Analysis of Unpatentability Findings in *Inter Partes* Review Final Written Decisions (2013–2025)

Date: March 15, 2026 | Authors: Gaétan de Rassenfosse (EPFL) & Laura Sheridan (Google)

Context and relevance

In 2024, the Patent Public Advisory Committee (PPAC) released a study that examined 192 *Inter Partes* Review (IPR) final written decisions (FWDs) from calendar year 2021 to determine whether findings of unpatentability are based on prior art that was not before the patent examiner during examination. The study found that 93% of prior art references were cited for the first time in the IPR.

Since the 2024 PPAC study, there have been significant changes to the IPR process, including changes that impact whether an IPR petition is instituted. Our study, which replicates and substantially extends the previous 2024 PPAC effort, provides timely data to inform further conversation on the role of the IPR process within the U.S. patent system. We analyze about 5,000 cases with at least one claim found unpatentable between November 2013 and November 2025. The objective is to learn from a large and policy-relevant set of post-grant outcomes about what kinds of prior art are cited in unpatentability decisions, and whether that prior art was also found (or perhaps should have been found) during original prosecution.

Key findings

- **ICT dominance**: Information and Communication Technology (ICT) accounts for 60% of all IPR cases studied.
- **Complexity as a risk factor**: Challenged patents are significantly more complex than the general patent population, typically featuring more claims, more prior art references, and larger patent families.
- **The "missed" prior art is frequently a U.S. patent publication**:
  - Only 6% of the patent prior art relied upon in FWDs to find claims unpatentable was cited by examiners during original prosecution. This share has been declining over time.
  - Critically, 85% of this "new" patent art consists of U.S. patent publications, and 71% share at least one CPC main group with the challenged patent, suggesting they were within reach of standard search parameters.
- **Non-Patent Literature (NPL)**: While NPL makes up only 6% of references in typical Office Actions, it accounts for 16% of references in FWDs, indicating it is a frequently overlooked source of invalidating art.

Significance

The results highlight specific search deficiencies to address through a variety of approaches including further integration of AI-enhanced search tools, robust and tailored examiner training, and increased examination time. The results also highlight the role the IPR process has played over the twelve years covered by our study to bring relevant prior art forward when it was otherwise missed during original prosecution. However, it is important to note that because IPR-challenged patents form a highly selected subset, with a particular concentration in ICT patents, these findings identify gaps conditional on a challenge being filed rather than universal search quality across all patents issued during this period.

About the authors

Gaétan de Rassenfosse is Associate Professor at EPFL, Switzerland. Laura Sheridan is Head of Patent Policy at Google, USA.

Full Presentation Access: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=6415818
The data acquisition and analysis pipeline can be found at: https://github.com/gderasse/ptab-data-pipeline

Unpatentability findings in *inter partes* review final written decisions: A look at the evidence

March 15, 2026

Prof. Gaétan de Rassenfosse
EPFL, Switzerland

Laura Sheridan
Google, USA

This study received funding from Google LLC.

Analyzing 4,856 cases of unpatentability

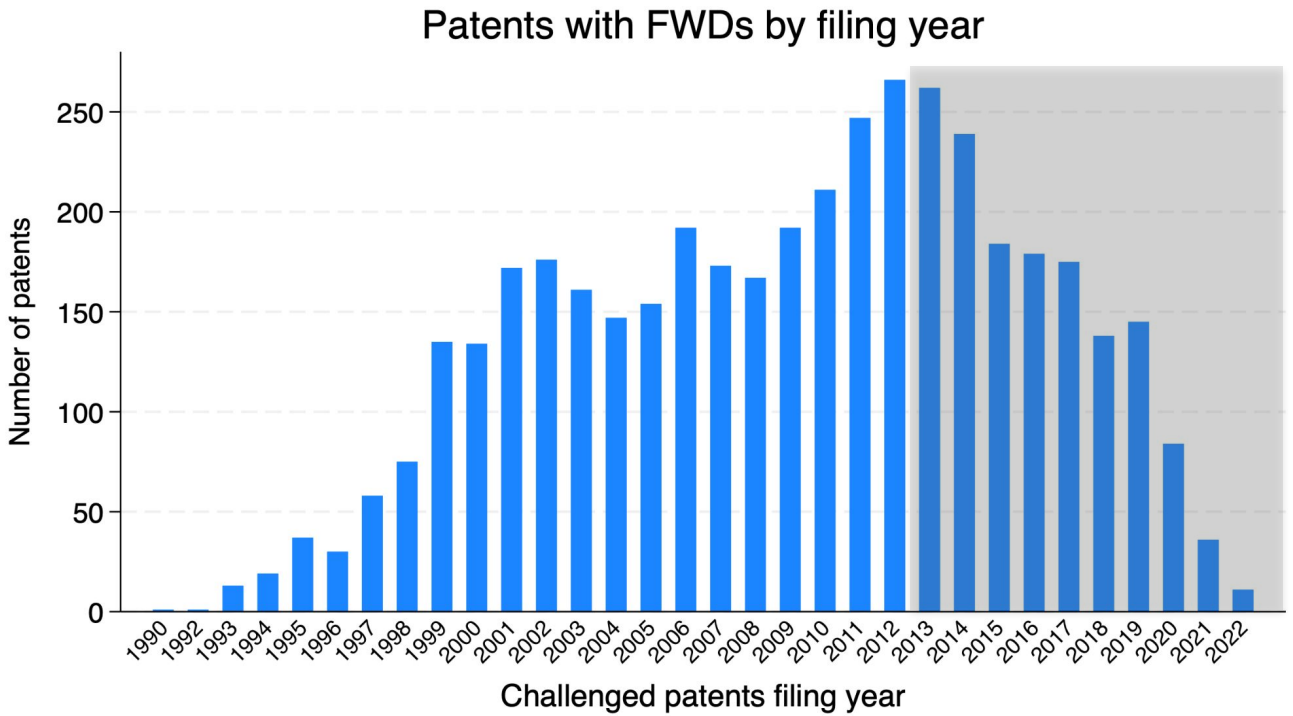
- The study extends the excellent “PPAC study” of unpatentability findings in *inter partes* review (IPR) final written decisions (FWDs) issued in calendar year 2021 (*N* = 192).

