

**A BRIEF CASE STUDY IN POLICY-RELEVANT EMPIRICAL ASSESSMENTS:
THE SHORTCOMINGS OF COUNTING PATENT GRANTS BY COUNTRY TO
INFORM PATENT ELIGIBILITY IN THE U.S.**

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I. Executive Summary

Policymakers considering innovation and economic policy should be applauded for trying to make evidence-based and data-driven decisions. But not every empirical assessment can be taken at face value, and without attention to the details, there's a risk that incorrect conclusions will be drawn from misunderstood or incomplete data. Reliable, inclusive datasets that accurately account for a full range of stakeholders are critical.

In the specific context of patent policy, data about patent applications and grants can be one useful (or at least readily-measurable) source when trying to quantify certain things about innovation. Yet, there are critical limitations and faults that can emerge when relying on patents as a proxy for innovation. For example, trying to understand domestic innovation by merely comparing the number of patents granted by the U.S. Patent and Trademark Office (PTO) to the number of patents granted by another country's patent office rarely (if ever) provides meaningful information without further analysis.

This case study demonstrates why policymakers and scholars need to approach policy-relevant empirical analyses with nuance and care. In recent conversations over what subject matter is (and is not) eligible for a U.S. patent, some have turned to counting the patents a country issues to determine which country's laws best support domestic innovation. One 2017 study, at least implicitly, adopts that lens.¹ It identifies 1,694 U.S. patent applications that were purportedly rejected and abandoned "on the ground that they [we]re ineligible for patent protection under § 101 [of the Patent Act],"² but were then granted by the European Patent Office (EPO), China, or both. And this has been interpreted as relevant to the question "of whether these countries are positioning themselves to bypass the U.S. as forerunners in innovation."³

As detailed below, it is essential to dig deeper to understand what is going on with the applications included in that 2017 study. Reviewing the file histories of a randomly-selected subset (ten percent) of the 1,694 patent applications reveals key variables that were previously unexplored.

First, for 85 percent of the applications reviewed, it does not make sense to say they were abandoned *because of* the U.S.'s patent subject matter eligibility law. Twenty-four percent of those applications never faced or overcame eligibility-related § 101 rejections before they were abandoned. A further 61 percent faced numerous rejections at the time they were abandoned—e.g., the claims were also

¹ See Kevin Madigan & Adam Mossoff, *Turning Gold to Lead: How Patent Eligibility Doctrine is Undermining U.S. Leadership in Innovation*, 24 Geo. Mason L. Rev. 939 (2017) (describing the dataset).

² *Id.* at 942.

³ *Id.* at 941.

unpatentable because they were anticipated, obvious, or lacked sufficient description. Only 15 percent of those applications faced a sole, eligibility-related § 101 rejection when they were abandoned.

Relatedly, 12 percent of the applications reviewed are still pending or have child applications that are either pending or issued. This means a patent claiming the same or an overlapping invention has or could issue. Nearly a quarter (22 percent) of the applications that faced a sole, eligibility-related § 101 rejection at abandonment have child applications pending.

Second, for a substantial majority of the applications reviewed, the connection to domestic innovation is tenuous at best. More than 75 percent of those applications reviewed were filed by foreign inventors and/or assignees. Indeed, in the current climate, at least some policymakers may be interested to know that Huawei appeared most often on this list of assignees with rejected and abandoned applications. Of the small fraction of applications that faced a sole, eligibility-related § 101 rejection at the time of abandonment, 85 percent of those applications were assigned to an organization outside the U.S. Because foreign entities make up most of the inventors and assignees that filed the abandoned applications, it is not possible to conclude, without more, that these applications reflect anything noteworthy about domestic innovation.

Overall, this case study reveals how policymakers seeking data to inform their work (notably when it comes to using patents as a proxy for innovation) must also pay close attention to details and context.⁴

II. Background

Officials crafting U.S. patent policy speak about promoting and supporting innovation, and they often focus on the value of domestic innovation.⁵ Not only do we want innovators to develop and offer new technologies and services, generally, but domestic innovation can be a source of global competitiveness and it contributes to economic growth and job creation in sectors like engineering, manufacturing, and sales.

In this vein, recent attention around § 101 of the Patent Act and what is (and is not) eligible for patent protection in the U.S. has some policymakers asking how this area of the law impacts the rate and pace of

⁴ This case study is not, and is not intended to be, a comprehensive investigation of empirical evidence (patent-related and otherwise) relevant to policy questions around the U.S. doctrine of patent eligible subject matter.

⁵ *E.g.*, Press Release, Leahy And Tillis Introduce Bipartisan Bills To Boost American Innovation (Sept. 21, 2021), <https://www.leahy.senate.gov/press/leahy-and-tillis-introduce-bipartisan-bills-to-boost-american-innovation> (statement of Sen. Leahy that “[e]xpanding access to the patent system is not a partisan issue; it is an issue of maintaining American competitiveness and extending opportunity to all Americans, no matter their background, economic status, or location”); Press Release, Leahy And Cornyn Introduce Bipartisan Bill To Support American Innovation And Reduce Litigation (Sept. 29, 2021), <https://www.leahy.senate.gov/press/leahy-and-cornyn-introduce-bipartisan-bill-to-support-american-innovation-and-reduce-litigation> (statement of Sen. John Cornyn that “[o]ur patent system is meant to encourage innovation, and when it functions properly that’s exactly what it does”); 157 Cong. Rec. S5356- S5357 (Sept. 7, 2011), <https://www.congress.gov/112/crec/2011/09/07/CREC-2011-09-07-pt1-PgS5356.pdf> (statement of Sen. Amy Klobuchar that “innovators and entrepreneurs across Minnesota have told me, we need to rejuvenate our laws to ensure that our patent system supports the needs of a 21st century economy”); 157 Cong. Rec. H4425, <https://www.congress.gov/congressional-record/2011/06/22/house-section/article/H4420-6> (statement of Rep. Goodlatte that “[i]t is only right that as more and more inventions with increasing complexity emerge, we examine our Nation’s patent laws to ensure that they still work efficiently and that they still encourage and not discourage innovation”).

domestic innovation.⁶ Yet within that context, some have turned to patent counts—and comparing the number of patents issued by the U.S. to the number issued by other countries—to inform policy debate.⁷ When looking at that type of data, though, policymakers need to scrutinize what such patent counts do (and do not) say. This case study takes a deeper dive into one dataset. And helps show why policymakers need to be discriminating when relying on patent counts and country comparisons as a proxy for domestic innovation.

