

UNCOVERING PATENT PROSECUTION: AN OBVIOUS(NESS) NEGOTIATION

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Abstract

Because a patent is a license for a monopoly affecting the public good, the process of patent prosecution deserves close scrutiny. Yet, significant aspects of this process remain unexplored. In particular, two central thresholds for patent eligibility, “novelty” and “non-obviousness,” regarded as the bedrock of patent law worldwide, have rarely been examined on an empirical basis. Investigating how these requirements are invoked during the patent prosecution process is critical to understanding how the application of patent law’s central tenets affects the quantity and quality of the resulting patents and, ultimately, the public interest.

In this empirical study, we examine a representative sample of utility patent applications filed with the Israeli Patent Office (ILPO) between 2012 and 2019 and quantify the occurrence of various grounds the examiner asserted for rejecting the applicants’ claims. We further investigate the patent office’s reliance on “non-novelty” and “obviousness” as grounds for restricting or rejecting patent claims, and we examine the progression of patent applications subject to such determinations.

Our results are thought provoking in two, interrelated respects: First, we found that obviousness—a mixed question of law and fact—was by far the most common basis for office action rejections, a result we observed consistently when controlling for variables such as the field of invention, the characteristics of the applicant, and the final disposition of the application. Second, we found that while office action rejections often lead to the narrowing or abandonment of claims in ensuing exchanges between the applicant and the examiner, at the end of this process, most applicants overcome the rejections and a patent, even if narrowed, is granted. These findings reveal

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that the interplay between the applicant and the patent office is akin to a negotiation—and that this negotiation generally culminates in at least some measure of success for the applicant.

These observations have important implications for patent policy and practice. The predominance of obviousness as a ground for office action rejections, and the ensuing negotiations between the examiner and the applicant, underscore that patent prosecution involves significant legal analysis in addition to technological expertise. The frequency with which disputes over obviousness arise in the course of patent prosecution suggests that clarification of the standard is imperative. This requires further development of the doctrine by courts; yet in practice, the patent office’s decisions are rarely subject to judicial review. Therefore, there is a pressing need to encourage greater judicial oversight of patent office decisions. The need for doctrinal clarity is particularly acute in view of efforts to integrate advanced computational technologies (such as artificial intelligence systems) into the patent prosecution process. It is questionable whether these technologies may be used to support examiners’ legal analysis, especially considering its uncertainty.

Moreover, our study suggests that patent examiners—whose role is to grant or reject patent applications in an objective manner that reflects interpretations of the law made by courts—may find it difficult to exercise their function consistently due to the individualized give-and-take that occurs in case-by-case negotiations with applicants. Accordingly, policymakers may wish to consider whether to impose limits on such negotiations to ensure that decisions by the patent office are free from the influence of applicant “bargaining” and produce predictable results that maximize the public good.

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INTRODUCTION

Prosecuting a patent is both an art and a science. After the inventor comes up with a new invention, she must initiate the process by filing a patent application. The process through which any patent office ultimately awards a patent is complex and expensive, and numerous factors may influence its outcome. Yet, to date, few empirical studies have investigated the grounds patent examiners most commonly assert for rejecting or restricting claims in office actions or examined how the objections raised affect the progression of the patent throughout the remainder of the prosecution.¹ This study aims to fill that gap.

Patent systems around the world reflect a basic *quid pro quo* designed to encourage innovation. On the one hand, the patentee gains a monopoly over her invention for a limited time, while on the other, the public gains full disclosure of new and useful inventions.² Given the societal importance of patents and their effect on the public good, there is a special public interest in understanding how the requirements for patentability are applied in practice. Indeed, uncovering patent prosecution practices serves the basic imperative of promoting transparency regarding how the patent office, *i.e.* the public authority responsible for granting limited monopoly rights, exercises its authority.³ Empirical evidence of how patent offices apply the legal principles governing their analysis may improve the decision-making process, increase certainty, and ultimately promote efficiency. Moreover, it may offer important insights into how the patent prosecution process affects patent quality⁴ and may provide evidenced-based knowledge for both policymakers and patent applicants.⁵

Two bedrock principles are at the heart of patentability determinations in patent systems worldwide: “novelty” and “non-obviousness.” In this study, we investigated empirically the invocation of these requirements as grounds for rejecting or restricting patent claims in office actions issued in the course of prosecution and analyzed the trajectory of applications subject

¹ Michael D. Frakes & Melissa F. Wasserman, *Empirical Scholarship on The Prosecution Process At The USPTO*, in RESEARCH HANDBOOK ON THE ECONOMICS OF INTELLECTUAL PROPERTY LAW 77 (Peter Menell and David Schwartz ed., 2019).

² See e.g., Elizabeth Pesses, Patent and Contribution: Bringing the Quid Pro Quo into Ebay v. Mercexchange, 11 YALE J. L. & TECH. 309 (2009).

³ Mark A. Lemley and Bhaven Sampat, *Is the Patent Office A Rubber Stamp?* 58 EMORY L.J. 101, 106 (2008) (arguing that “knowing what the PTO and applicants are actually doing is a prerequisite to informed policy debate on these issues”).

⁴ Michael D. Frakes & Melissa F. Wasserman, *Does the U.S. Patent and Trademark Office Grant Too Many Bad Patents: Evidence from a Quasi-Experiment*, 67 STAN. L. REV. 613 (2015).

⁵ *Id.*

to rejections on these grounds. Our empirical examination allowed us to determine which of the various fundamental patentability requirements predominated the claims analysis during prosecution and how their application affected the final outcome.

Our analysis is based on examination of a representative sample of 330 utility patent applications filed with the Israeli Patent Office (ILPO) between 2012 and 2019 in which the ILPO issued a final decision. Our sample included a total of 10,784 claims. We examined all correspondence between the applicant and the ILPO, which included office actions rejecting some or all of the claims in the sampled patents and the responses the applicant submitted to the ILPO regarding those claims. We then quantified our observations with reference to different variables.

It should be emphasized that Israel is an apt case study for examining worldwide trends, since its patent law and patent prosecution system are based on the same core principles as those of other countries with robust intellectual property regimes, including the U.S. Moreover, the ILPO serves as a Receiving Office of the Patent Cooperation Treaty (PCT), as well as an International Search Authority (ISA) and international agency for a preliminary examination.⁶ These attributes reflect the ILPO's high standards, as well as its adherence to international patent law requirements. Accordingly, empirical evidence of the ILPO's process may serve as a basis for global discourse concerning patent prosecution practices.

Our study produced two key findings. First, we determined that obviousness was by far the most common basis for office action rejections, followed by non-novelty. This result was consistent when controlling for several different variables, including the final result of the prosecution process, the technical field of the invention, and certain characteristics of the applicant. This observation offers important insights into the nature of the patent prosecution process and the character of the examiners' work and has significant implications for patent policy and practice.

Novelty is primarily a factual question within the purview of an examiner with expertise in the relevant technical field. Obviousness, however, is a mixed question of law and fact that requires the examiner not only to assess whether the invention represents an advancement in the relevant technical field, but also to apply the legal standard used to determine whether any advancement is sufficiently inventive that it would not have been obvious to a person with ordinary skill in that field. Accordingly, our finding that the predominant basis for office action rejections requires not only technical expertise, but also legal analysis in a doctrinal area laden with uncertainties

⁶ ORIT FISCHMAN AFORI, DAVID GILAT, ERAN BAREKET AND TAMIR AFORI, *INTELLECTUAL PROPERTY LAW IN ISRAEL*, 80 (KLUWER LAW INTERNATIONAL, INTERNATIONAL ENCYCLOPEDIA OF LAWS, PROF. H. VANHEES, ED. 2016).

suggests a need to clarify the relevant legal standard to enable examiners to apply it consistently. This is especially true given the increasing integration of advanced computational techniques (artificial intelligence) into the patent prosecution process.

Our second key finding is the observation that patent prosecution most often entails a back-and-forth interaction between the applicant and the examiner. The majority of patent applications eventually overcome office action rejections based on obviousness or non-novelty because the applicant either persuades the examiner through argument, abandons the rejected claims and proceeds only on those not subject to rejection, or amends the claims to address the examiner's basis for rejection. This process may occur over the course of several rounds of office actions and responses—in some cases as many as six.

Our observations reveal that patent prosecution is not a static administrative procedure in which the applicant merely submits her application and awaits the patent office's determination, but rather a dynamic negotiation between the applicant and the examiner, in which the applicant bargains with the patent office to achieve issuance of her patent. This finding also has important implications. Because patent examiners are generally technical experts rather than legal experts, the nature of this process raises concerns that applicants' unlimited ability to amend their claims and present legal argument to overcome office action rejections may unduly influence the process, leading to unmerited patents.

This article proceeds as follows: In part II, we provide an introduction to the patent system, explain the principles underlying the novelty and non-obviousness requirements, provide a short description of the Israeli patent system, and review briefly the existing empirical literature on patent prosecution in the U.S. In Part III, we delve into the empirical part of our study, describing our methodology and results. In Part IV, we discuss some of the key implications of these results for patent policy. Part V offers our concluding remarks.

II. PATENT PROSECUTION

A. *Introduction to the Patent System*

(i) General Background

Over the past several decades, the number of patent applications filed and the number of patents issued have increased rapidly on a global scale.⁷

⁷ John R. Allison & Mark A. Lemley, *The Growing Complexity of the United States Patent System*, 82 B.U. L. REV. 77, 78 (2002). See also U.S. Patent and Trademark Office Patent

This phenomenon attests to the fact that patents have grown into an immense industry.⁸ This can be attributed to the fact that in the new information economy, intellectual property rights function as the backbone of commercial value,⁹ and also to the tremendous growth in innovations that manifest themselves in patents.¹⁰ Companies from all over the globe are investing more and more in their patent portfolios. In this context, understanding the patent prosecution process is critical.

According to the traditional utilitarian notion, the patent system is designed to incentivize innovation by providing the inventor with a set of exclusive rights¹¹ that enable her to recoup her investment, earn a profit, and ultimately benefit society as a whole.¹² A patent right is generally understood as a State-sanctioned monopoly over an invention for a limited time (typically 20 years).¹³ In return for this limited monopoly, applicants are required to disclose their inventions to the public so that people who are skilled in the art

Technology Monitoring Team (PTMT), *U.S. Patent Statistics Chart Calendar Years 1963 – 2019*, USPTO.GOV https://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm; WIPO Statistical Country Profiles https://www.wipo.int/ipstats/en/statistics/country_profile/; WIPO, *World Intellectual Property indicators 2019*, 24-26 (2019) https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2019.pdf. See also, WIPO Statistics, Facts and Figures <https://www.wipo.int/edocs/infogdocs/en/ipfactsandfigures2019/> (the 2019 report indicates that while in 2008, approximately 1,930,000 patent application were filed worldwide, and 781,700 patents were granted, in 2018 the overall number of applications worldwide was 3,326,300 and the number of grants rose to 1,422,800).