- It covers **FWDs issued in 2013/11–2025/11** (*N* = 5,814) that have at least one Final Decision (excluding 222 cases that have been joined with another case) and at least one claim found unpatentable (***N* = 4,856**).

The PPAC study is available at https://www.uspto.gov/sites/default/files/documents/ppac-aia-ipr-study-20241121.pdf

Sample characteristics

Examining three decades of patents

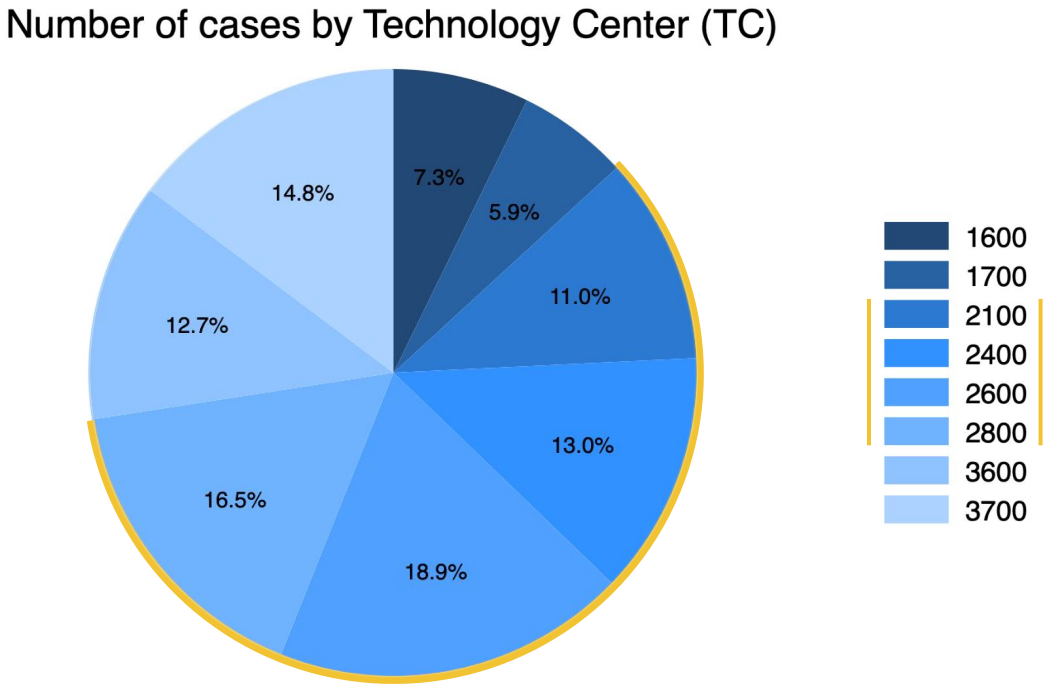


Note. 4214 unique challenged patents considered. The same patent can be subject to several FWDs.

The downward trend is a consequence of truncation bias. Many recent cases are still pending.

ICT (TC 2100–2800) accounts for 60% of the cases

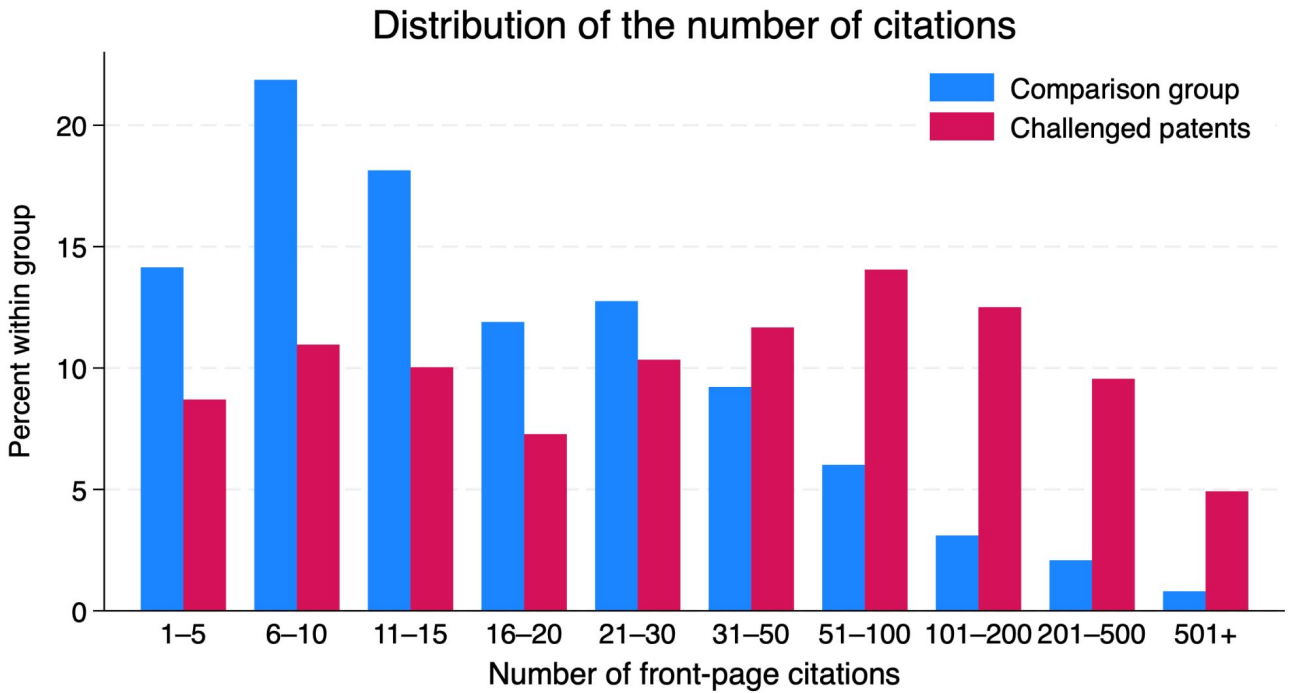
ICT: Information and Communication Technology