Before turning to the data, a few brief points of introduction. First, counting the patents issued by the PTO is sometimes used as an (admittedly-imperfect) proxy for innovation.⁸ In that context, it is helpful to remember what a U.S. patent is. It is a *negative* right, the *right to exclude* others in the U.S. from doing what the patent covers.⁹ A U.S. patent does not come with the *positive* right to practice your invention.¹⁰ Put another way, just because you have a patent does not mean you can make or do the thing you invented. It just means you can limit what other people can do within the scope of your patent claims (and sometimes that means you can prevent other inventors in the U.S. from making or offering their own innovations).¹¹

Likewise, a patentee does not have to make, use, or sell her invention,¹² and anyone, in any country, can apply for a U.S. patent. The owner of a U.S. patent does not have to do any work in this country, does not need to create any jobs here, and there is no requirement that she engage in inventive or innovative activity within the U.S. to obtain a patent here.¹³

As a second point of background, this case study concerns patent eligible subject matter and 35 U.S.C. § 101. That doctrine, rooted in over 150 years of law, confirms that one cannot patent abstract ideas, laws of nature, and natural phenomena.¹⁴ For example, you cannot patent a human gene or patent the use of generic computers to carry out ordinary business transactions, because those ideas are not patent

⁶ See, e.g., Press Release, Sens. Tillis and Coons and Reps. Collins, Johnson, and Stivers Release Draft Bill Text to Reform Section 101 of the Patent Act (May 22, 2019), <https://www.tillis.senate.gov/2019/5/sens-tillis-and-coons-and-reps-collins-johnson-and-stivers-release-draft-bill-text-to-reform-section-101-of-the-patent-act>.

⁷ See, e.g., Madigan, *supra* note 1, at 941-42; Steve Brachmann, *WIPO Stats on Patent Application Filings Shows China Continuing to Lead the World*, IP Watchdog (Dec. 12, 2017), <https://www.ipwatchdog.com/2017/12/12/wipo-stats-patent-application-filings-china-lead/id=90855/>.

⁸ See, e.g., Petra Moser, *Patents and Innovation: Evidence from Economic History*, 27 J. Econ. Perspectives 23, 23-24 (2013) (noting that “[i]n the absence of economy-wide data on the quantity of innovations, patent counts have become the standard measure of innovation,” yet patent data “may fail to capture innovation that occurs *outside* of the patent system”).

⁹ See, e.g., Janice M. Mueller, *Patent Law* 15 (3d. ed. 2009); 35 U.S.C. § 154(a)(1) (2013).

¹⁰ Mueller, *supra* note 9, at 15.

¹¹ This is known as a “blocking patent”—a patent that prevents others from practicing their subsequent inventions or innovations. When the patent system is working well, any blocking patent is novel and non-obvious, appropriately tailored to claim and describe what was invented, directed to eligible subject matter, and not so over-broad as to unduly preempt broad swaths of follow-on innovation.

¹² There are very few exceptions. See, e.g., Cong. Research Serv., R43266, *Compulsory Licensing of Patented Inventions* (Jan. 14, 2014), <https://crsreports.congress.gov/product/pdf/R/R43266>.

¹³ Cf. United States Patent and Trademark Office, *General Information Concerning Patents*, USPTO (Oct. 2015), <https://www.uspto.gov/patents-getting-started/general-information-concerning-patents#toc-foreign-applicants-for-u-s-patents> (“The patent laws of the United States make no discrimination with respect to the citizenship of the inventor. Any inventor, regardless of his or her citizenship, may apply for a patent on the same basis as a U.S. citizen.”).

¹⁴ E.g., *O'Reilly v. Morse*, 56 U.S. (15 How.) 62 (1853); *Gottschalk v. Benson*, 409 U.S. 63 (1972); *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948).

eligible.¹⁵ While there are a number of reasons for the doctrine, from the pro-innovation perspective, if the law allowed one company to “own” such underlying concepts, it would permit that company—who contributed nothing truly inventive—to prevent productive, innovative activity by everyone else in the U.S.¹⁶

Right now, as some policymakers are reviewing how subject matter eligibility doctrine is working in the U.S.,¹⁷ it is timely to revisit one 2017 study on the law and its purported connection to U.S. leadership in innovation.¹⁸ This 2017 study reported on a dataset of patent applications that had received a rejection (or “Office Action”), where the PTO examiner found the application was unpatentable because it was directed to an abstract idea, law of nature, or natural phenomena. The study focused on applications that were rejected and then abandoned, and suggested a list of 17,743 applications filed over an approximately three-year period were rejected “on the ground that they [we]re ineligible for patent protection,” having received a “final” rejection from the PTO on eligibility grounds. (As detailed below, the term “final rejection” is a term of art in patent examination, and numerous applications receive such a so-called “final rejection” before continuing through the examination process.¹⁹) Within that universe of abandoned patent applications, the study identified 1,694 applications that were granted by the EPO and/or China.