⁸ John R. Allison and Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VANDER. L. REV. 2099, 2100 (2000).

⁹ Allison & Lemley, *supra* note 7, at 77-78.

¹⁰ See, Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 173 (1986); Eric S. Maurer, *Comment, An Economic Justification for a Broad Interpretation of Patentable Subject Matter*, 95 NW. U. L. REV. 1057, 1073 (2001); Allison & Lemley, *supra* note 7, at 78.

¹¹ See generally, Robin Feldman and Mark A. Lemley, *Is Patent Enforcement Efficient*, 98 B.U. L. REV. 649 (2018); Robin Feldman, *Intellectual Property Wrongs*, 18 STAN. J.L. BUS. & FIN. 250, 252 (2013). For a discussion in the literature questioning the contribution of the patent system to innovation, see MICHELE BOLDRIN & DAVID K. LEVINE, *AGAINST INTELLECTUAL MONOPOLY* 11 (2008); JAMES BESSEN & MICHAEL J. MEURER, *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK* 21-24 (2008). But See, DAN L. BURK & MARK A. LEMLEY, *THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT* 80-81 (2009) (Discussing the contribution of the patent system to the investment in research in the pharmaceutical industry).

¹² For A General Discussion, see WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 294-310 (2003); see also John F. Duffy, *The Marginal Cost Controversy in Intellectual Property*, 71 U. CHI. L. REV. 37, 52 (2004).

¹³ World Intellectual Property indicators, *supra* note 7, at 212. See also, U.S. Patent and Trademark Office, GLOSSARY <http://www.uspto.gov/main/glossary/index.html#p>.

can reproduce them and use them to create new products.¹⁴ This *quid pro quo* reflects the utilitarian goals and justifications of the patent system.¹⁵

Patent rights are territorial by their nature.¹⁶ Consequently, an applicant must file a patent application with a national or regional patent office such as the ILPO or the United States Patent and Trademark Office (USPTO).¹⁷ Alternatively, the applicant can file an international application under the Patent Cooperation Treaty (PCT).¹⁸ The PCT system simplifies the process of multinational patent filings by allowing the applicant to apply in multiple designated ratifying countries.¹⁹ Additionally, various international law treaties, headed by the Paris Convention and the TRIPS agreement, standardize patent law to a large extent on a global scale.²⁰ While the final decision on whether to grant a patent is left to the national or regional patent offices,²¹ a 2010 study by Peter Drahos showed that patent offices around the world share similar procedures and practices, reflecting shared underlying policy trends.²²

¹⁴ See e.g., Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 547 (2012). Cf. Feldman & Lemley, *supra* note 11, at 653-4.

¹⁵ For further discussion of the utilitarian and other justification theories, see PETER DRAHOS, *A PHILOSOPHY OF INTELLECTUAL PROPERTY THE GLOBAL GOVERNANCE OF KNOWLEDGE, PATENT OFFICES AND THEIR CLIENTS* (Routledge 1996).

¹⁶ GRAEME B. DINWOODIE, WILLIAM O. HENNESSEY & SHIRA PERLMUTTER, *INTERNATIONAL AND COMPARATIVE PATENT LAW* §1.03, 30 (2002) (“... patent laws operate territorially, and patent rights are thus national in scope”).

¹⁷ These offices are the ones responsible for issuing patents, and the patent rights are limited to the jurisdiction of their authority.

¹⁸ See, Patent Cooperation Treaty Done at Washington on June 19, 1970, amended on September 28, 1979, modified on February 3, 1984, and on October 3, 2001 (as in force from April 1, 2002).

¹⁹ Amir H. Houry, *Intellectual Property and the Red Planet: Formulating IP Policies Towards the Successful Colonization of Mars*, 19 N.C. J. L. & TECH. 337, 379 (2017)

²⁰ See generally, MARTIN PFLÜGER, *PARIS CONVENTION FOR THE PROTECTION OF INDUSTRIAL PROPERTY IN COTTIER AND VÉRON (EDS.), CONCISE INTERNATIONAL AND EUROPEAN IP LAW: TRIPS, PARIS CONVENTION, EUROPEAN ENFORCEMENT AND TRANSFER OF TECHNOLOGY* (KLUWER LAW INTERNATIONAL, 2008); DANIEL GERVAIS, *THE TRIPS AGREEMENT: DRAFTING HISTORY AND ANALYSIS* (3rd ed. Sweet and Maxwell, 2008).

²¹ For further discussion, see www.wipo.int/pct.

²² PETER DRAHOS, *THE GLOBAL GOVERNANCE OF KNOWLEDGE, PATENT OFFICES AND THEIR CLIENTS*, 5, (Cambridge University Press 2010) In this study, the procedures and practices of 45 patent offices worldwide were examined, and officials from about 140 patent offices were interviewed (*id.* at 45). It should be noted that Israel was not included in the study. It concludes that “patent offices, at the level of technical cooperation, have been able to advance the case of global patent governance further than have states at the level of treaty negotiation. Much has been achieved in the construction of a global system of patent governance by patent offices through quiet technocratic cooperation” (*id.* at 5). In other words, while a unified global patent system has not yet been adopted, the *de facto* practices of national patent offices create a net of global governance over patents.

After a patent application is filed, it is put under examination.²³ The examination procedure is known as “prosecution.”²⁴ The prosecution of a patent application may include the issuance of one or more “office actions” by the patent office, in which the examiner provides the applicant with reasons grounded in the criteria for patent eligibility for rejecting or allowing the applicant’s claims.²⁵ In many patent offices, patent prosecution proceeds through an interactive process between the applicant and the examiner during which the applicant has an opportunity to reply to the examiner’s rejections, explaining her stance and/or amending her application accordingly.²⁶ The interactive nature of patent prosecution has been discussed in the literature. While some scholars perceive this process as a conversation held with the administrative authority,²⁷ others have argued that this “conversation” is more similar to a negotiation.²⁸

(ii) The Bedrock of Patent Law: Novelty and Non-Obviousness

Jurisdictions around the world have embraced certain core principles governing the patentability of inventions. Most countries and regions require: 1) that the invention concern patentable subject matter; 2) that the claimed subject matter be industrially applicable or useful; 3) that the claimed subject matter be new (the “novelty” requirement); 4) that the claimed subject matter be non-obvious or demonstrate an inventive step (the “non-obviousness” requirement); and 5) that the invention be properly disclosed in the application.²⁹

²³ 35 U.S.C. §§ 131 - 135.

²⁴ John R. Thomas, *On Preparatory Texts and Proprietary Technologies: The Place of Prosecution Histories in Patent Claim Interpretation*, 47 UCLA L. REV. 183 (1999).

²⁵ See USPTO Manual of Patent Examining Procedure (MPEP) 9th ed., (2020), <https://www.uspto.gov/web/offices/pac/mpep/index.html>.

²⁶ For further discussion, see below at Part V.B.

²⁷ See Kristen Osenga, *Cooperative Patent Prosecution: Viewing Patents Through a Pragmatics Lens*, 85 ST. JOHN'S L. REV. 115 (2011).

²⁸ See, e.g. Kevin Johnston, *Reasons to Avoid the Anchor: Negotiation in Patent Prosecution*, 2020 J. DISP. RESOL. 467 (2020); Tabrez Y. Ebrahim, *Automation & Predictive Analytics in Patent Prosecution: USPTO Implication & Policy*, 35 Ga. St. U. L. Rev. 1185, 1194 (2019); Jaron Brunner, *Patent Prosecution As Dispute Resolution: A Negotiation Between Applicant and Examiner*, 2014 J. DISP. RESOL. 7 (2014); Adam Stephenson, *A View of the Future in Semiconductor Process: Patent Prosecution in Class 438 Under the United States Patent and Trademark Office's Final Claims and Continuations Rules*, 8 WAKE FOREST INTELL. PROP. L.J. 272, 272 (2008); Matt Browning, *Now You See Them Now You Don't: The PTO's Rules on Claims and Continuations*, 23 BERKELEY TECH. L.J. 247, 249 (2008).

²⁹ See e.g., 35 U.S.C. § 101 (utility); 35 U.S.C. § 102 (novelty) and 35 U.S.C. § (103) non-obviousness.

Of these patentability requirements, two are regarded as the bedrock of patent law, as they reflect the basic *quid pro quo* at the heart of the utilitarian model: novelty and non-obviousness. While both requirements are rooted in the same underlying rationale,³⁰ they reflect two separate and distinct legal doctrines and are governed by different legal standards.³¹

In many countries, including Israel and the U.S., the novelty requirement is interpreted to mean that a patent will not be granted for something that is already “patented, described in a printed publication, or in public use, on sale, or otherwise available to the public.”³² In practice, novelty is examined with reference to the “prior art,” meaning that to be eligible for a patent, an invention cannot have been disclosed in any prior published knowledge.³³ During prosecution, the patent examiner assesses novelty by conducting a prior art search and compares the claimed invention with previously disclosed information. In the United States, the USPTO Manual of Patent Examining Procedure (MPEP) specifies in detail the various methods and standards for such a search.³⁴ Though prior art searches and examination may be complex, especially in “crowded” and highly developed scientific fields, a structured, systematic, and clear framework governs the examiner’s review.³⁵ Moreover, the emergence of digital databases, including various sources on the internet, has led to the development of highly efficient search tools.³⁶ In recent years,

³⁰ Pesses, *supra* note 2. See also *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 63 (1998).

³¹ See e.g., U.S. CONST. art. I, § 8, cl. 8 (Patent and copyright legislation is aimed “To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries”).

³² 35 U.S.C. § 102.

³³ See Timothy R. Holbrook, *Patent Prior Art and Possession*, 60 WM. & MARY L. REV. 123, 127 (2018).

³⁴ See MPEP, *supra* note 25, § 900.

³⁵ See, for example, the detailed explanations of the USPTO MPEP (“an examiner must conduct a thorough search of the prior art. Planning a thorough search of the prior art requires three distinct steps by the examiner: (A) identifying the field of search; (B) selecting the proper tool(s) to perform the search; and (C) determining the appropriate search strategy for each search tool selected. Each step is critical for a complete and thorough search,” and so on). MPEP, *supra* note 25 § 904.02.