Notes. 604 challenged patents dropped for which the art unit was not found. 21 patents from TC 2700 dropped and 18 patents from TC 2900 dropped.
1600: Biotechnology and Organic Chemistry; 1700: Chemical and Materials Engineering; 2100: Computer Architecture Software and Information Security;
2400: Networking, Multiplexing, Cable, and Cybersecurity; 2600: Communications; 2800: Semiconductors, Electrical and Optical Systems and Components;
3600: Transportation, Construction, e-Commerce, Agriculture, National Security and License and Review;
3700: Mechanical Engineering, Manufacturing, Gaming, and Medical Devices/Processes

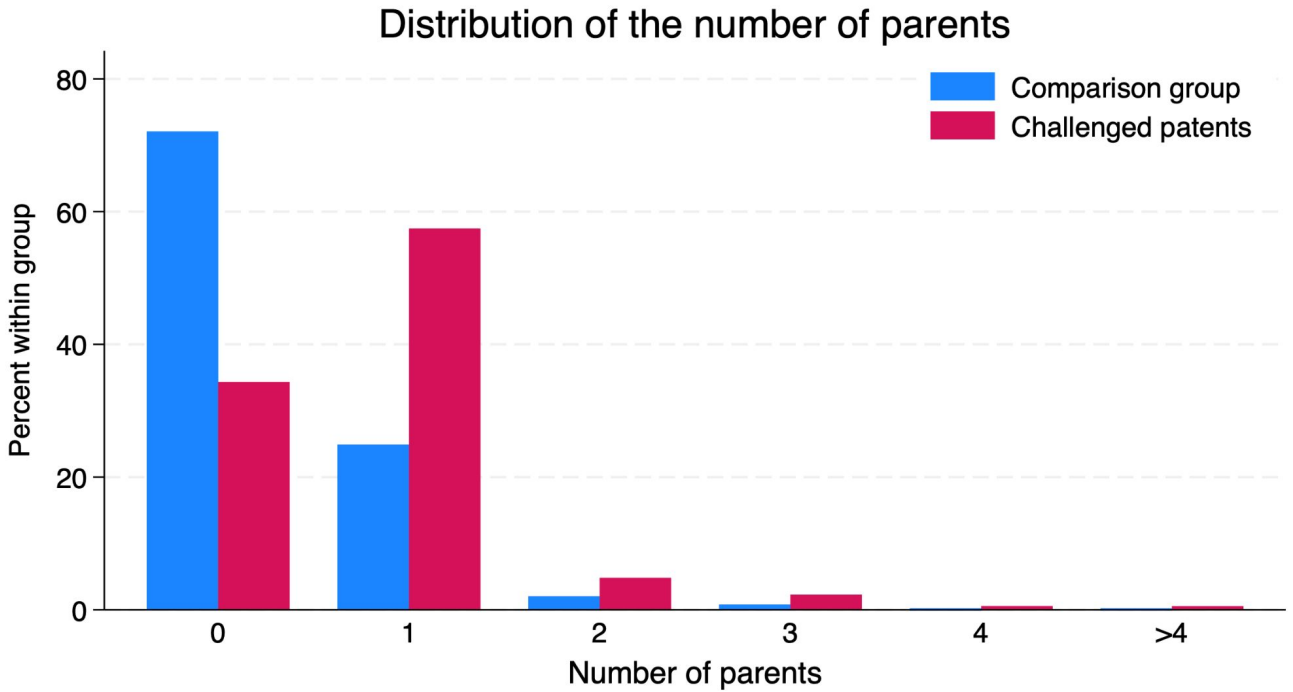
Characteristics of challenged patents (vs. “control” patents in the same TC / year)

Challenged patents make substantially more citations



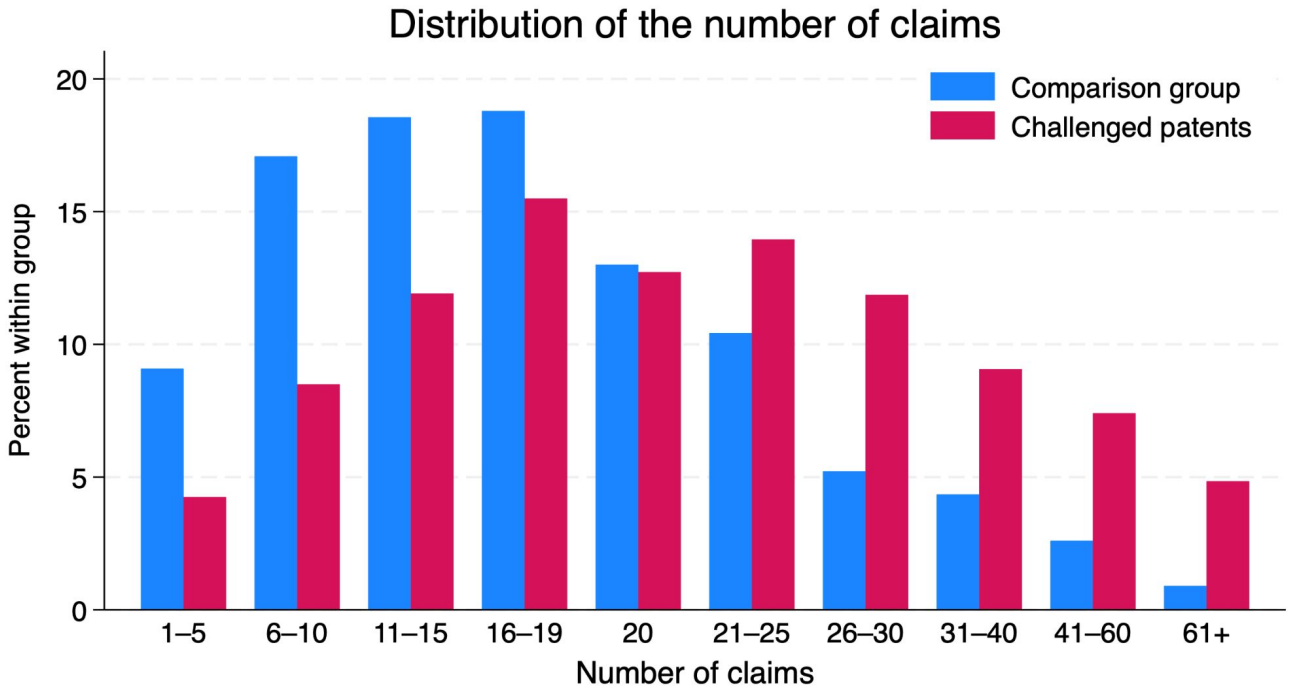
Notes. Ten comparison patents used for each challenged patent in a (Technology Center - Year) cell. 36013 challenged patents (and their corresponding comparison patents) included.