This study has been written up and cited in ways that seem to miss the point of what the underlying data actually show. For example, it has been suggested that the data show the U.S. “is ceding [its] innovation leadership to other countries,”²⁰ that “China is poised to ‘fill the void’ . . . as the U.S. has lost its ‘comparative advantage in securing stable and effective property rights in new technological innovation,’”²¹ and that the contrasts in patent issuance “has had negative results for the U.S. leadership role in innovation.”²²

In fact, a closer inspection of a random sample of these abandoned U.S. patent applications reveals that (1) most were unpatentable for a variety of reasons and (2) most were filed by foreign entities. As such, it does not make sense to conclude these applications were abandoned *because of* § 101—most of them were unpatentable for separate and independent reasons. It also does not make sense to characterize the abandonment of these applications as a substantial issue for domestic innovation—most of the applications were filed by foreign inventors and assignees. The more accurate conclusion appears to be: the PTO is trying to do its job in rejecting unpatentable applications, and in many cases has declined to grant dubious patents in response to applications from across the globe.

¹⁵ *E.g.*, *Ass’n Mol. Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013) (holding that naturally occurring DNA segments are not patent eligible); *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363 (Fed. Cir. 2015) (holding patent claims directed to budgeting were ineligible)

¹⁶ *E.g.*, *Alice Corp. Pty. Ltd. V. CLS Bank Int’l*, 573 U.S. 208, 216 (2014) (monopolizing basic tools of scientific and technological work “through the grant of a patent might tend to impede innovation more than it would tend to promote it”) (citations omitted).

¹⁷ *E.g.*, Tillis, *supra* note 6.

¹⁸ See Madigan, *supra* note 1 (describing the dataset).

¹⁹ See generally *infra* note 33 (discussing post-final rejection options); *Rapid Rise in the Request for Continue Examination Backlog Reveals Challenges in Timely Issuance of Patents*, U.S. Dept. of Commerce Office of Inspector General 2 (June 30, 2014), <https://www.oig.doc.gov/OIGPublications/OIG-14-024-A.pdf> (noting volumes of post-final rejection Requests for Continuing Examination).

²⁰ Madigan, *supra* note 1, at 960.

²¹ National Security Commission on Artificial Intelligence, *Final Report*, NSCAI.Gov, ch.12 (2021), <https://reports.nscai.gov/final-report/chapter-12/>.

²² Shahrokh Falati, *Patent Eligibility of Disease Diagnosis*, 21 N.C.L.J. & Tech. 63, 132 (2020).

As such, it appears this dataset is of limited relevance for policymakers trying to use patent application data as a proxy for domestic innovation. If anything is to be drawn from this dataset, because foreign entities filed most of the abandoned applications among those reviewed, the most supportable conclusion from this 2017 dataset seems to be that changing § 101 would benefit foreign applicants conducting R&D outside the U.S.

III. Methods

A. *Underlying dataset.* The underlying dataset of 1,694 patent applications was compiled in late September 2017, based on data from Patent Advisor and Thomson Innovation.²³ It was designed to include all U.S. patent applications that received a final rejection under § 101 and were later abandoned (between August 1, 2014 and September 27, 2017).²⁴ For those 1,694 applications, patents “claiming the same or similar inventions were granted by the [European Patent Office], China, or both.”²⁵ At the time the data were collected, the applications were abandoned and no child patents had issued, but since 2017 some of the applications have had their abandonments withdrawn or have pending or issued U.S. patent family members.

B. *Identifying a random subset of applications.* A subset of 170 of the 1,694 abandoned applications (constituting 10 percent) was randomly identified. A random number generator was used to identify 170 integers, with duplication not allowed.²⁶ The applications were sorted by patent application number, and if an application’s position on the list aligned with one of the randomly-generated integers it was slated for review.

²³ The underlying dataset has been described in one paper as follows: “The total database includes all patent applications that received an initial or final rejection as patent ineligible under § 101 and were then abandoned by the applicant between August 1, 2014 and September 27, 2017. The database of total patent applications is 48,586. From this total, 17,743 applications received a final rejection from the PTO on the basis of § 101, and were subsequently abandoned. Of these 17,743 patent applications, 344 were appealed and abandoned after the Examiner filed an Answer to the applicant’s appeal brief. Thus, no U.S. patent issued from these 17,743 applications, nor did any other patents issue on related inventions (what patent lawyers call a ‘family’). Among these 17,743 patent applications, 1,694 patent applications claiming the same or similar inventions were granted by the EPO, in China, or both.” Madigan, *supra* note 1, at 956.

²⁴ One of the individuals who compiled the dataset further stated that, from subsequent “discussions with Patent Advisor I have come to understand that what I believed to be Section 101 ‘judicial exception’ patent eligibility rejections turned out upon further analysis by Patent Advisor to be other types of Section 101 rejections (i.e., ‘software per se’ or claiming a ‘human organism,’ inoperative/utility). Also, some of the applications that were identified as having [] Section 101 rejections had such rejections withdrawn prior to the abandonment. These applications were included in the list as a result of how Patent Advisor codes the data in [a] manner that obscures the specific basis of the 101 rejection and the timing of the abandonment relative to the office action having the Section 101 rejection. Even so, I am confident that the majority of the 1694 applications meet my initial screening criteria—applications abandoned following a rejection with Section 101 ‘judicial exception’ rejection and for which there was a counterpart China or EP patent in patent family, but no issued U.S. patent in the family.” In addition, “[a]s it has been several years since the original data was gathered, some of the applications have had their abandonments withdrawn and are either pending or have issued, or have issued U.S. family members in addition to their China or EP counterparts.” Correspondence with R. Sachs, Sept. 16, 2019 (on file).

²⁵ Madigan, *supra* note 1, at 956.

²⁶ *Random Number Generator*, Calculator.net, <https://www.calculator.net/random-number-generator.html> (last visited Oct. 12, 2021).