³⁶ *Id.*

the feasibility of using artificial intelligence (AI) technologies to improve operational prior art search and examination processes have been considered³⁷ and even tested.³⁸

In contrast to the relatively straightforward criteria for establishing novelty in the course of patent prosecution, the standards patent examiners apply to determine non-obviousness are far from clear and decisive. This is not surprising, given that non-obviousness, also known as the inventive step requirement, is regarded as one of the most elusive concepts in patent law.³⁹ The term “non-obvious” generally means that an invention is not a trivial improvement over the existing state of the art such that it would have been obvious, at the time the patent application was filed, to a person having ordinary skill in the art, i.e., a “PHOSITA.”⁴⁰

The inventiveness requirement evolved in its modern phase from around the mid-nineteenth century, when two major schools of thought prevailed—a quantitative one in the UK and a qualitative one in the US.⁴¹ According to early US conceptions, a patent should be granted only to inventions with “sufficient importance,” a concept that evolved into a substantial inventiveness standard.⁴²

³⁷ For example, the UK Intellectual Property Office commissioned a study on AI-Assisted Patent Prior Art Searching – Feasibility Study, which was published in April 2020. The study concludes that it is not feasible using current AI tools to provide a fully automated solution for conducting prior art searches, but that AI may offer effective supportive measures. For example, AI tools can provide a proof-of-concept that enables experimental comparisons between different approaches; retrieve and rank the most relevant documents; cluster and visualize the retrieved documents; and suggest synonyms and classifications. See CARDIFF UNIVERSITY, AI-ASSISTED PATENT PRIOR ART SEARCHING - FEASIBILITY STUDY (April 2020), <https://www.gov.uk/government/publications/ai-assisted-patent-prior-art-searching-feasibility-study>.

³⁸ See WIPO Index of AI initiatives in Intellectual Property Offices around the world (e.g. Canada “uses commercially available semantic AI search engines ... to assist in conducting searches for prior art and citations.” European Patent Office “has been active in developing business solutions using machine learning and AI for patent searches at various degrees of implementation: Automatic Search of prior art for incoming patent applications.”). See, WIPO, *Index of AI Initiatives in IP Offices* https://www.wipo.int/about-ip/en/artificial_intelligence/search.jsp.

³⁹ See e.g., Samuel Parkes & Co. Ltd. v. Cocker Brothers Ltd., *Reports of Patent, Design and Trade Mark Cases*, Volume 46, Issue 8, 12 June 1929, Pages 241–253, <https://doi.org/10.1093/rpc/46.8.241>. (“Nobody, however, has told me, and I do not suppose anybody ever will tell me, what is the precise characteristic or quality the presence of which distinguishes invention from a workshop improvement.”)

⁴⁰ See below part II A iii.

⁴¹ LODewijk W.P. PESSERS, *THE INVENTIVENESS REQUIREMENT IN PATENT LAW: AN EXPLORATION OF ITS FOUNDATIONS AND FUNCTIONING*, CHAPTER 8.4 (KLUWER LAW INTERNATIONAL B.V, 2016).

⁴² *Id.*

At the beginning of the twentieth century, the U.S. qualitative approach prevailed in all jurisdictions, and the question of inventiveness was conceptualized as a meaningfully greater advancement than mere novelty, according to which “patentable inventions should have that ‘special something’ which cannot be produced by the person of ordinary skill.”⁴³ By the second half of the twentieth century, the inventiveness requirement was unified and systematized through codifications on both sides of the Atlantic.⁴⁴ In the US, the Patent Act of 1952 enacted a detailed standard for obviousness, which is still in force today.

Section 103 of the US Patent Act provides:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, *if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains*. Patentability shall not be negated by the manner in which the invention was made.⁴⁵ (Emphasis added).

The United States legislature had hoped to promote clarity and certainty by the enactment of Section 103, considering the two centuries of interpretational uncertainty.⁴⁶ Yet, Section 103 codifies the qualitative approach, which inherently requires interpretive legal analysis and thus requires development and construction by the courts.⁴⁷ The non-obviousness requirement thus constantly evolves in a never-ending interpretive process.

A major milestone in this process was the seminal decision by the United States Supreme Court in *Graham v. John Deere Co. of Kansas City*,

⁴³ *Id.*, at chapter 10.1.

⁴⁴ *Id.*, at chapter 11.1.

⁴⁵ 35 U.S.C. § 103(a) (2012). This clause is applicable to any patent application subject to the first inventor to file provisions of the AIA (see 35 U.S.C. 100 (note)). However, inventions not subject to the first inventor to file provisions of the AIA are subject to the following version of Art. 103 “[a] patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

⁴⁶ The Senate and House Reports, Senate Report No 1979, 82d Cong, 2d Sess (1952) 7; PESSERS, *supra* note 41 at chapter 11.2.

⁴⁷ Paul R. Gugliuzza, *Law, Fact, And Patent Validity*, 106 IOWA L. REV. (forthcoming 2020) (manuscript at 34-41), available at <https://ssrn.com/abstract=3583043> (observing that non-obviousness is a question of law, or at least a mixed question of law and fact, in which the court has to apply the law to the facts).

handed down in 1965. The *Graham* Court held that ascertaining whether patent claims are non-obvious requires a basic factual inquiry into the “differences between the prior art and the claims,” followed by analysis to determine whether the differences, viewed through the PHOSITA lens, represent a technological progressive step meriting a patent.⁴⁸ This second step not only involves a legal question,⁴⁹ it requires the application of a policy-driven, open legal standard rather than a bright-line rule.⁵⁰ Later case law building on *Graham* further refined the inquiry into the progressive step.⁵¹

The United States Supreme Court again addressed the non-obviousness requirement in *KSR International Co. v. Teleflex Inc.*, holding that a claim is obvious when “there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent’s claims.”⁵² The Supreme Court proposed several tests for realizing this standard, including the “obvious to try” test, which asks whether the claim reflects a choice out of a finite number of identified, predictable solutions, with a reasonable expectation of success.⁵³ A number of commentators have examined the implications of *KSR* on the obviousness standard, reaching conflicting conclusions.⁵⁴ While an in-depth analysis of *KSR* and its repercussions is beyond the scope of this article, the decision has undeniably solidified obviousness as a policy-driven legal doctrine⁵⁵ that functions as a gatekeeper, first by the patent office and then by the judiciary, to guarantee that the grant

⁴⁸ *Graham v. John Deere & Co.*, 383 U.S. 1 (1965).

⁴⁹ Gugliuzza, *supra* note 47, at p. 36.

⁵⁰ For the classical distinction between legal rules and standards, see Isaac Ehrlich & Richard A. Posner, *An Economic Analysis of Legal Rulemaking*, 3 J. LEGAL STUD. 257 (1974); Louis Kaplow, *Rules Versus Standards: An Economic Analysis*, 42 DUKE L.J. 557 (1992).

⁵¹ DONALD S. CHISUM, CHISUM ON PATENTS § 5.02 (2001).

⁵² *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 420 (2007).

⁵³ *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

⁵⁴ See, e.g., Christopher A. Cotropia, *Predictability and Nonobviousness in Patent Law After KSR*, 20 MICH. TELECOMM. & TECH. L. REV. 391, 395 (2014) (arguing that “patent law is focused on incentivizing would-be inventors to journey down unlikely development paths, not just create inventions with a specific type of result—an unpredictable one”). See also Michael Abramowicz & John F. Duffy, *The Inducement Standard of Patentability*, 120 YALE L. J. 1590, 1603-20 (2011); Glynn S. Lunney, Jr. & Christian T. Johnson, *Not So Obvious After ALI: Patent Law’s Nonobviousness Requirement, KSR, and the Fear of Hindsight Bias*, 47 GA. L. REV. 41 (2012); Jennifer Nock & Sreekar Gadde, *Raising the Bar for Nonobviousness: An Empirical Study of Federal Circuit Case Law Following KSR*, 20 FED. CIR. B.J. 369 (2011); Ali Mojibi, *An Empirical Study Of The Effect Of Ksr V. Teleflex On The Federal Circuit’s Patent Validity Jurisprudence*, 20 ALB. L.J. SCI. & TECH. 559 (2010).

⁵⁵ Gugliuzza, *supra* note 47, at p. 38-41 (describing the various ramifications of considering nonobviousness to be a question of law or fact, and concluding that it should be perceived as a question of law, particularly after *KSR*).

of a patent is in line with the public interest.⁵⁶ By viewing the non-obviousness requirement as a significant instrument for executing patent policy, we can better perceive the crucial importance of empirical data concerning its application.⁵⁷

B. The Israeli Patent System

(i) General Background

Substantive patent law in Israel is based on the same foundational principles as those underlying patent systems worldwide. In particular, the Israeli Patent Act, enacted in 1967, follows the Anglo-American tradition, leaning heavily on both the United States Patent Act of 1952 and the British Patent Act of 1949.

A patentable invention is defined in Section 3 of the Israeli Patent Act as “an invention, whether a product or a process in any field of technology, which is new and useful, can be used industrially and which involves an inventive step.” Novelty, as required in Section 3, is defined in Section 4, which provides that an invention is deemed new if it was not published and specifies the required standard of disclosure negating novelty. An inventive step is defined in Section 5 as a step that does not, to a person of average skill, appear obvious in the light of information published before the application date. Section 7 specifically excludes from the scope of patentable subject matter methods of medical treatment of the human body, new varieties of plants and animals, and microorganisms derived from nature.

The Supreme Court of Israel’s seminal decision in *Hughes Aircraft Company v. State of Israel* addressed both the novelty and the non-obviousness requirements.⁵⁸ With respect to the latter, the Court held that an inventive step is examined through the eyes of a person (or team) of average skill in the relevant art, acting without any inventive capacity.⁵⁹ The Court further stressed that a modest advancement would suffice and that analysis of the prior art should refrain from the use of hindsight.⁶⁰ Additionally, the Court

⁵⁶ Christopher A. Cotropia, *Nonobviousness and the Federal Circuit: An Empirical Analysis of Recent Case Law*, 82 NOTRE DAME L. REV. 911, 912 (2007) (stressing that “[t]he patent system’s health is linked to a properly working nonobviousness doctrine”).

⁵⁷ *Id.*, at 913 (arguing that empirical data is crucial for understanding the function of the nonobviousness doctrine, and that dismay over the perception that courts had lowered the standard was based on “feelings” rather than on empirical studies).