Challenged patents have substantially more parents



Notes. Ten comparison patents used for each challenged patent in a (Technology Center - Year) cell.

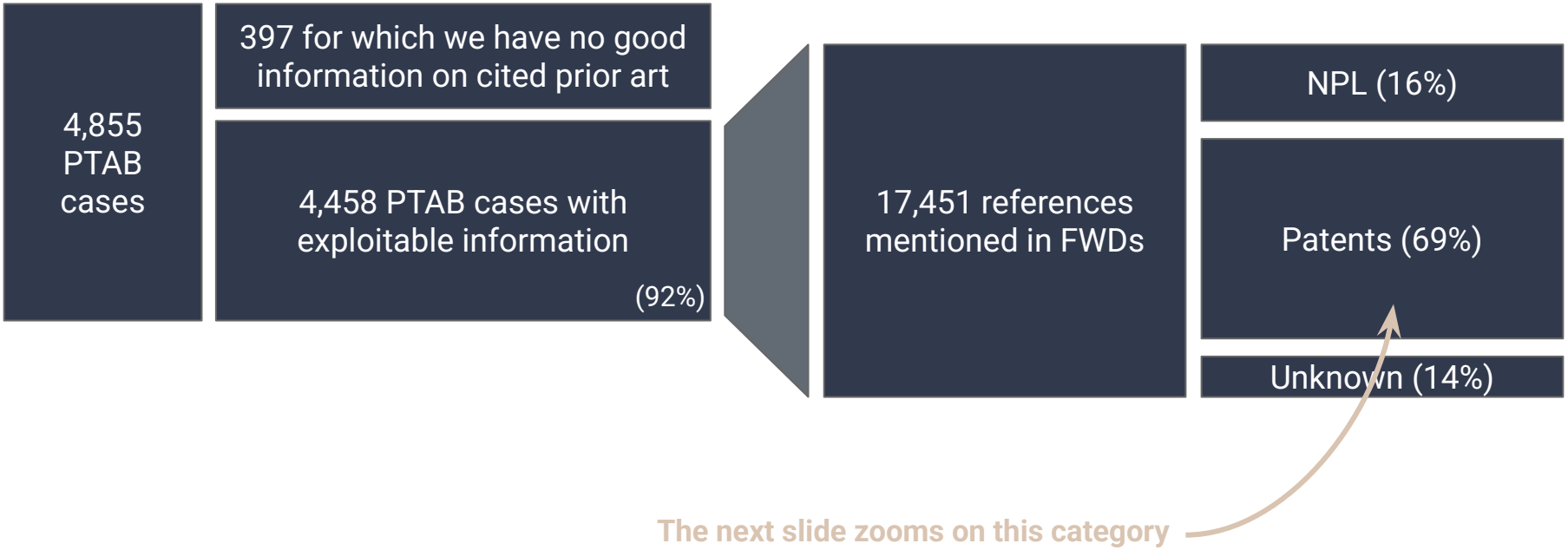
Challenged patents have substantially more claims



Notes. Ten comparison patents used for each challenged patent in a (Technology Center - Year) cell. Data for the total number of claims (independent and dependent).

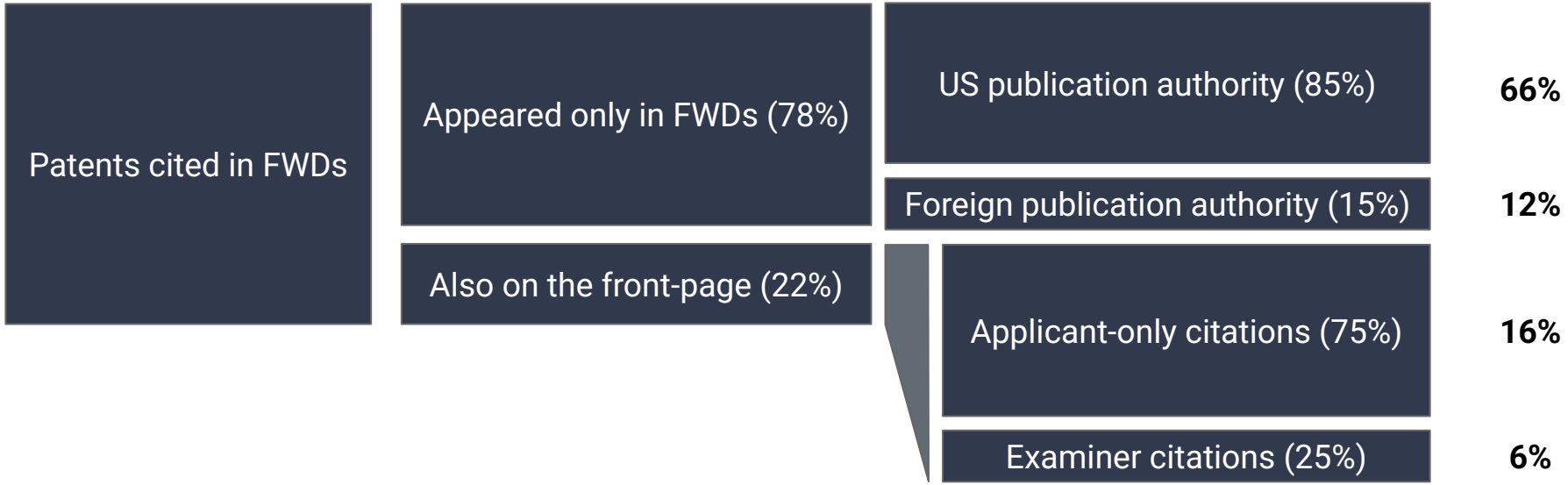
Consideration of the evidence relied on in findings of unpatentability in the IPR proceedings