C. *Prosecution history review.* The PTO’s Public Patent Application Information Retrieval (PAIR) website was used to search for the 170 patent applications. The following information was collected about each:²⁷

- First named inventor and his or her country;
- Current assignee and its country;²⁸
- First claim of the published patent application;
- Child continuity data, identifying whether there were any subsequent applications that claimed the benefit of the application in question, the status of those applications, and patent numbers for child applications that had been granted; and
- Date of most recent rejection.

The most recent rejection before abandonment was reviewed, in the PAIR “Image File Wrapper” tab for each of the 170 applications,²⁹ and the following information was noted:

- Did the Office Action include an eligibility-related § 101 rejection, i.e., a rejection pursuant to cases like *Alice*, *Mayo*, or *Myriad*, on the grounds the claims were directed to a judicial exception (law of nature, abstract idea, natural phenomenon) without significantly more, yes or no?
- Did the Office Action include an unrelated § 101 rejection, e.g., because the application claimed a transitory signal or was directed to or encompassed a human organism,³⁰ yes or no?
- What were the other grounds of rejection in the most recent rejection/Office Action before abandonment?

This Office Action indicates what rejections an application was facing at the time the applicant abandoned it. Separately, there are so-called “final rejections” in patent examination, but the use of “final” there is a misnomer.³¹ While common use of the word “final” could be misinterpreted to suggest a *final patent rejection* is also the *last rejection* before an application was abandoned, in this context, “final” is more a term of art,³² and a patent applicant facing a “final rejection” has several options to continue prosecution of her application.³³ As such, there can be a lot of final rejections in a single file

²⁷ The dataset already included application number, filing date, and title of invention.

²⁸ Where assignment information was not listed in PAIR, the PTO’s assignment database was consulted. *Patent Assignment Search*, U.S. Patent and Trademark Office, <https://assignment.uspto.gov/patent/index.html#/patent/search> (last visited Oct. 12, 2021). For a handful of applications there was no assignee information in either database. In those circumstances, the assignee from the published patent application was captured (Appl. Nos. 12/555,522; 13/618,415; 13/739,450; 13/788,610; 13/833,905; 13/885,738; 14/292,170). For six applications, there was no assignment information available (Appl. Nos. 12/279,201; 12/441,296; 13/396,187; 13/981,707; 14/047,698; 14/175,650), and for each of those the first named inventor was from outside the U.S.

²⁹ If the application had not been abandoned, or had been reopened, that was also noted.

³⁰ U.S. Patent and Trademark Office, *Manual of Patent Examination Procedures* § 2106 (9th ed. 2020), <https://www.uspto.gov/web/offices/pac/mpep/s2106.html>.

³¹ Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U.L. Rev. 63, 67 (2004) (quoting Robert P. Merges et al., *Intellectual Property in the New Technological Age* 116 (3d ed. 2003)).

³² Cf. MPEP, *supra* note 30, at § 706.07, <https://www.uspto.gov/web/offices/pac/mpep/s706.html#d0e68889> (defining final rejections, laying out time for reply, requests for continued examination, etc.).

³³ See, e.g., *Patent Final Rejection: Everything You Need to Know*, UpCounsel, <https://www.upcounsel.com/patent-final-rejection> (last visited Oct. 12, 2021); *Is a Final Rejection from the USPTO Really Final? w/Patent Attorney J.D. Howener of Bold Patents*, YouTube (May 12, 2021), https://www.youtube.com/watch?v=g1V_PAeZkVk.

wrapper,³⁴ and a so-called “final rejection” is often not the final word on a patent application. Applicants can often make amendments or different arguments to convince a patent examiner that an application should be granted.

In addition to these most recent rejections, a handful of applications were subject to appeals, interviews, or advisory actions after the latest rejection, and each of those pre-abandonment documents was reviewed.³⁵ In most cases, the post-rejection/pre-abandonment activity did not alter the present analysis. However, for two applications, the applicant overcame the eligibility-related § 101 rejection—leaving no eligibility-related § 101 rejections remaining at the time of abandonment.³⁶ And for two applications the opposite happened, where the applicant overcame some rejections (but not the eligibility-related § 101 rejection).³⁷

IV. Results

A. The 2017 study focused on fewer than 0.1 percent of U.S. utility patent applications during the relevant time.

To put the dataset in context, abandoned applications with a § 101 rejection were a small fraction of all applications in the relevant time. Between 2015 to 2017, the PTO received 1,801,937 utility patent applications, and granted 920,285 patents.³⁸ The 1,694 abandoned applications at the center of the discussion about § 101 jurisprudence constitute less than 0.1 percent of all utility patent applications in the relevant time period.³⁹

B. Most applications cannot be fairly characterized as abandoned because of § 101 and subject matter eligibility rejections.

Public data cannot tell us why any applicant decides to abandon a given application, but from the public data it appears there are only a small fraction of applications in the dataset that could fairly be described as potentially being abandoned *because of* a § 101 subject matter eligibility issue. First, in the prosecution history review, only 76 percent of the applications even faced an eligibility-related § 101 rejection at the time they were abandoned.⁴⁰ The remaining 24 percent were abandoned at a time when *no* subject matter eligibility rejections were pending—those applications either never faced an eligibility-related rejection or overcame it. It cannot be credibly said that these applications, which were facing no eligibility-related § 101 rejections, were abandoned because of such rejections.

³⁴ For example, Appl. No. 10/210,299 had four final rejections and eight non-final rejections during examination.

³⁵ In addition, each Office Action and interview summary in the file histories received a cursory review, for where and how § 101 was addressed, but nothing in that review impacts the results reported here.

³⁶ U.S. Appl. Nos. 13/398,880; 14/199,348.

³⁷ U.S. Appl. Nos. 13/168,382; 13/833,905.

³⁸ *U.S. Patent Statistics Chart, Calendar Years 1963 – 2020*, U.S. Patent and Trademark Office (May 2021), https://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm.

³⁹ The dataset covers the time period from August 2014 – September 2017. The PTO reports annual calendar year data from January – December. This calculation compares the patents in the approximately three years covered by the data set to three years of patent applications filed from January 2015 – December 2017.