⁵⁸ CA 345/87 *Hughes Aircraft Company v. State of Israel et al.*, 44(4) P.D. 45 [1990] (*Hughes Case*).

⁵⁹ *Hughes*, *id.* at 108–9.

⁶⁰ *Hughes*, *id.* at 109–10.

listed some non-determinative criteria aimed at assisting in the assessment of the non-obviousness threshold, such as the *long-felt need* standard.⁶¹

More recently, the ILPO has adopted the *obvious to try* standard, pursuant to which an invention is deemed obvious when evidence establishes that it would have been obvious for a person skilled in the art to try the invention and that such a person would have believed she had reasonable chances of success.⁶² The Court approved this standard but did not specifically address the element requiring an expectation of success, leaving some ambiguity on the matter.⁶³ In a line of subsequent court decisions, non-obviousness has been held to be primarily a legal question rather than a factual one.⁶⁴ It is therefore evident that the substantive requirements of novelty and non-obviousness in Israeli patent law are closely akin to those in U.S. patent law and reflect the core principles of the globalized patent law.

(ii) Patent Prosecution in Israel

Israel has been a party to the PCT since 1996. Applications for the grant of an Israeli patent may therefore be made as national patent applications or as national phase applications of PCT applications. Upon receiving a new application or national phase entry, the ILPO reviews it for compliance with various formal and procedural requirements and allocates a filing date and application number. If and when a patent is granted, the application number becomes the Israel Patent Number.⁶⁵

The process of patent examination begins with the issuance of a “Notice Prior to Examination.”⁶⁶ Commonly, it takes about 2 years for the issuance of such notice.⁶⁷ The applicants must respond to this notice, providing, among other things, a list of foreign applications; a list of all prior art citations relied upon during examination of the application in all other jurisdictions in

⁶¹ Hughes, *id.* at 111-12. The ILPO stated that some other measures, such as the commercial success of the invention, are non-applicable for examiners, *see*: The ILPO Working Manual, last updated February 17 2019, available at: <https://www.justice.gov.il/Units/RashamHaptemtim/Units/patent/HoraaotAvoda/Pages/Bhina.aspx> (in Hebrew).

⁶² *Id.*

⁶³ *See* MCA (Jer. Distr.) 35096-09-10 Merck Sharp & Dohme Corp. v. Unipharm Ltd et al. [2012], and ALA 6837/12 Merck Sharp & Dohme Corp. v. Unipharm Ltd et al [2013]; FISCHMAN AFORIE ET AL., *supra* note 6, at 92.

⁶⁴ *Id.*, at 91.

⁶⁵ Throughout this paper we simplify our description of the patent prosecution process to highlight the stages that are most relevant to our objectives.

⁶⁶ *See* generally, the Israeli Patent Act, 5727-1967, 510 LSI 148 (1967) (Isr.) § 18. Although all official correspondence with the Patent Office is in Hebrew and is therefore published in Hebrew, substantive arguments and amendments are normally in English.

⁶⁷ *See* generally ILPO, Final Report (2019) https://www.justice.gov.il/Units/RashamHaptemtim/about/Documents/2019_he2.pdf.

which an application for the same invention has been filed; and a list of all directly related publications known to the applicant.⁶⁸ During examination, the application is scrutinized for novelty, non-obviousness, and other substantive and procedural requirements.⁶⁹ The ILPO working manual provides administrative guidelines describing the major doctrines, standards, and references that examiners must apply in the course of examination.⁷⁰ This working manual leans heavily on decisions of the Patent Registrar and on a few seminal court decisions, including *Hughes*, discussed above.

Throughout the examination process, the patent office may issue one or more office actions—theoretically an unlimited number. The grounds for office actions may be procedural or substantive.⁷¹ When issuing an office action, the examiner will notify the applicant whether some or all of the claims in the application were rejected and will explain the basis for any rejections. Thereafter, the applicant may decide to modify her claims to cure the basis for rejection, or she may leave the claims unmodified and offer arguments disputing the examiner’s basis for rejection. Alternatively, she could decide to abandon any rejected claims.

The applicant has four months to respond to each office action.⁷² In her response, the applicant may advance arguments to counter the examiner’s basis for rejection, amend the claims in attempt to overcome the rejection, or abandon the claims subject to rejection.⁷³ If the applicant fails to respond to the office action, a “Notice Prior to Rejection” will be issued. An applicant’s failure to respond timely to such a notice will cause the application to be regarded as abandoned. Otherwise, an applicant’s response to a Notice Prior to Rejection will lead to a final official rejection.

Another form of communication between the applicant and the examiner is the “Examiner Interview.” Such interviews may be initiated by either the applicant or the examiner and may be conducted either face-to-face or by

⁶⁸ See generally, Israeli Patent Act, *supra* note 66, § 18.

⁶⁹ For exceptions to this rule, see Israeli Patent Act, *supra* note 66, § 17(c) (“Modified”) Examination.

⁷⁰ See e.g. The ILPO Working Manual, *supra* note 61.

⁷¹ Patent Regulations (Office Practice, Rules of Procedure, Documents and Fees), 5728-1968 (Isr.) § 41.

⁷² Later response may be allowed in certain circumstances. *See* Patent Regulations (Office Practice, Rules of Procedure, Documents and Fees), *supra* note 71 (Isr.) § 42.

⁷³ The applicant can make amendments to the specification and claims at any time after filing the patent application but before the Notice of Allowance is issued. After notice of allowance, the specifications and amendments can only be amended in such a way that does not lead to the broadening of the scope of claimed invention. Patent Regulations (Office Practice, Rules of Procedure, Documents and Fees), *supra* note 71 (Isr.) § 42.

telephone.⁷⁴ Examiner interviews can further the process of patent prosecution and help the applicant to clarify her position and convince the patent examiner to allow her claims.⁷⁵

An applicant may also ask to be heard before the Patent Registrar with regard to any decision by the examiner, including interim and final rejections.⁷⁶ Although such hearings are administrative in nature, they function in practice as quasi-judicial appeals over the examiner's determination.⁷⁷ The Patent Registrar's decision may then be appealed to the District Court.⁷⁸ Alternatively, if the examiner becomes satisfied that the claims are patentable, a Notice of Allowance will issue. The application will then be published for opposition. During the three months following the publication of the application, any third party may file a Notice of Opposition. If no Notice of Opposition is filed, a patent will issue.⁷⁹

Israeli law does not limit the number of claims that may be included in a patent application, yet there is a fee for every claim over 50.⁸⁰ It is interesting to note that because claims are usually expensive to draft, file, and prosecute, the literature concerning patent practices suggests that the number of claims in a patent correlates with the patent's value.⁸¹ In other words, a patentee values a patent with a greater number of claims more highly than a patent with fewer claims.⁸²

In contrast to the USPTO's MPEP, the ILPO working manual does not require the use of standardized coding to indicate the grounds for office action rejections. Therefore, tracking the reason for rejections must be conducted manually by reading each patent file. Israeli patent application files are available to the public for online inspection.⁸³ Additionally, a list of patent

⁷⁴ See, Israel Patent Office, Work Instructions, 23.3 (10.2.2020).

<https://www.justice.gov.il/Units/RashamHaptentim/Units/patent/HoraaotAvoda/Pages/Bhina.aspx?WPID=WPQ7&PN=2>

⁷⁵ For further discussion of examiner interviews in the US, see generally, Shine (Sean) Tu, *Patent Examination and Examiner Interviews* (November 5, 2020). WVU College of Law Research Paper (forthcoming 2021), Available at SSRN: <https://ssrn.com/abstract=3725770>.

⁷⁶ Israeli Patent Act, *supra* note 66, § 161.

⁷⁷ Israeli Patent Act, *supra* note 66, § 46; Israel Patent Office, Work Instructions, 90.2 (21/10/2012). <https://www.justice.gov.il/Units/RashamHaptentim/Units/patent/HoraaotAvoda/Pages/Bhina.aspx?WPID=WPQ7&PN=2>.

⁷⁸ Israeli Patent Act, *supra* note 66, § 174.

⁷⁹ See, Israeli Patent Act, *supra* note 66, § 26, 30.

⁸⁰ See, Israeli Patent Act, *supra* note 65, Second Addition.

⁸¹ See, Kimberly A. Moore, *Xenophobia in American Courts*, 97 NW. U. L. REV. 1497 (2003).

⁸² John R. Allison, Mark A. Lemley, Kimberly A. Moore & R. Derek Trunkey, *Valuable Patents*, 92 GEO. L.J. 435, 458 (2004).

⁸³ See, www.ilpatsearch.justice.gov.il/UI. Under Israeli patent law, patent applications may be filed in English, Hebrew, or Arabic. See Patent Regulations (Office Practice, Rules of Procedure, Documents and Fees), *supra* note 71 (Isr.) § 11.

applications that identifies bibliographical data only (*e.g.* application number, title of the invention etc.), is published periodically in the Patent Gazette.⁸⁴ Pursuant to new legislation, all patent applications filed from 2012 onwards are fully open and available to the public online.⁸⁵ Accordingly, in-depth inspection of patent prosecution materials, including office actions, is possible for patent applications filed in or after 2012.⁸⁶ However, application materials are searchable only on a file-by-file basis; no aggregative information drawn from individual patent applications is available to the public.

C. *Empirical Studies of Patent Prosecution*

In recent years, scholars have increasingly employed empirical methodologies to study the function and impact of the patent system.⁸⁷ This scholarship addresses issues including the motivation to register patents, how patents are perceived and used,⁸⁸ what happens to patents after they are issued and what type of subject matter is being patented, the relationship between patents and economic development,⁸⁹ applicant strategic behavior, patent valuation,⁹⁰ patents as a marker for innovation, and patent litigation.⁹¹ A subset of this literature pertains to patent prosecution. As this is the body of scholarship to which this paper seeks to contribute, the following part provides a brief review of the primary empirical literature on patent prosecution. As such studies proliferate, the overall picture of how patent prosecution is conducted *in fact* is gradually uncovered.

⁸⁴ Publication takes place 18 months after the application date or the Convention Priority date in the case of a national patent application, or 45 days after the entry date of the national phase in the case of a PCT application. It is important to note that the applicant can prevent the publication if she chooses to abandon the application within 7 days from the date notice of publication has been issued. See generally, Israeli Patent Act, *supra* note 66, § 16A.

⁸⁵ See, Israeli Patent Act, *supra* note 66, § 166A.

⁸⁶ *Id.*

⁸⁷ See *e.g.*, Allison & Lemley, *supra* note 8, at 2099.