References cited in FWDs are mostly patent prior art



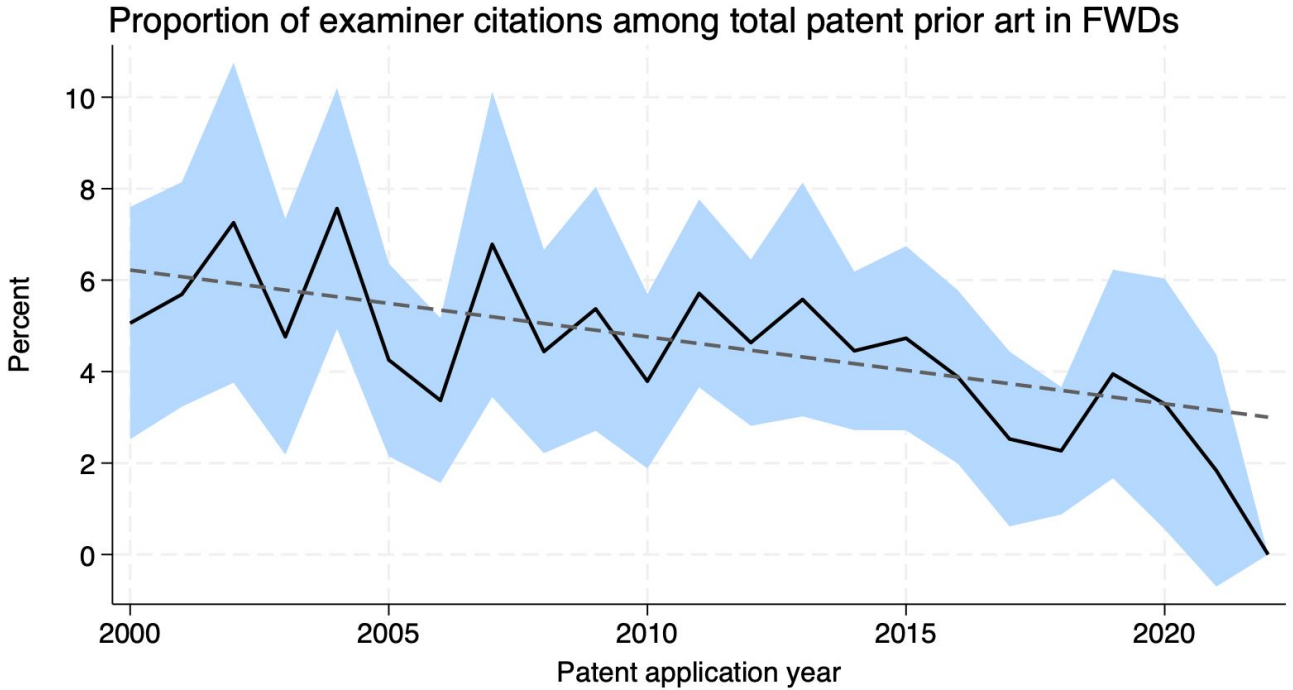
NPL: non-patent literature

Most patent prior art appears only during proceedings



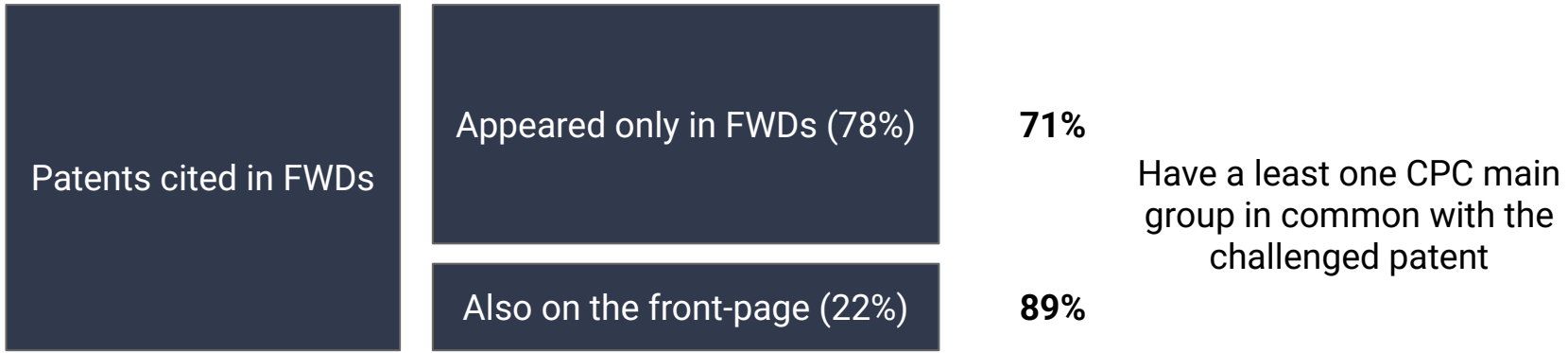
The next slide shows the evolution of this last category