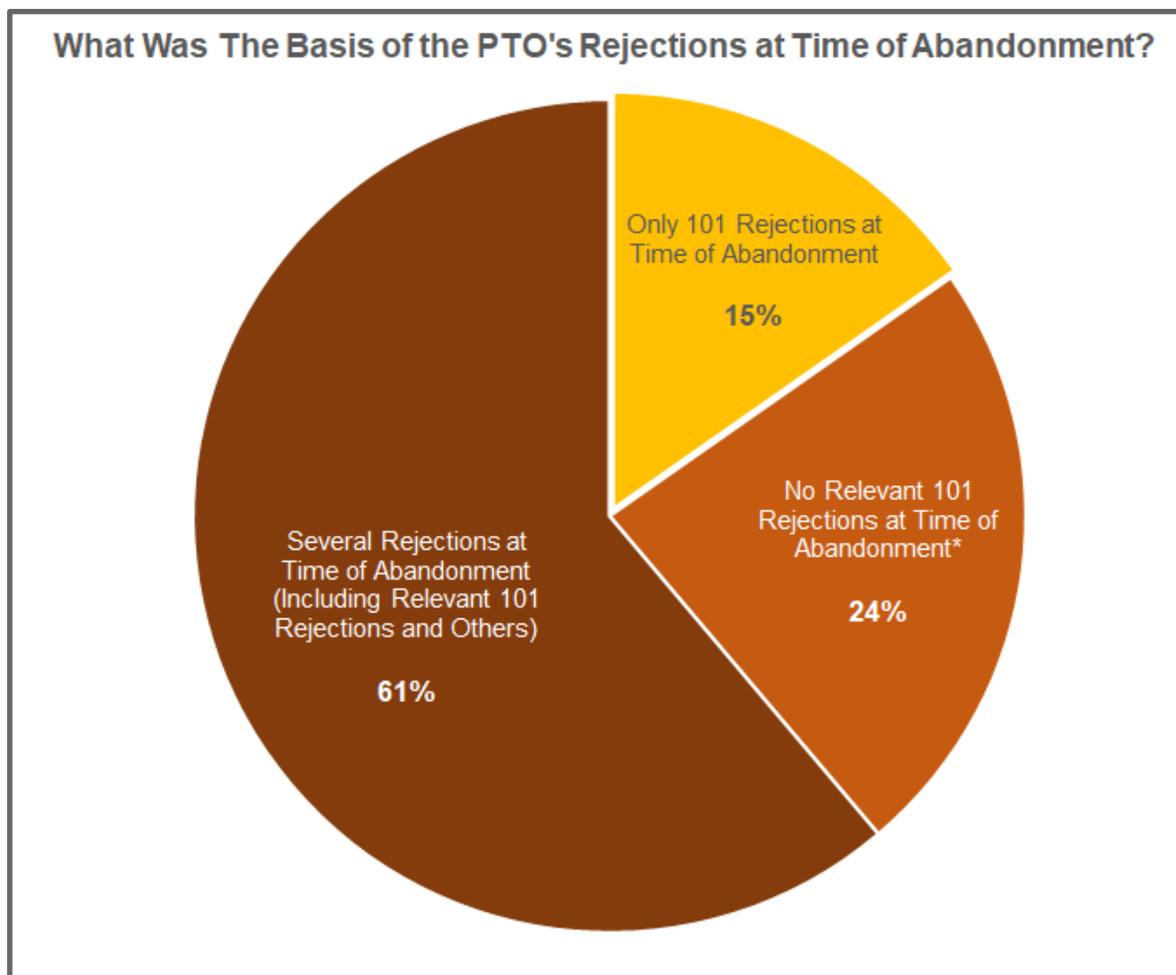
⁴⁰ This is consistent with an updated dataset that was reported on in a blog post, which noted that only 1,310 (or 77 percent) of the 1,694 abandoned applications actually received eligibility-related rejections. Kevin Madigan & Adam Mossoff, *Five Years Later, the U.S. Patent System is Still Turning Gold to Lead*, IP Watchdog (Dec. 15, 2019), <https://www.ipwatchdog.com/2019/12/15/five-years-later-the-us-patent-system-is-still-turning-gold-to-lead/id=116984/>.

In addition, the overwhelming majority of applications were rejected for a variety of reasons. Most of those that did have an eligibility-related § 101 rejection were also rejected because, e.g., the claims were obvious or anticipated by the prior art, because the claims used indefinite terms, or because the applications lacked enablement or sufficient written description. Of the applications reviewed, 61 percent faced an eligibility-related § 101 rejection *and* other rejection(s) at the time they were abandoned. (Put another way, of those applications that did face an eligibility-related § 101 rejection at the time of abandonment, 80 percent faced sometimes-several other grounds of rejection.) Here again, it cannot credibly be said that applications which were obvious or anticipated in light of the prior art, etc., were abandoned *because of* § 101.

Overall, only 15 percent of the applications reviewed faced an eligibility-related § 101—and only an eligibility-related § 101—rejection at the time they were abandoned.⁴¹ Presuming this random sample is representative—a presumption on solid ground because independent analyses have produced similar results⁴²—fewer than 260 U.S. patent applications in the dataset could have been abandoned on subject matter eligibility grounds while similar patents were granted by either the EPO or China. This would constitute approximately 0.014 percent of all utility patent applications filed with the PTO in the relevant time period.

⁴¹ This includes U.S. Appl. No. 12/988,136, which faced an interrelated eligibility-related rejection and a software per se type 101 rejection.