⁸⁸ RICHARD C. LEVIN ET AL., APPROPRIATING THE RETURNS FROM INDUSTRIAL RESEARCH AND DEVELOPMENT, in 3 BROOKINGS PAPERS ON ECONOMIC ACTIVITY 789 (Martin Neil Baily & Clifford Winston eds., 1987).

⁸⁹ Zvi Griliches, *Patent Statistics as Economic Indicators: A Survey*, 28 J. ECON. LIT. 1661 (1990).

⁹⁰ See *e.g.*, Mark Schankerman & Ariel Pakes, *Estimates of the Value of Patent Rights in European Countries During the Post-1950 Period*, 96 ECON. J. 1052 (1986); Dietmar Harhoff, Frederic M. Scherer, & Katrin Vopel, *Citations, Family Size, Opposition and the Value of Patent Rights*, 32 RES. POL'Y 1343, 1359-60 (2003).

⁹¹ See Josh Lerner, *Patenting in the Shadow of Competition*, 38 J.L. & ECON. 463 (1995); Jean O. Lanjouw & Mark Schankerman, *Characteristics of Patent Litigation: A Window on Competition*, 32 RAND J. ECON. 129 (2001).

Early empirical studies were published in the 1990s, examining, for instance, the specific characteristics of biotechnology patents,⁹² and evaluating the time applications spend in prosecution.⁹³ The studies of the early 2000s marked a new phase in which scholars attempted to better understand key factors in the process of patent prosecution. For example, John Allison and Mark Lemley collected and analyzed a sample of utility patents issued between 1996 and 1998 in the U.S. Using this sample, they identified a large number of facts about each of these patents across all major areas of technology.⁹⁴ In a later study, using the same sample of utility patents, Allison and Lemley were able to identify and consequently predict the characteristics of all patents obtained during that period of time.⁹⁵ Lastly, they compared their sample to another random sample of patents issued between 1976 and 1978. By comparing the samples, they were able to gain insights into how the patent system has changed over time. For example, they found that the patents issued between 1996 and 1998 were much more complex than the patents issued 20 years earlier.⁹⁶ In both groups, the majority of patents were obtained by corporations from the developed world (e.g., North America, Europe, and a small number of Asian countries), although they observed some diversification on this front. Additionally, patents issued in the 1990s were found to cite more prior art in comparison to patents issued in the 1970s. As for patent prosecution, Allison and Lemley demonstrated that prosecution time has increased substantially over time, particularly in fields such as pharmaceuticals and biotechnology.⁹⁷

Later studies have further explored the USPTO prosecution process, addressing various issues regarding the examination procedures and the quality of its outcomes.⁹⁸ While there is disagreement as to whether the USPTO

⁹²DANIEL K.N. JOHNSON & VITTORIO SANTANIELLO, BIOTECHNOLOGY INVENTIONS: WHAT CAN WE LEARN FROM PATENTS?, in AGRICULTURE AND INTELLECTUAL PROPERTY RIGHTS 169 (V. Santaniello et al. eds., 2001).

⁹³ Mark A. Lemley, *An Empirical Study of the Twenty-Year Patent Term*, 22 AIPLA Q.J. 369 (1994); Chris L. Holm, *Patent Prosecution Comparison Between the United States Patent and Trademark Office and the European Patent Office*, 25 AIPLA Q.J. 233 (1997).

⁹⁴ Allison & Lemley, *supra* note 8, at 2099.

⁹⁵ *Id.*

⁹⁶ In terms of subject matter, time spent in prosecution, number of prior art references cited, number of claims, number of continuation applications, and number of inventors. Allison & Lemley, *supra* note 7.

⁹⁷ Allison & Lemley, *supra* note 7, at 139-41.

⁹⁸ For a review of the empirical scholarship pertaining to USPTO, prosecution *see* Frakes and Wasserman, *supra* note 1, at 77. (stressing that "... the administrative process by which patent rights are initially established has received scant attention. In the past decade a growing but nascent literature has emerged that has begun to shed empirical light on the patent examination process").

over-grants patents by failing to filter out low-quality and non-eligible patents, most scholars agree that there is inadequate empirical data concerning the patent prosecution process, and therefore no solid ground for policymakers to tackle the issue properly.⁹⁹ For instance, in a study published in 2008, Mark Lemley and Bhaven Sampat explained the drawbacks of the patent registry data available to the public and the potential discrepancies stemming from simplistic data analysis. They further explained how difficult it is to extract the exact success rate of patent applications.¹⁰⁰ Considering a wide range of variables such as application abandonment and continuous applications, and after tracking patent applications filed in 2001 over the following years, they concluded that the patent grant rate of the USPTO is 70.5%, or slightly higher.¹⁰¹ Moreover, they concluded that out of the remaining approximately 30% of applications, only two-thirds imply rejection (since the applications were abandoned after a substantive office action, an appeal, or a petition decision), while one-third of the applications were abandoned after non-substantive office communications. In other words, the substantive rejection rate of the USPTO is, in fact, even lower.¹⁰² Nevertheless, Lemley and Sampat concluded that this ratio of rejections is reasonable and therefore that the USPTO does not function as a “rubber stamp.”

Additional studies have examined various aspects of USPTO procedures and prosecution process. In a study published in 2012, Lemley and Sampat explored how examiners’ level of experience affected the outcomes of the prosecution, inspecting a large number of applications filed in 2001. They concluded that the more experienced examiners had a higher grant rate than the junior examiners, and that the grant rate increased as the examiners became more experienced.¹⁰³ Michael Frakes and Melissa Wasserman have examined whether the fact that the USPTO collects fees only after the grant of a patent generates an incentive to over-grant patents. Based on an empirical analysis, they found a positive correlation between times of financial distress and a higher rate of patent grants.¹⁰⁴ Frakes and Wasserman also inspected

⁹⁹ Frakes and Wasserman, *supra* note 1, at 77-8.

¹⁰⁰ Lemley & Sampat, *supra* note 3, at 103-5.

¹⁰¹ *Id.*, at 114.

¹⁰² *Id.*, at 114-5.

¹⁰³ Mark A. Lemley & Bhaven Sampat, *Examiner Characteristics and Patent Office Outcomes*, 94 REV. ECON. & STAT. 817, 817, 821-22 (2012). The results of this study were criticized for being inaccurate, *see* Frakes & Wasserman, *supra* note 4, at , 623.

¹⁰⁴ Michael D. Frakes & Melissa F. Wasserman, *Does Agency Funding Affect Decisionmaking? An Empirical Assessment of the PTO’s Granting Patterns*, 66 VAND. L. REV. 67, 96 (2013).

whether time allocation affects examiners' tendency to grant patents to determine whether time constraints run counter to the public interest.¹⁰⁵ In a series of studies, Shine Tu has examined aspects of individual examiners' profiles and assessed how certain features affect the prosecution of applications they examine.¹⁰⁶ For instance, in a very recent study, Tu inspected the relationship between examiners' experience level, speed, and the quality of their examinations. The empirical study revealed that experienced, low volume ("slow") examiners conducted prosecutions differently from experienced, high volume ("fast") examiners in the sense that the slower examiners issued significantly more rejections based on obviousness, ending up with more narrowing of claims.¹⁰⁷

In an empirical study published in 2015, Frakes and Wasserman found evidence that the USPTO over-grants patents when the agency lacks sufficient resources to meet its expected demand for examination.¹⁰⁸ They also identified the important role that repeat filings play in generating biases in the USPTO decision-making.¹⁰⁹ As they observed, because there is no limit on the number of repeat applications an applicant can refile after rejection, a patent application can potentially be processed through the USPTO indefinitely.¹¹⁰ And because the rate of repeat filings has grown significantly (in 2012, repeat filings represented 40% of all applications), they put a significant burden on the office, which is incentivized to accommodate the pressure by increasing the grant rates.¹¹¹ Frakes and Wasserman have argued that while policymakers may seek to improve the patent system, measures they implement—such as those included in the America Invents Act of 2012¹¹²—resemble a "shot in the dark," given the absence of empirical evidence to

¹⁰⁵ Michael D. Frakes & Melissa F. Wasserman, *Is the Time Allocated to Review Patent Applications Inducing Examiners to Grant Invalid Patents? Evidence from Microlevel Application Data*, 99 REV. OF ECON. AND STAT. 550 (2017).

¹⁰⁶ Shine Tu, *Luck/Unluck of the Draw: An Empirical Study of Examiner Allowance Rates*, 2012 STAN. TECH. L. REV. 10, 14 (2012); Shine Tu, *Three New Metrics for Patent Examiner Activity: Office Actions per Grant Ratio (OGR), Office Actions per Disposal Ratio (ODR), and Grant to Examiner Ratio (GER)*, 100 J. PATENT AND TRADEMARK OFF. SOC'Y 277 (2018).

¹⁰⁷ Shine Sean Tu, *Patenting Fast and Slow: Examiner and Applicant Use of Prior Art*, 38 CARDOZO ARTS & ENT. L.J. 391, 392 (2020)

¹⁰⁸ Frakes & Wasserman, *supra* note 1, at 617.

¹⁰⁹ *See Id.*

¹¹⁰ *Id.* at 626-7.

¹¹¹ *Id.* at 649-50.

¹¹² The America Invents Act introduced comprehensive amendments to the US patent system, such as post-grant opposition. *See Leahy-Smith America Invents Act*, Pub. L. No. 112-29, 125 Stat. 284 (2011).

illuminate the actual problems stemming from current prosecution practice.¹¹³

Another study targeting examiners' evaluation of prior art shed light on their decision-making process. In this study, Cotropia, Lemley, and Sampat inspected 1000 patent applications filed in 2001 and concluded that the examiners did not cite applicant-submitted prior art in rejections narrowing the applicant's claims, but instead relied almost exclusively on prior art they found themselves.¹¹⁴

To the best of our knowledge, our study is the first to quantify the most common grounds for office action rejections and to analyze the aftermath of such rejections in later exchanges between the patent office and the applicant.

III. EMPIRICAL RESEARCH

A. *Data and Methodology*

To begin our study, we composed a list, using information provided to us from the ILPO's internal records, of all utility patent applications filed with the ILPO between 2012 and 2019 for which a final decision was issued (i.e., 32,997 applications).¹¹⁵

To investigate the major patentability thresholds, we reviewed office actions from a representative sample to reflect the larger population of utility patent applications. The sample was stratified by filing year proportionately to the distribution in the larger population. Next, the filing year subgroup was further stratified by patent industry field classification based on the international patent classification;¹¹⁶ application final status; PCT status;

¹¹³ Frakes & Wasserman, *supra* note 1, at 621.