A declining share of examiner citations



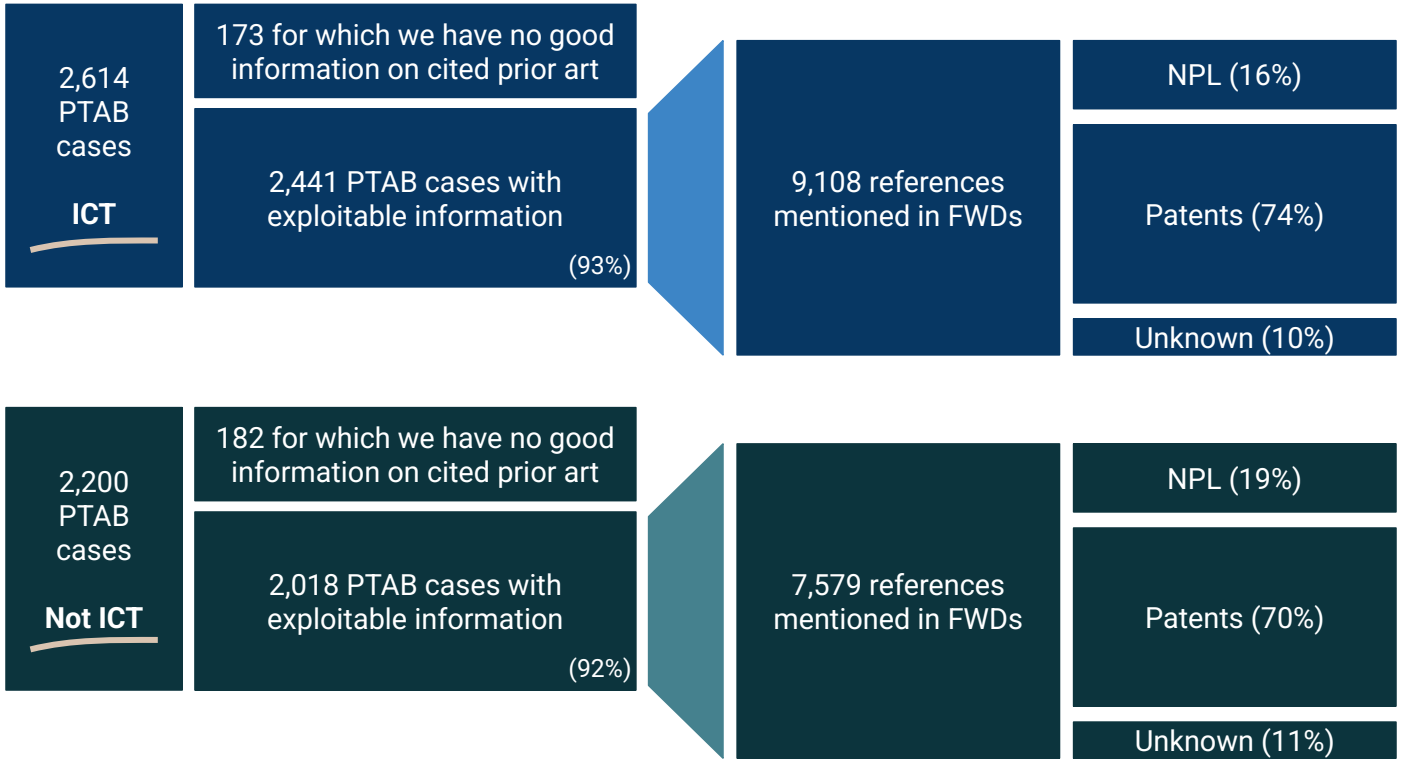
Notes. Solid line shows yearly estimates from a regression with year fixed effects and standard errors clustered at the patent level. 95%-percent confidence interval reported in blue. Dashed line shows the linear trend.

Most “FWD-only” references share at least one CPC main group with the challenged patent