⁴² An independent analysis of 100 applications in the same 2017 dataset produced similar results. There, 19 percent of the applications did not face an eligibility-related § 101 rejection at the time of abandonment and just 14 percent faced only an eligibility-related § 101 rejection. Josh Landau, *Senate Judiciary § 101 Hearings Less Neutral, Helpful Than They May Appear*, Patent Progress (June 3, 2019), <https://www.patentprogress.org/2019/06/03/senate-judiciary-%c2%a7-101-hearings-less-neutral-helpful-than-they-may-appear/>.



**This includes one where applicant filed petition to revive application/withdraw unintentional abandonment.*

C. Most applications were filed by foreign inventors and/or foreign companies.

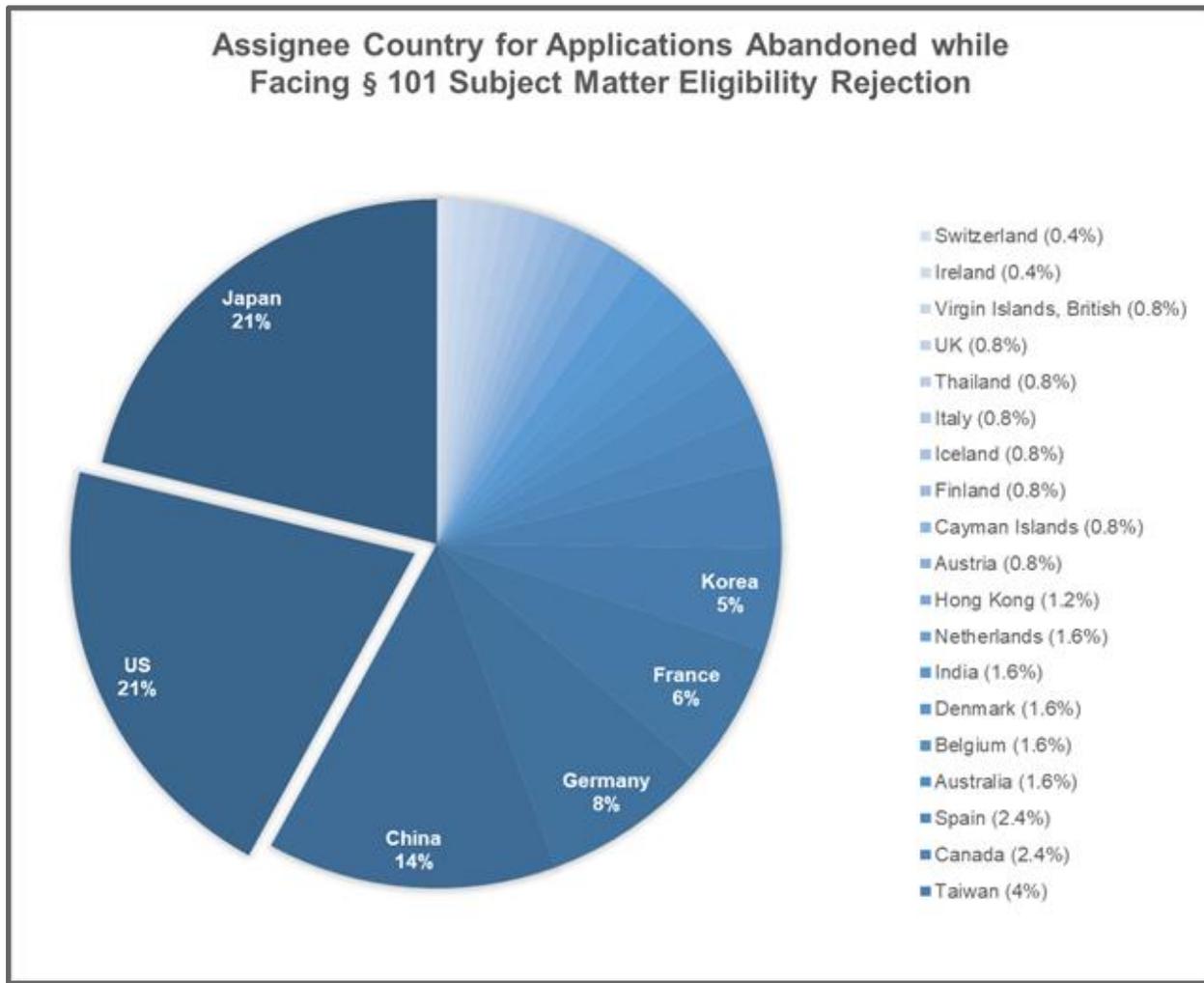
The prosecution history review revealed a substantial majority of abandoned applications filed by foreign entities, not U.S. inventors or assignees.

Of all the applications reviewed, only 23 percent had a first named inventor from the U.S. The remaining 77 percent of the applications listed a first named inventor in another country. Likewise, 75 percent of the abandoned applications were assigned to entities outside the U.S., while only 25 percent were assigned to U.S. entities.⁴³

For the subset of applications that did actually have an eligibility-related § 101 rejection at the time of abandonment, the numbers shift slightly further away from the U.S., with only 20 percent listing a first named inventor from the U.S. The remaining 80 percent of the applications which were abandoned while facing an eligibility-related § 101 rejection listed a first named inventor in another country. Similarly, 79

⁴³ This calculation excludes the 6 patent applications where there was no assignment data available in PAIR. *Supra* note 28. Each of those applications had a first named inventor from outside the U.S., though.

percent of those abandoned applications were assigned to entities outside the U.S., while only 21 percent were assigned to U.S. entities.⁴⁴



Only twelve assignees abandoned more than one reviewed application while it was facing an eligibility-related § 101 rejection:

- Huawei Technologies Co., Ltd. (China) was the assignee on 5 applications out of the 130 that had an eligibility-related § 101 rejection at the time of abandonment;⁴⁵
- ZTE Corporation (China) was the assignee on 3 applications out of those 130 that had an eligibility-related § 101 rejection at the time of abandonment;
- Microsoft Technology Licensing, LLC (U.S.) was the assignee on 3 such applications; and
- Each of the following companies was the assignee on 2 applications out of the 130 that had an eligibility-related § 101 rejection at the time of abandonment: Alcatel-Lucent USA Inc. (U.S.),

⁴⁴ Here again, this calculation excludes applications where there is no assignment information in PAIR. *Supra* notes 28, 43.