¹¹⁴ Christopher A. Cotropia et al., *Do Applicant Patent Citations Matter?*, 42 RES. POL'Y 844, 847 (2013) (Concluding that "of the references examiners use to reject claims, only 12.7% come from the applicants, while 87.2% come from examiners").

¹¹⁵ The ILPO's internal records, which are not available to the public, contain aggregative information pertaining to the applications on an annual basis, and provides data such as filing dates, status, and applicant name. These internal records allowed us to compose the list of all relevant applications in the years 2012 -2019.

¹¹⁶ "The International Patent Classification (IPC), established by the Strasbourg Agreement 1971, 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." See, About the International Patent Classification, [http:// www.wipo.int/classifications/ipc/en/general/](http://www.wipo.int/classifications/ipc/en/general/). See also, Rajnish Kumar Rai, *Patentable Subject Matter Requirements: An Evaluation of Proposed Exclusions to India's Patent Law in Light of India's Obligations Under the Trips Agreement and Options for India*, 8 CHI.-KENT J. INTELL. PROP. 41, 84 (2008).

and frequency of patent application filings, all in proportion to the population distribution. We then used a random numbers generator to sample from each group so as to ensure that the sample proportion of the subgroups would reflect their proportions in the larger population of utility patent applications. The total sample numbered 330 utility patent applications.

Table 1 - Characteristics of the sample and the general population

Filing Year	Randomly selected sample (N=330)	General Population (N=32,997)*
2012	20.30%	20.38%
2013	18.18%	18.22%
2014	19.09%	19.01%
2015	17.88%	17.96%
2016	12.42%	12.33%
2017	7.88%	7.76%
2018	3.33%	3.48%
2019	0.91%	0.85%
All	100.00%	100.00%
Patent Status		
Granted	58.10%	58.06%
Abandoned	41.90%	41.94%
All	100.00%	100.00%
Classification		
Chemistry; metallurgy	30.00%	30.00%
Electricity	8.79%	8.86%
Fixed constructions	1.82%	1.92%
Human necessities	32.73%	32.62%
Mechanical engineering; lighting; heating; weapons; blasting engines or pumps	4.55%	4.43%
Performing operations; transporting	7.88%	8.00%
Physics	13.64%	13.64%
Textiles; paper	0.61%	0.52%
All	100.00%	100.00%
PCT		
Yes	80.91%	80.79%
No	16.97%	16.95%
PCT (Israel)	2.12%	2.26%
All	100.00%	100.00%
Frequency of patent application filings		
Single application	20.91%	22.16%
Multiple applications (2-28 applications)	51.21%	48.60%

Top percentile (29 applications and above) 27.88% 29.24%

* Data obtained from the ILPO.

We then reviewed the complete file histories—which, as noted above, are publicly available on the ILPO’s website—for each application in our sample. From each application in our sample, we extracted the following information: (1) patent application number;¹¹⁷ (2) filing date;¹¹⁸ (3) publication date;¹¹⁹ (4) international classification;¹²⁰ (5) applicant name;¹²¹ (6) applicant nationality (Israeli or foreign);¹²² (7) application status (allowed/ abandoned/ rejected);¹²³ (8) foreign priority dates;¹²⁴ (9) priority date country;¹²⁵ (10) international application number;¹²⁶ (11) representing firm;¹²⁷ (12) number of claims included in the application;¹²⁸ (13) number of office actions issued;¹²⁹ (14) office action references to each claim;¹³⁰ (15) claims status;¹³¹ (16) date

¹¹⁷ Israeli patent application number.

¹¹⁸ This information was drawn from the Israeli Patent Office’s internal database, which provides the essential records for the public patent application and information database. See, www.ilpatsearch.justice.gov.il/UI.

¹¹⁹ This information was drawn from the Israeli Patent Office’s internal database, which provides the essential records for the public patent application and information database.

¹²⁰ This information was drawn from the Israeli Patent Office’s internal database, which provides the essential records for the public patent application and information database.

¹²¹ As indicated by the Israeli Patent Office’s internal records (on file with authors).

¹²² This was determined based on the applicant name and address.

¹²³ As indicated by the Israeli Patent Office’s internal records (on file with authors).

¹²⁴ Data obtained from the information listed in the patent application file, which is available to the public online.

¹²⁵ Data obtained from the information listed in the patent application file, which is available to the public online.

¹²⁶ Data obtained from the information listed in the patent application file, which is available to the public online.

¹²⁷ Data obtained from the information listed in the patent application file, which is available to the public online.

¹²⁸ To determine the number of claims, we examined the patent applicant’s initial files and subsequent amendments made to the claims following each office action issued.

¹²⁹ Data obtained from the information listed in the patent application file, which is available to the public online.

¹³⁰ To map the grounds for each office action, we examined the office action notice issued by the Israeli Patent Office.

¹³¹ Based on the information listed in the patent application file, each claim was classified into one of the following groups: modified, modified (technically), has not been modified, attracted by the applicants, abandoned, rejected, and allowed).

of first and any subsequent office actions;¹³² (17) examiner name;¹³³ (18) discussion with the examiner (yes/no and dates);¹³⁴ (19) refusal date (if applicable);¹³⁵ (20) grounds for refusal (if applicable);¹³⁶ (21) number of claims granted (if applicable);¹³⁷ and (22) whether the examiner's decision was rendered based on a parallel foreign patent application.¹³⁸ These data and all associated prosecution papers used for our analysis are available online or are derived from publicly available information published on the ILPO's website, which is searchable on a file-by-file basis.¹³⁹ This includes the information about the number and status of claims as well as the grounds for issuing an office action.

Until 2015, office action files and applicant responses were generally uploaded to the patent office's public website in an image file format. Therefore, to convert these image files into an open readable text we used optical character recognition ("OCR") software that allowed us to compare files and track the changes made in the various claims.¹⁴⁰

Although we started our investigation with a sample of 330 utility patent applications, some files within this sample were incomplete, empty, or corrupted. Such files were removed from our sample. In the end, our sample included 315 files, comprising 10,784 claims.

Because patent claims can be amended, revised, added, or abandoned during prosecution, in compiling our dataset we distinguished between the first set of patent claims submitted by the patent applicant (first patent claims), and subsequent (new and revised) sets of claims submitted in response to office actions. Each set of claims was methodically examined. For each claim, we collected the following data: concerns raised by the patent examiners (e.g., obviousness, non-novelty, or other issues) and whether the applicant decided to modify or abandon the claim following the office action.

¹³² As stated on the office actions issued by the Israeli Patent Office, which are available to the public online.

¹³³ Based on the information listed in the patent application file, which is available to the public online.

¹³⁴ Based on the information listed in the patent application file, which is available to the public online.

¹³⁵ Data obtained from the information listed in the patent application file, which is available to the public online.

¹³⁶ Based on the information listed in the patent application file, which is available to the public online.

¹³⁷ Based on the information listed in the patent application file, which is available to the public online.

¹³⁸ Based on the information listed in the patent application file, which is available to the public online.

¹³⁹ See, www.ilpatsearch.justice.gov.il/UI.

¹⁴⁰ We used the ABBYY system, see: <https://www.abbyy.com/>.

As we elaborate in the following section, our results were broken down into two main segments. The first uses the empirical data collected and analyzed to describe the main characteristics of patent applications filed with the ILPO. The chief advantage of this data is that it allows us to observe the different stages of patent prosecutions as well as the interactive nature of the process. The second and more complicated segment of results involves evaluation of the most common grounds for issuance of office actions, in conjunction with other variables (e.g., application status, year, classification, etc.).

Although our study covers only a sample of applications, each observation is considered to be a probabilistic representative of the population. Our results thus reveal broad trends that have tremendous practical implications for the industry, policymakers, and scholars.

B. Our Results

(i) Patent Prosecution – The Interplay Between the Applicant and the ILPO

As noted above, we examined 315 patent applications comprising 10,784 claims. Of these applications, 128 were ultimately abandoned by the applicant and 187 were allowed, resulting in issuance of a patent. Stated differently, 41% of the patent applications in our sample were abandoned and 59% were allowed. Of the 10,784 claims examined, 3,248 were asserted in applications that were later abandoned, and 7,536 were asserted in applications that were allowed.

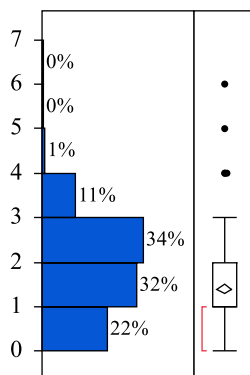
Patent abandonment does not necessarily correlate to the issuance of an office action or rejection by the ILPO. As explained above, upon receiving a new application or national phase entry, the examiner checks for compliance with various formal and procedural requirements. An applicant may choose to abandon an application for strategic or other external reasons before any substantive examination takes place.¹⁴¹ To consider the number of patent applications abandoned prior to substantive examination, we first distinguished between substantive and non-substantive rounds of review. The issuance of an office action, a letter of allowance, or a letter of rejection was used as an indicator that a substantive round of review took place. When a patent application was filed but abandoned following only a non-substantive

¹⁴¹ Lemley & Sampat, *supra* note 3, at 104.

office communication and before any office action was issued, we regarded it as a non-substantive round (N=0).

Our results indicate that the median number of patent prosecution rounds in our sample is equal to one.¹⁴² The maximum number of rounds observed in our sample was six.