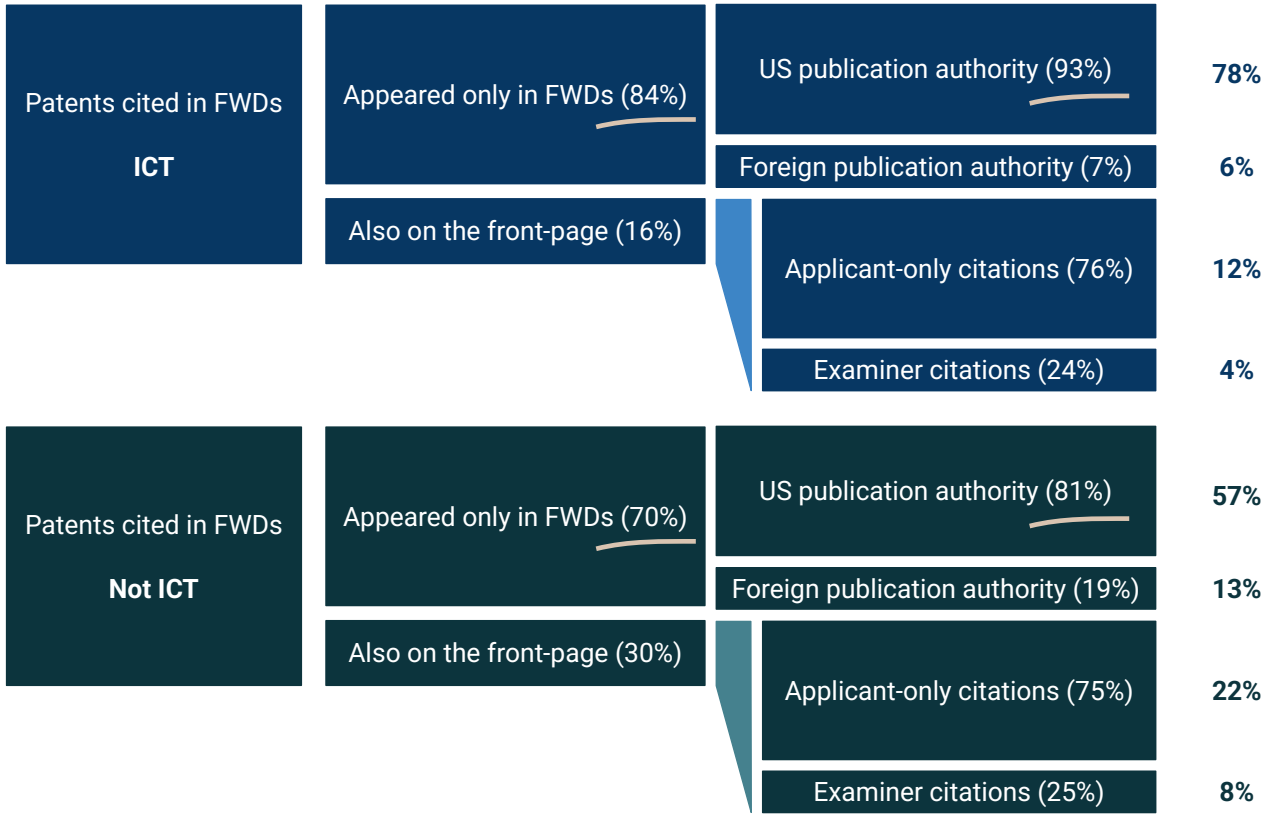


Example of a CPC main group: “G06K11: Methods or arrangements for graph-reading or for converting the pattern of mechanical parameters, e.g. force or presence, into electrical signal”

Similar origins of refs among ICT and non-ICT prior art



More “unseen” yet “local” patent prior art ICT challenges



Conclusions

Key Takeaways

- IPR cases are **dominated by ICT**, forming 60% of all cases.
- Challenged patents are **more complex**.
  - They have substantially more claims, make more references to prior art and have more family members than a sample of representative patents.
- Among all the patent art cited in FWDs, **about 6% were cited by examiners** during prosecution. The figure has been declining over time.
- **Should have been found?** About 85% of the *new* patent art cited were U.S. patent publications and 71% shared at least one CPC main group in common with the challenged patent.
- In ICT specifically, patent prior art used in FWDs is more likely to have been missed by examiners than in other TCs, yet is predominantly U.S. patent prior art.

Do not generalize to the whole population of patents

- Because PTAB-challenged patents are a highly selected subset of issued patents, the analysis is subject to potential **sample-selection bias**. The results identify search deficiencies conditional on selection into challenge, not search quality in the population of all granted patents. Over that period, the USPTO issued 3 million patents.

- The PTAB sample may yield an **upward-biased estimate of the extent of missed prior art** relative to the universe of issued patents. (Because no prior art may have been missed for patents that are not challenged.) However, the magnitude of this bias is unknown.

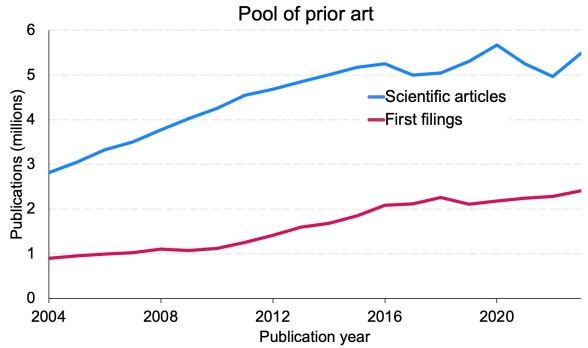
A note on the non-patent literature (NPL)

- According to recently-released data, about 6% of Office Action references are NPL over 2008–2023.
- Yet, about 16% of references mentioned in FWDs are NPL references.

  ⇒ **NPL references are overlooked**: they are significantly more likely to appear as prior art during challenges than during prosecution.

- There is also significantly more NPL available than patent literature.

  ⇒ **Vast pool of NPL references** available, searching them is particularly challenging.



Sources: Higham et al. (2026) for OA statistics, Open Alex for scientific articles, and 2025 IP5 statistics report for patent filings

About the authors

Gaétan de Rassenfosse

Gaétan is Associate Professor of Science, Technology and Innovation Policy at Ecole polytechnique fédérale de Lausanne (EPFL), Switzerland.

He has published more than 50 peer-reviewed papers, most of which dealing with the patent system. He publishes *The Patentist*, a monthly review of patent research ○ www.thepatentist.com

Laura Sheridan

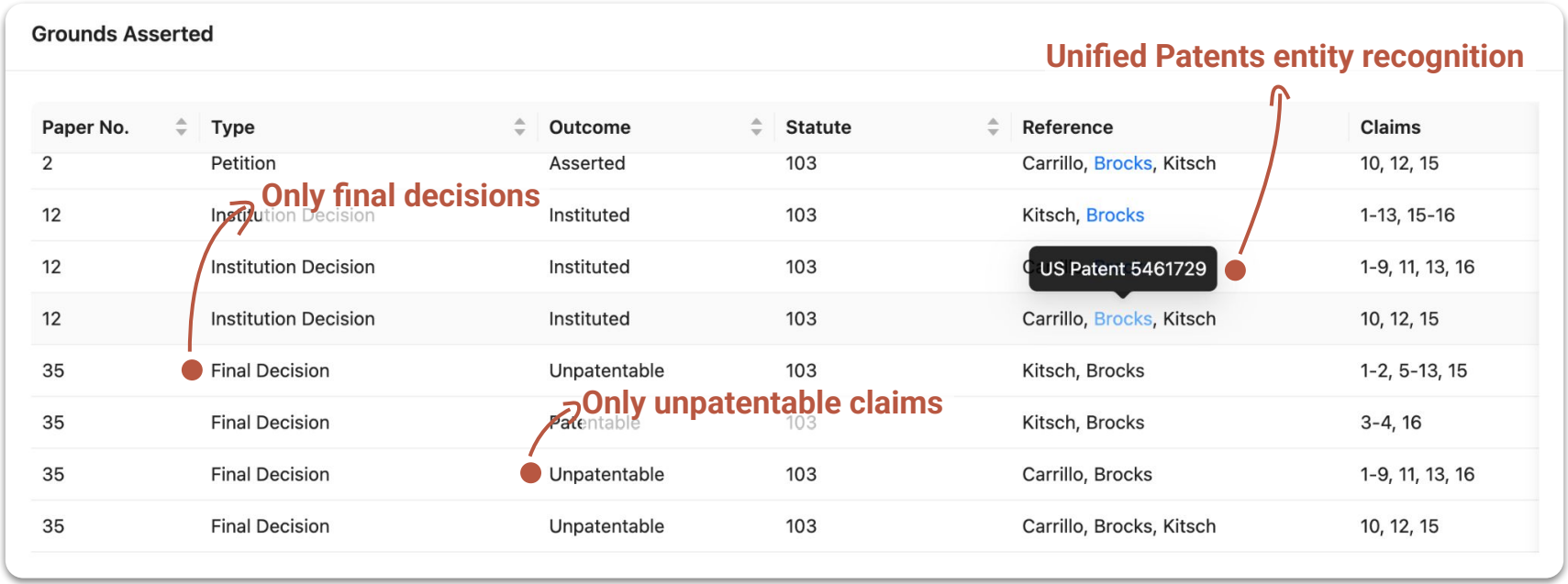
Laura is Head of Patent Policy at Google.

