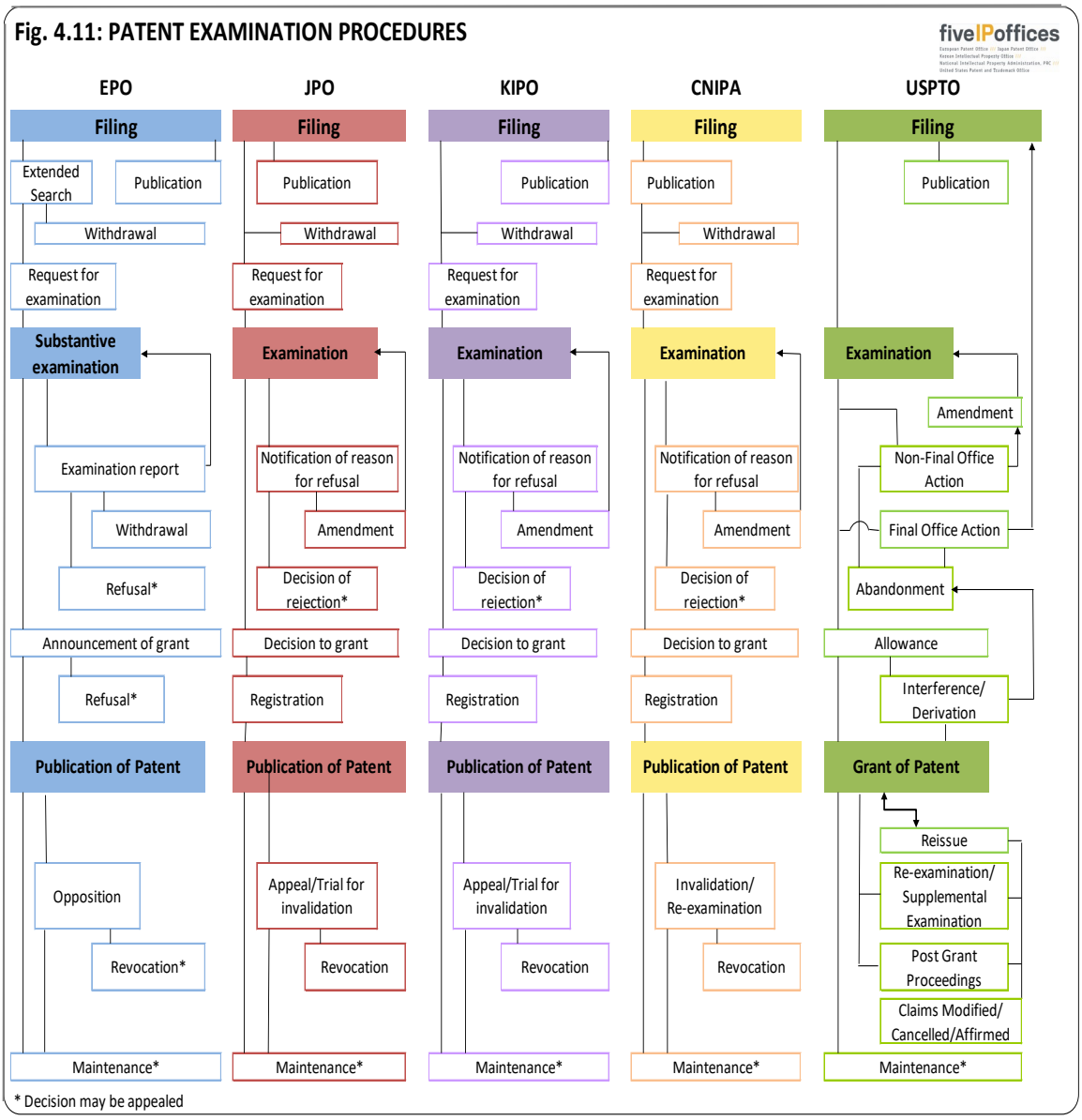
[38] Once granted by the EPO, European patents need to be validated to come into force in the various member states that are designated at the time of grant.

PATENT EXAMINATION PROCEDURES

PROCEDURE FLOW CHART

Fig. 4.11 is a simplified view of the major phases of the procedures at the IP5 Offices and concentrates on the similarities between offices to motivate the comparative statistics to be presented in Table 4.3. However, the reader should bear in mind when interpreting such statistics that details of the procedures differ between offices, sometimes to quite a large degree (e.g. in time lags between stages of the procedures).

Fig. 4.11: PATENT EXAMINATION PROCEDURES



See Annex 2 for some further details about the procedures.

Fees are due at different stages of the procedure. Information on main comparable fees at the IP5 Offices is made available online on the IP5 home page[39].

[39] See https://www.fiveipoffices.org/statistics/statisticaldata_index.html under fees. These data are not guaranteed to be entirely accurate or up to date. Official fee schedule information and associated regulations from each IP5 Office take precedence.

STATISTICS ON THE PROCEDURES

Table 4.3 shows various statistics as average rates and numbers where applicable for 2019 and 2020. Definitions of the various terms are given in Annex 2.