Figure 1 - number of rounds per application¹⁴³



Our results indicate that 22% of all patent applications in our sample were abandoned before any substantive examination took place. Moreover, we found that 47% of all patent applications that were eventually abandoned by the applicant were abandoned before any substantive examination occurred.¹⁴⁴

The average number of rounds that took place before a patent application was abandoned equals 0.72 (SD = 0.98), while the average number of

¹⁴² One hundred forty-nine patent applications underwent a second round of examination, 40 patent applications underwent a third round of examination, 6 patent applications underwent a fourth round of examination, 2 patent applications underwent a fifth round of examination and only 1 application underwent a sixth round of examination. It is important to note that ILPO's current work instructions state that the examiner should act to complete the examination process after 3 or 4 rounds of examination, depending on various conditions. See, Israel Patent Office, Work Instructions, 23.1 (31.12.2017) <https://www.justice.gov.il/Units/RashamHaptentim/Units/patent/HoraotAvoda/Pages/Bhina.aspx?WPID=WPQ7&PN=2>

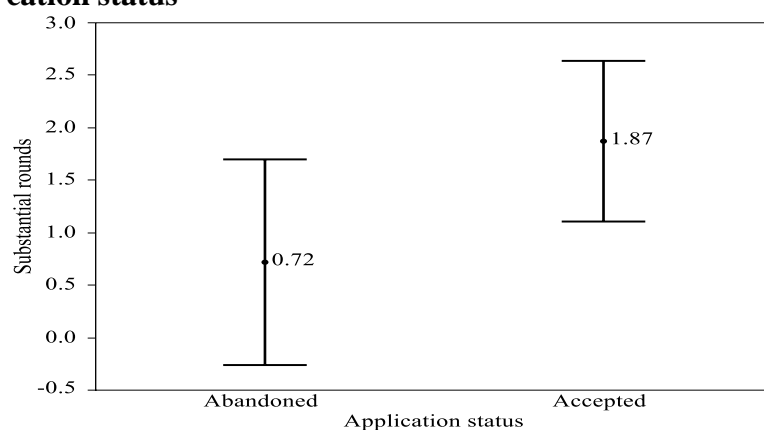
¹⁴³ Sixty-eight patent applications did not go through any substantive round of examination. 100 patent applications went through one round of substantive examination. One hundred seven patent applications went through two rounds of substantive examination. Thirty-five patent applications went through three rounds of substantive examination. Three patent applications went through four rounds of substantive examination. One application went through five rounds of substantive examination. And one application went through six rounds of substantive examination.

¹⁴⁴ Thirty-nine percent of all patent applications were abandoned after the first round, 10% after the second round, and 4% after the third round.

rounds that took place before patent allowance equals 1.87 (SD = 0.77).¹⁴⁵ This difference was found to be statistically significant using an ANOVA ($F_{(1,313)} = 136.97, p < 0.001$)

The following figure and table show the difference in the average number of rounds, inspected by application status (abandoned or allowed).

Figure 2 - Average number of rounds per application, by application status



* Each error bar is constructed using \pm Std Dev.

As noted above, applicants can and often do amend their patent claims in response to office actions issued over the course of prosecution. Our results indicate that the number of claims filed by the applicant decreases as the number of rounds of office actions and responses increases, as illustrated by the table below.

Table 2 - the average number of claims per application by round

	Round No.	Applications	Mean (Claims)
Non Substantive	0	71	23
Substantive	1	244	21.8
Substantive	2	149	20.1
Substantive	3	40	18.4
Substantive	4	5	12.6
Substantive	5	2	6.5
Substantive	6	1	3

¹⁴⁵ Fifty-five percent of patent applications in our sample that were ultimately allowed were allowed after the first round, 34% after the second round, 8% after the third round, and 1% after the fourth round.

To examine the difference between the average number of claims in each round, a one-way ANOVA was estimated. However, no significant difference was found between these groups (rounds) ($F_{(5, 435)} = 1.71, NS$).

Our sample comprised patent applications from various fields. Therefore, we wanted to understand whether the area of invention—sorted according to classification—affects the number of claims filed by the applicant. To do so, we calculated the average number of claims filed per round per classification. Overall, we observed that all classifications demonstrated a decline in the average number of claims as the substantive rounds progressed.

The table below details the average number of claims per round per classification.

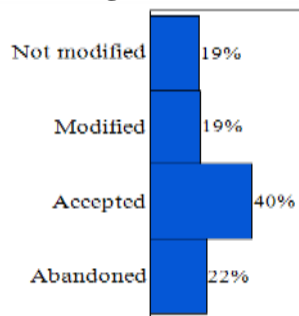
Table 3 - The average number of claims per round by patent application classification

	Round No.	International Patent Classification	Applications	Mean(Claims)
Substantive	1	Chemistry; metallurgy	77	27.1
Substantive	1	Electricity	16	21.5
Substantive	1	Fixed constructions	2	9
Substantive	1	Human necessities	80	18.9
Substantive	1	Mechanical engineering, etc.	13	18.1
Substantive	1	Performing operations; transporting	18	19
Substantive	1	Physics	36	20.9
Substantive	1	Textiles; paper	2	19
Substantive	2	Chemistry; metallurgy	52	24.7
Substantive	2	Electricity	7	19.9
Substantive	2	Fixed constructions	1	5
Substantive	2	Human necessities	46	15.8
Substantive	2	Mechanical engineering, etc.	6	24.3
Substantive	2	Performing operations; transporting	14	19
Substantive	2	Physics	21	18.5
Substantive	2	Textiles; paper	2	16
Substantive	3	Chemistry; metallurgy	15	24.5
Substantive	3	Electricity	1	26
Substantive	3	Human necessities	17	13.2
Substantive	3	Mechanical engineering, etc.	1	29
Substantive	3	Performing operations; transporting	2	3

Substantive	3	Physics	4	20.8
Substantive	4	Chemistry; metallurgy	2	11.5
Substantive	4	Human necessities	1	20
Substantive	4	Performing operations; trans- porting	1	1
Substantive	4	Physics	1	19
Substantive	5	Chemistry; metallurgy	1	3
Substantive	5	Human necessities	1	10
Substantive	6	Chemistry; metallurgy	1	3

Of the 10,784 patent claims in our dataset, 9,135 underwent substantive examination. Analysis of all 10,784 claims reveals that 40% of all claims were allowed, 22% were abandoned, 19% were modified (either in substance or technically) and 19% were left unmodified.¹⁴⁶

Figure 3- distribution of claims by claim status



The figure above illustrates the distribution of the four possible outcomes of each substantive round: the applicant can decide to abandon or modify any rejected claims, or she can argue to overcome the examiner's rejections without modifying the claims. Alternatively, each round can end with the examiner's decision to allow the claims. One might argue that our analysis should differentiate between claims whose status was determined by the examiner and those the applicant chose to abandon, modify, or leave intact. For purposes of this study, however, the distinction is immaterial because all possible outcomes reflect the interactive nature of the process. Accordingly, our aim is to quantify the number of rounds per application and to investigate the possible outcomes of each round.

As noted above, either applicants or examiners may also initiate face-to-face or telephonic interviews during the patent prosecution proceedings.

¹⁴⁶ Abandoned (2,002 claims); Allowed (3,609 claims); Modified (1,734 claims); Not modified (1,724 claims). The status of 66 claims was not available.

We found that examiner interviews took place in only 4 of the 315 patent applications in our sample. In each instance, a single interview was conducted.¹⁴⁷

(ii) Office Action - Grounds of Rejection

As discussed above, the two primary requirements for patentability are novelty and non-obviousness. Our results demonstrate that twenty-five percent (25%) of all claims were rejected in office actions based on obviousness,¹⁴⁸ while only about eleven percent (11%) of the claims were rejected for non-novelty (either as the sole issue or in combination with other concerns).¹⁴⁹

As the table below demonstrates, obviousness remains the primary grounds for rejection throughout the progressive rounds of substantive examination.

Table 4 - Distribution of grounds for rejection per round

No. of substantive round	Obviousness			Non-novelty		
	N/A	No	Yes	N/A	No	Yes
1	3%	59%	38%	3%	79%	18%
2	1%	92%	8%	1%	96%	3%
3	0%	100%	0%	0%	99%	1%
4	0%	68%	32%	0%	100%	0%
5	0%	100%	0%	0%	100%	0%
6	0%	100%	0%	0%	100%	0%

* Each row in each of the two groups (i.e., obviousness and non-novelty) totals 100%. N/A (Non-Available) relates to missing information in the files.

This table shows that in the first round, for example, the examiner raised obviousness objections to 38% of all claims (“Yes”) and did not raise

¹⁴⁷ The substance of an examiner interview, whether in person or by telephone, must be made on the record in the patent application. See, ILPO's Work Instructions, *supra* note 74. 23.3 (10.2.2020).

¹⁴⁸ Two thousand three hundred nine (2,309) claims out of 9,135.

¹⁴⁹ One thousand thirty-four (1,034) claims out of 9,135.

obviousness objections to 59% of all claims (“No”), while records were missing with respect to 3% of all claims (“N/A”). Also in the first round, the examiner raised non-novelty objections to 18% of all claims (“Yes”) and did not raise non-novelty objections to 79% of all claims (“No”), while records were missing with respect to the same 3% of all claims (“N/A”).

We next examined whether results differed between two groups of patent applications: allowed (*i.e.* patent was granted) and abandoned. The following tables and figures show the distribution of obviousness and non-novelty rejections per round, grouped according to the application’s final status (allowed or abandoned). It is clear from the results that whether the application was ultimately rejected or allowed, the most common ground for claim rejection was obviousness.

Table 5 - Distribution of grounds for rejection per round for all allowed applications

No. of substantive round	Obviousness			Non-novelty		
	N/A	No	Yes	N/A	No	Yes
1	3%	62%	34%	3%	81%	16%
2	1%	94%	5%	1%	98%	2%
3	0%	100%	0%	0%	99%	1%
4	0%	67%	33%	0%	100%	0%
5	0%	100%	0%	0%	100%	0%

* Each row in each of the two groups (*i.e.*, obviousness and non-novelty) totals 100%. N/A (Non-Available) relates to missing information in the files.

As the table above shows, in the first round, for example, out of all claims in applications that were eventually allowed, the examiner raised obviousness rejections to 34% of the claims (“Yes”) and did not raise obviousness objections to 62% of the claims (“No”), while records were missing with respect to 3% of the claims (“N/A”). Also in the first round, the examiner raised non-novelty objections to 16% of the claims (“Yes”) and did not raise non-novelty objections to 81% of the claims (“No”), while records were missing with respect to the same 3% of the claims (“N/A”).

Table 6- Distribution of grounds for rejection per round for all abandoned applications

No. of substantive round	Obviousness			Non-novelty		
	N/A	No	Yes	N/A	No	Yes
1	2%	46%	52%	2%	75%	22%
2	2%	71%	27%	2%	85%	13%
3	0%	100%	0%	0%	100%	0%
4	0%	100%	0%	0%	100%	0%
5	0%	100%	0%	0%	100%	0%
6	0%	100%	0%	0%	100%	0%

* Each row in each of the two groups (i.e., obviousness and non-novelty and other ground) totals 100%. N/A (Non-Available) relates to missing information in the files.

As the table above shows, in the first round, for example, out of all claims in applications that were eventually abandoned, the examiner raised obviousness rejections to 52% of the claims (“Yes”), and did not raise obviousness objections to 46% of the claims (“No”), while records were missing with respect to 2% of the claims (“N/A”). Also in the first round, out of all claims, the examiner raised non-novelty objections to 22% of the claims (“Yes”) and did not raise non-novelty objections to 75% of the claims (“No”), while records were missing with respect to the same 2% of the claims (“N/A”).