⁴⁵ One of these applications was assigned to both Huawei Technologies Co., Ltd., and Peking University.

Konica Minolta (Japan),⁴⁶ Kyocera (Japan),⁴⁷ LG Electronics Inc. (Korea), National Cheng Kung University (Taiwan), Omron Healthcare Co., Ltd. (Japan), Shiseido Company, Ltd. (Japan), Sony (Japan),⁴⁸ and Thomson Licensing (France).⁴⁹

Finally, for the 26 applications that were abandoned after an Office Action raising *only* an eligibility-related § 101 rejection (and no other grounds for rejection), only four were assigned to a U.S. entity. The remaining 22 applications (85 percent) were assigned to entities outside the U.S.⁵⁰

D. Several patent applications and families resulted in issued patents or pending applications.

Several years have passed since the dataset was compiled. And even just within the prosecution histories reviewed, for 12 percent the patent is no longer abandoned or a child patent has issued or is pending. In some cases, the abandoned applications have been followed-up with child applications that resulted in up to four granted patents.⁵¹ And for those few applications that faced *only* a § 101 rejection at the time of abandonment, 22 percent of them have child applications that were granted or are still pending and could be granted.

V. Conclusions

At the outset, the 2017 dataset does not establish some crisis of domestic innovation, and this case study illustrates some pitfalls in counting U.S. patents to inform domestic innovation policy. For one, the 1,694 applications at the core of the 2017 study are a tiny fraction of the applications the PTO receives. As a point of comparison, the PTO works with 1,800 volunteer lawyers through its pro bono program, and they have filed more than 1,500 patent applications on behalf of under-resourced innovators.⁵² That is also a small fraction of the PTO's work, which has a lower profile than § 101 at the moment, but expanding the scope and reach of this program would directly and unequivocally support domestic innovators and small businesses.⁵³

Second, the case study reveals how counting U.S. patent applications may have little (if any) connection to domestic innovation, since anyone across the globe can file. Here, U.S. innovators experienced relatively fewer eligibility-related § 101 rejections, compared to foreign entities. While foreign applicants received approximately 52 percent of the utility patents in the 2014-2017 timeframe, they made up approximately 79 percent of the reviewed applications that were abandoned when facing an eligibility-

⁴⁶ This includes one application on which Konica Minolta Holdings, Inc. was an assignee, and Miracure, Inc. and Masahiko Kuroda were also assignees on that application.

⁴⁷ This includes an application assigned to Kyocera Corp. and one assigned to Kyocera Document Solutions, Inc.

⁴⁸ This includes an application assigned to Sony Computer Entertainment, Inc. and one assigned to Sony Corp.

⁴⁹ This includes an application assigned to Thomson Licensing and one assigned to Thomson Licensing SAS.

⁵⁰ Here again, this includes an application assigned to Alcatel-Lucent USA, which faced an interrelated eligibility-related rejection and a software per se type 101 rejection. *Supra* note 41.

⁵¹ U.S. Patent Nos. 9,828,419; 10,428,138; 10,106,599; & 11,041,016 claim priority to abandoned Appl. 14/239,776.

⁵² Press Release, U.S. Patent and Trademark Office, USPTO Announces Recipients of the 2020 Patent Pro Bono Achievement Certificate (May 24, 2021), <https://www.uspto.gov/about-us/news-updates/uspto-announces-recipients-2020-patent-pro-bono-achievement-certificate>.

⁵³ *See, e.g.*, Press Release, Leahy And Tillis Introduce Bipartisan Bills To Boost American Innovation (Sept. 21, 2021), <https://www.leahy.senate.gov/press/leahy-and-tillis-introduce-bipartisan-bills-to-boost-american-innovation> (introducing legislation to study and update pro bono program); Matt O. Dhaiti, Jamie Dohopolski, & Phillip Malone, *Engine's Response to the Call for Comments on Expanding American Innovation*, Engine 7 (Feb. 23, 2021), <https://bit.ly/2NrnfpD> (suggesting expansion of PTO's pro bono program).

related § 101 rejection. If anything, this suggests that foreign (not domestic) entities would benefit most from relaxing U.S. patent eligibility standards.

Third, because most of the applications that were reviewed faced a variety of rejections at the time they were abandoned, only a few could even be fairly characterized as abandoned “because of” an eligibility-related rejection. The reason any given application is abandoned is complex, and falls outside the public’s eye, leaving us—and policymakers—to guess why that happened and why it matters. But it is also apparent that rejected patent applications can (and often do) have a constellation of problems, for example, simultaneously claiming an abstract idea, being anticipated by the prior art, and lacking adequate description. And there are multiple avenues to overcome those rejections and obtain patents⁵⁴—an applicant can re-open previously-abandoned applications or continue prosecution of a common invention through continuation or divisional patents.⁵⁵

Fourth, even if we were to use patent count as a proxy for innovation, the number of patents issued to U.S. inventors has steadily increased over recent years—from 144,621 patents in 2014 to 164,572 in 2020.⁵⁶ And while anyone in the world can apply for a U.S. patent, both foreign and domestic applicants are barred from patenting (and trying to “own”) the use of abstract ideas, laws of nature, and natural phenomena in this country. These principles are valuable because other domestic innovators, inventors, and even small businesses can use those underlying concepts in their own work.⁵⁷

Finally, for economic and innovation policy, there is a wide and varying array of data that policymakers need to weigh when shaping or (re)considering laws. Patents are only one small piece of that picture, and policymakers need to zoom out and appreciate what innovators are thinking about first and foremost in deciding where to operate, hire, and grow—for example, companies will be motivated to set up shop where they can attract resources and talent,⁵⁸ where privacy laws and data localization requirements are

⁵⁴ See generally Josh Landau, ‘Gold Into Lead’ Article Focuses on Pyrite Patents, Patent Progress (June 12, 2018), <https://www.patentprogress.org/2018/06/12/gold-into-lead-article-focuses-on-pyrite-patents/> (addressing prosecution history of specific applications, including those that had overcome eligibility-related rejections).