Details on the definition of the terms presented in Table 4.3 can found in Annex 2. In the following cases, there exist some differences between the offices:

- Pending examination: For the KIPO, only the unexamined patent applications with a request for examination filed have been counted. In the reports prior to the 2016 edition, the figure of this category included the entire unexamined patent applications.

- Pendency first office action: For the EPO the measurement begins at the date of initial filing and ends upon completion of either the extended European search report that includes a written opinion on patentability or, in the case of a PCT without supplementary search, the international search report with a written opinion. The JPO, KIPO, and CNIPA measure from the request for examination. Rather than measuring average pendency, in 2020 the USPTO has transitioned to a compliance rate based on compliance with a 14 month goal between filing and the mailing of the first office action, in accordance with its statutory mandate.

- Pendency final action: The pendency in examination is calculated from the date at which the file was allocated for examination (EPO, usually 6 months after the first action), the date of the request for examination (JPO, KIPO), the date on which the application enters the substantive examination phase (CNIPA).Rather than measuring average pendency, in 2020 the USPTO has transitioned to a compliance rate based compliance with a 36 month goal between filing and mailing of a final office action, in accordance with its statutory mandate.

Note: The length of time until request for examination can vary, this leads to significant differences between offices in the time periods that are reported.

Table 4.3: STATISTICS ON THE PROCEDURES

Definitions of the various terms are given in Annex 2.

Progress in the procedure Rates in percentage	Year	EPO	JPO	KIPO	CNIPA	USPTO
Examination	2019	94.5	72.7	81.7	89.5	100.0
	2020	94.3	73.1	84.5	89.1	100.0
Grant	2019	63.9	74.9	68.8	44.3	77.3
	2020	64.5	74.4	72.2	48.9	77.8
Opposition	2019	2.7	0.6	n.a	n.a	n.a
	2020	2.4	0.6	n.a	n.a	n.a
Appeal on examination	2019	14.6	30.5	5.5	11.4	2.7
	2020	12.3	30.6	4.4	13.0	2.0
Pendency	**Year**	**EPO**	**JPO**	**KIPO**	**CNIPA**	**USPTO**
Awaiting request for examination	2019	98,161	619,007	244,276	266,567	n.a
	2020	100,708	589,694	238,252	207,422	n.a
Pending examinations	2019	335,293	173,494	174,064	2,218,145	578,138
	2020	320,961	179,341	206,957	2,360,652	602,777
Pendency first action (months)	2019	4.1	9.5	10.8	14.9	13.3
	2020	4.3	10.1	11.1	14.4	n.a
Pendency final action (months)	2019	26.1	14.3	15.6	22.2	21.8
	2020	23.7	14.8	15.8	20	n.a
Pendency invalidation (months)	2019	n.a	12	n.a	5	n.a
	2020	n.a	12.5	n.a	5.9	n.a

n.a = not available

RATES

The examination rate at the USPTO is 100 percent, since filing a non-provisional patent application at the USPTO implies a request for examination, whereas at the EPO,the JPO, the KIPO, and the CNIPA a specific request for examination has to be made. At the EPO, a large proportion of PCT applications in the granting procedure give a high examination rate, as almost all of them proceed to examination. The examination rate is somewhat lower at the JPO and the KIPO since the deferred examination system allows more time for the applicants to evaluate whether or not to proceed further with the application.

The grant rates at the EPO, the KIPO and the USPTO increased between 2019 and 2020. At the CNIPA and the JPO, the grant rate decreased between 2019 and 2020.

The appeal on examination rates vary between offices, mainly due to the differing procedures.

PENDENCIES

In the successive stages of the procedure, there are pending applications awaiting action in the next step of the procedure. The number of pending applications gives an indication of the workload (per stage of procedure) from the patent grant procedure in each of the IP5 Offices. Although this may seem to be an indicator for the backlog in handling applications within the offices, it is not in fact a particularly good one because substantial parts of pending applications are awaiting action from the applicant. This could be for instance a request for examination or a response to actions communicated by the office.

As shown in Table 4.3, about 4.8 million applications were pending (i.e. awaiting request for examination or pending examination) in the IP5 Offices at the end of 2020. The total number of applications pending at the IP5 Offices increased by 2.1 percent

between 2019 and 2020. Pending applications decreased at the EPO and the JPO, increased at the KIPO, the CNIPA and stayed flat at the USPTO between 2019 and 2020.

The pendency to first action decreased at the CNIPA, while it increased at the EPO, the JPO and the KIPO. The pendency to final action decreased at the EPO and the CNIPA.

These numbers should be compared with caution, taking account of the differences in the procedures. At the EPO, the examination is done in two phases: a search and a substantive examination, while they are done in one combined phase at the other IP5 Offices.

Unlike the other IP5 offices, the USPTO does not have a request for examination step. As a result, the USPTO does not have pendency metrics that would be comparable to the other IP5 offices. See Annex 2 for further explanation.

At all IP5 Offices, various options to initiate a faster examination are available.