She has shared her views on patent issues in numerous policy dialogues, including testifying before Congress on the intersection of AI and patents. Her patent policy work is shaped by years of experience in patent prosecution, litigation, due diligence, and post-grant practice before the USPTO.

Appendix

Data acquisition and processing pipeline

We obtain the base data from Unified Patents database



Paper No.	Type	Outcome	Statute	Reference	Claims
2	Petition	Asserted	103	Carrillo, Brocks, Kitsch	10, 12, 15
12	Institution Decision	Instituted	103	Kitsch, Brocks	1-13, 15-16
12	Institution Decision	Instituted	103	[illegible]	1-9, 11, 13, 16
12	Institution Decision	Instituted	103	Carrillo, Brocks, Kitsch	10, 12, 15
35	Final Decision	Unpatentable	103	Kitsch, Brocks	1-2, 5-13, 15
35	Final Decision	[illegible]	103	Kitsch, Brocks	3-4, 16
35	Final Decision	Unpatentable	103	Carrillo, Brocks	1-9, 11, 13, 16
35	Final Decision	Unpatentable	103	Carrillo, Brocks, Kitsch	10, 12, 15

Note. Example taken from https://portal.unifiedpatents.com/ptab/case/IPR2024-01163

Other data sources used

- **Patents Public Data** stored on Google Cloud Platform to obtain information on the number of claims, art unit, CPC codes, etc.
- **Google Patents API** to disambiguate patent numbers from Unified Patents, available at https://patents.google.com/api/match.
- Data analysis was performed using **Python** and **StataMP 19**.*
- Data analysis pipeline available at https://github.com/gderasse/ptab-data-pipeline

* Data collection, processing, and analysis were conducted by Gaétan de Rassenfosse. Any errors introduced in these stages are his alone.

FWD cases without a “Final Decision”

- Among the 5,814 cases in Unified Patents flagged as having a FWD at the time of data collection, 222 (3.8%) do not have a “final decision” listed.
  - Extraction failed for two cases:
  - The other 220 cases have a “joinder decision”. For example, case number “IPR2017-01747” is joined with case number IPR2017-00392, which has a final decision.

→ No quality concerns.

The quality check is available in “quality/final_decision_analysis.xlsx”

Quality of Claims - References Outcome

- We selected a random sample of 50 “Final Decision” entries on the Unified Patents platform, such as:

case_no	outcome	statute	reference	claims
IPR2014-01428	Patentable	103	Hickey ## Hill ## Furuhashi	4, 15-19, 22, 24
IPR2021-00678	Unpatentable	103	Dahlman ## Samsung	1, 3-5, 11, 13-15
IPR2021-01446	Unpatentable	103	Hardouin	1-4, 10, 14, 16-17, 19-21, 31
IPR2020-01020	Unpatentable	102	Alexander	1, 5, 7
IPR2023-00900	Unpatentable	103	Lee ## Endoh	16-17
IPR2013-00282	Patentable	103	Gertz ## Stewart ## Morrow ## DDAG ## HP86.	7

- We manually check the outcome on the FWD PDF file. 6 out of 50 cases (12%) don’t have a correct outcome. All of the mistakes were false negatives: claims were deemed unpatentable but were, in fact, patentable. → Reported unpatentability is likely higher than it truly is.

The quality check is available in “quality/fwd_files_assembled_analysis.xlsx”

Cited references of “unknown” type

- Arise mostly from entity recognition failures in Unified Patents.

case_no	litigated_patent	ucid
IPR2021-01124	7292870	UNKNOWN - I)
IPR2024-00828	8982086	UNKNOWN - Rekimoto
IPR2020-01416	10165869	UNKNOWN - POSITA
IPR2018-00739		UNKNOWN - '196 PCT
IPR2020-01007	6424041	UNKNOWN - Ryan
IPR2014-00750	7546933	UNKNOWN - Albert
IPR2015-00025	8161077	UNKNOWN - Data ONTAP Guide
IPR2015-01341	RE39618	UNKNOWN - FDR Parameters
IPR2021-00293		UNKNOWN - Warden '712
IPR2019-01671	9468330	UNKNOWN - Admitted Prior Art

manual inspection leads to

Type	No. Cases
US patent	28
NPL	10
Foreign patent	5
PHOSITA	4
Other	2
Parsing error	1

  - 14% of entries flagged as “references” are, in fact, not proper references (7/50)—mitigates potential quality concerns.
  - 23% of NPL references among “legitimate” references (10/43)—more likely to be missed than baseline (16%).
  - 85% of US patents among patent references (28/33)—same as baseline.

→ References of unknown types lead to a slightly underestimation of NPL. But otherwise they are unlikely to be a cause for concern.

The quality check is available in “quality/unknown_references.xlsx”