⁵⁵ See, e.g., *supra* notes 19, 33.

⁵⁶ Data compiled from *Calendar Year Patent Statistics (January 1 to December 31)*, U.S. Patent and Trademark Office, https://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports_stco.htm (last visited Oct. 12, 2021).

⁵⁷ See generally Alice, *supra* note 16; Charles Duan, *Do Patents Protect National Security?*, Lawfare (July 12, 2019), <https://www.lawfareblog.com/do-patents-protect-national-security> (discussing Huawei’s assertion of U.S. patents against Verizon); *Startups & the U.S. Patent System: Prioritizing Quality and Balance to Promote Innovation*, Engine 18 (July 2021), <https://www.engine.is/news/category/prioritizing-quality-and-balance-to-promote-innovation> (noting startups that have benefited from existing § 101 jurisprudence).

⁵⁸ E.g., Jennifer Weinhart, *U.S. Needs a Startup Visa for Innovation to Thrive*, Medium (July 16, 2021), <https://engineadvocacyfoundation.medium.com/u-s-needs-a-startup-visa-for-innovation-to-thrive-a84f2e505f7d> (discussing reforms to immigration law to attract talent and entrepreneurs); Caleb Watney, *America’s Innovation Engine is Slowing*, The Atlantic (July 19, 2020), <https://www.theatlantic.com/ideas/archive/2020/07/americas-innovation-engine-slowing/614320/> (discussing the flow of talent from overseas, and the impact on domestic innovation, universities, etc. if policy and pandemic limit the free flow of top talent to the U.S.); Ian Rutledge, *#StartupsEverywhere Profile: Nicholas Hinrichsen, Co-Founder & CEO, WithClutch*, Engine (Sept. 17, 2021), <https://www.engine.is/news/startupseverywhere-sanfrancisco-ca-withclutch> (discussing need for a startup visa, noting “there are a lot of talented people who would not go home after studying in the U.S. or work from abroad, if they could just start their company here”); Nathan Lindfors, *#StartupsEverywhere Profile: Andy Cole, Executive Director, 20Fathoms*, Engine (July 19, 2019), <https://www.engine.is/news/category/startupseverywhere-traverse-city-mich> (“We are fortunate that one of our partners paid to bring fiber Internet to our space. We’ve had three startups relocate here from outside of the region because of this quality Internet access.”).

not unduly onerous,⁵⁹ where the tax code is fair and predictable, and where the regulatory environment affords them freedom to operate.⁶⁰ Indeed, given the territoriality of patents, while a patent issued by the PTO may never correlate to innovation in the U.S., if the PTO issues dubious patents they can only stand in the way of domestic innovators—and could force a U.S. company or shutdown altogether.⁶¹

⁵⁹ Nathan Lindfors, *The Nuts & Bolts of Competing Globally: How Startups Compete Abroad*, Medium (July 21, 2021), <https://engineadvocacyfoundation.medium.com/the-nuts-bolts-of-competing-globally-how-startups-compete-abroad-72d4f93ef659> (quoting startup founder discussing how data-intensive companies can run into difficult choices when facing cross-border data transfer restrictions, noting his company “will have to really start choosing to keep local data or drop it if it might not be worth it price-wise”); Allied for Startups, *Why Data Protection & Data Localisation Don’t Mix Well*, Medium (Aug. 23, 2018), <https://medium.com/@Allied4Startups/why-data-protection-data-localisation-dont-mix-well-2f4aa81a6906> (“Forced data localisation makes companies less competitive.”); Hong Zhuang, *#StartupsEverywhere Profile: Ben Golub, CEO, Storj*, Engine (Oct. 8, 2021), <https://www.engine.is/news/startupseverywhere-atlanta-ga-storj> (“Varying regulatory regimes always makes life difficult for startups, and even just figuring out what the rules are can be a challenge. Privacy is just one particular area where many startups struggle to understand what is required of them.”); Edward Graham, *#StartupsEverywhere Profile: Mikel Carmenes Cavia, Co-Founder & VP of Engineering, Onfleet*, Engine (May 7, 2021), <https://www.engine.is/news/startupseverywhere-sanfrancisco-ca-onfleet> (describing court decision invalidating EU-U.S. Privacy Shield as catastrophic from startup company perspective, forcing company to make major changes in their system and causing loss of prospective customers).

⁶⁰ See generally *Principles to Guide Digital Trade Policy*, Engine, <https://engineis.squarespace.com/s/Trade-Principles.pdf> (last visited Oct. 12, 2021) (summarizing policy principles to promote global competitiveness and success for U.S. startups); Ian Rutledge, *#StartupsEverywhere Profile: Jifei Ou, Founder and CEO, OPT Industries*, Engine (May 28, 2021), <https://www.engine.is/news/startupseverywhere-medford-ma-opt> (“[I]n China, if you’re a manufacturing-related startup company, there are tax policies, real estate, and hiring incentives that are very beneficial for a young company. In the end, there’s a whole package of benefits that encourage people to go into manufacturing and develop those businesses in China.”).

⁶¹ *Startups Need Comprehensive Patent Reform Now*, Engine 7–14, <http://static1.squarespace.com/static/571681753c44d835a440c8b5/57323e0ad9fd5607a3d9f66b/57323e14d9fd5607a3d9faec/1462910484459/Startup-Patent-Troll-Stories1.d.pdf?format=original> (summarizing experience of several startups).