Figure 4 – Distribution of obviousness and non-novelty as grounds for rejection per round for all abandoned applications in our sample

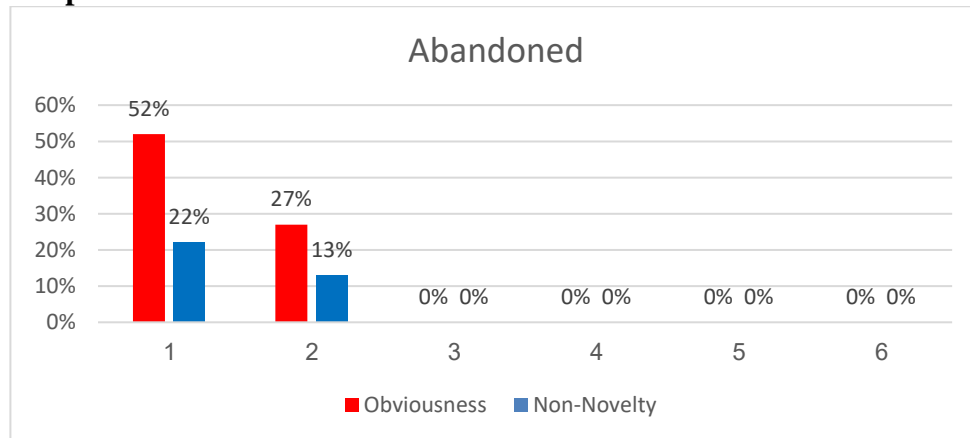
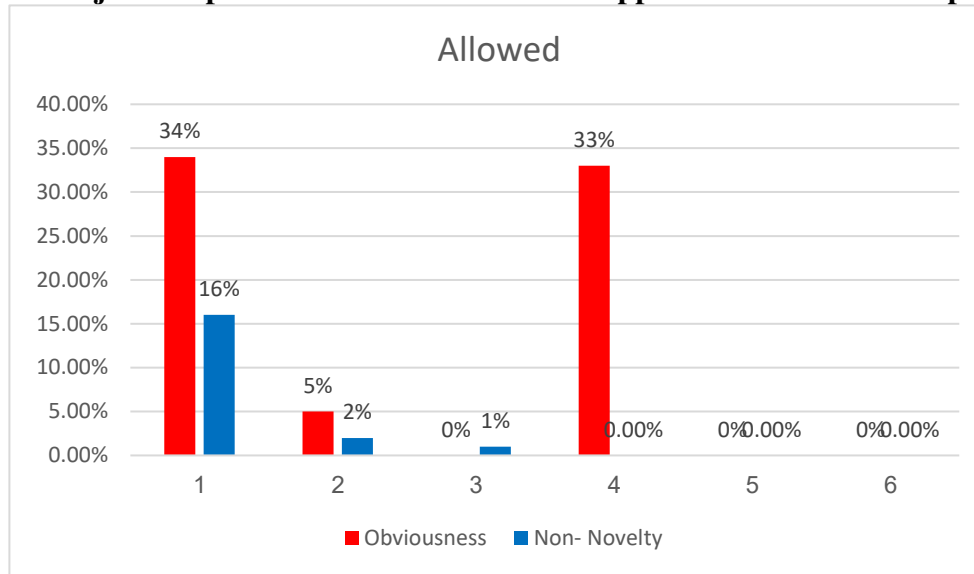


Figure 5 - Distribution of obviousness and non-novelty as grounds for rejection per round for all allowed applications in our sample



Because the roles and benefits of patents vary greatly from one technology or industry to another, we examined whether the rate of obviousness and non-novelty rejections was similar across industries. The two major classifications that dominated patent applications in the years 2012-2019 – chemistry and human necessities – deserve special attention.¹⁵⁰ Our results indicate that in the classification of chemistry, obviousness was asserted in 50% of the claims in the first round, while non-novelty was asserted in only 21% of the claims. In the classification of human necessities, obviousness was asserted in 40% of the claims in the first round, while non-novelty was asserted in only 17% of the claims. Therefore, though we found a difference in the rates at which claims were rejected on these grounds, in both dominant classifications, obviousness was asserted more than twice as often as non-novelty. Moreover, in all other classifications, obviousness was asserted at higher rates than non-novelty, as set forth in the table below. For instance, in the classification of textiles & papers, obviousness was asserted in 87% of the claims in the first round, while non-novelty was asserted in only 17% of the claims. At the other end of the range, in the classification of fixed constructions, obviousness was asserted in 17% of the claims in the first round, while

¹⁵⁰ Patent applications in chemistry comprised 30%, of our sample (96 applications), and patent applications in human necessities comprised 32% of our sample (100 applications). Patent applications in Electricity comprised 9% (27 applications); Fixed constructions applications comprised 2% (5 applications); Mechanical engineering comprised 5% (16 applications); Performing operations comprised 8% (24 applications); Physics comprised 14% (43 applications); and Textiles; paper comprised 1% (2 applications).

non-novelty was not asserted at all. Yet, because patent applications are rarely examined in these two latter classifications, they are marginal in their representation in our sample.

The following tables illustrate our results in detail:¹⁵¹

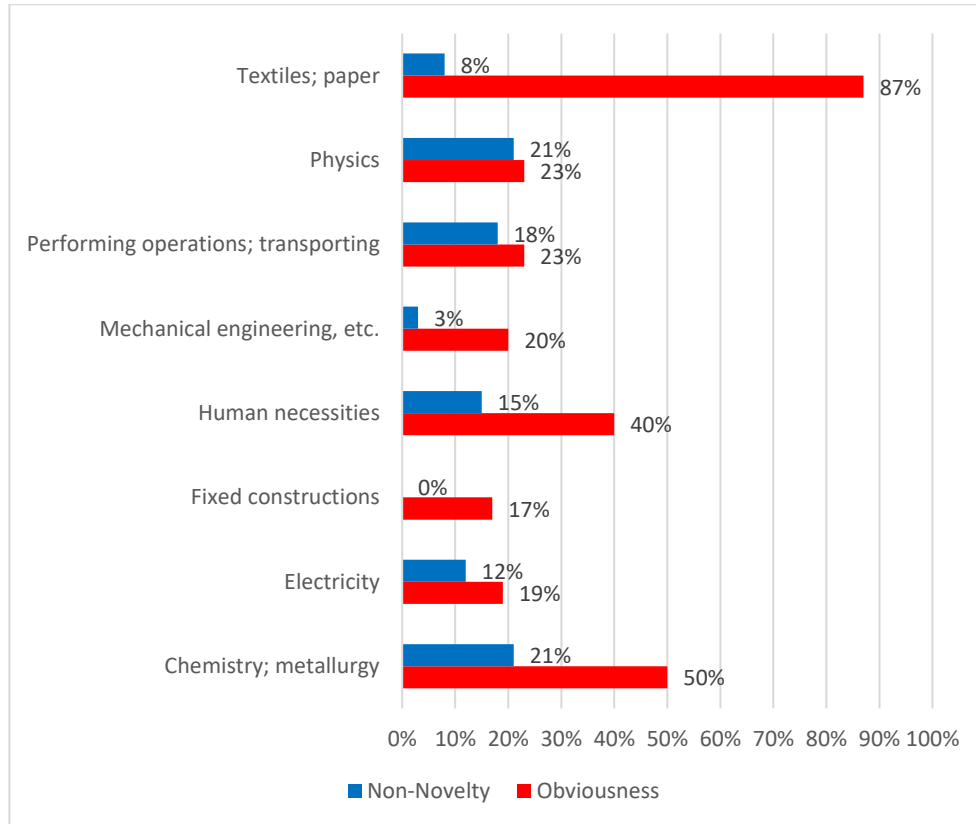
Table 7 - Distribution of grounds for rejection by classification for all applications in our sample

International Patent Classification	Obviousness			Non-novelty		
	N/A	No	Yes	N/A	No	Yes
Chemistry; metallurgy	2%	47%	50%	2%	76%	21%
Electricity	6%	75%	19%	6%	83%	12%
Fixed constructions	0%	83%	17%	0%	100%	0%
Human necessities	3%	57%	40%	3%	82%	15%
Mechanical engineering, etc.	6%	73%	20%	6%	91%	3%
Performing operations; transporting	6%	71%	23%	6%	75%	18%
Physics	1%	76%	23%	1%	78%	21%
Textiles; paper	0%	13%	87%	0%	92%	8%

* Each row in each of the two groups (i.e., obviousness and non-novelty) totals 100%. N/A (Non-Available) relates to missing information in the files.

¹⁵¹ For example, in the chemistry classification, the examiner raised obviousness objections to 50% of the claims (“Yes”) and did not raise obviousness objections to 47% of the claims (“No”), while there are no records with respect to 2% of the claims (“N/A”). In the same classification, the examiner raised non-novelty objections to 21% of the claims (“Yes”), and did not raise non-novelty objections to 76% of the claims (“No”), while there are no records with respect to the same 2% of the claims (“N/A”).

Figure 6 - Distribution of grounds for rejection by classification for all applications in our sample



(iii) Recurring Applicants

Drafting patent claims is a complex task, generally undertaken by patent attorneys who are experts on the matter. Accordingly, preparation of a high-quality patent application is expensive. Moreover, because patent prosecution generally requires multiple interactions between the applicant and the patent office, applicants may also benefit from the assistance of legal advocates whose role is to formulate arguments to overcome patent office rejections. One may therefore assume that applicants who are experienced in the process of patent prosecution, and who have the resources to hire qualified experts, will have an advantage over first time applicants and those of lesser means.

The legal literature has confirmed the advantages repeat players enjoy in the context of a wide variety of contexts.¹⁵² For instance, repeat players achieve greater success in courts as compared to “one-shotters,” since the repeat players tend to have greater resources, better lawyers, more litigation experience, and a more sophisticated understanding of the law and the judicial system.¹⁵³ Additionally, repeat players are generally better able to develop and employ litigation strategies that work to their advantage.¹⁵⁴ Building on these observations, we sought to explore whether repeat players also achieve greater success in patent prosecution as compared to one-shotters. To this end, we examined how the number of patent applications filed by a specific applicant affected the patent prosecution process.

We first divided the patent applications in the sample into 3 subgroups based on the name of the applicant. The first and biggest group consisted of applicants who filed a single patent application during the years 2012-2019. The second group consisted of applicants who filed more than one but fewer than twenty-nine patent applications during this period. The last group consisted of the top percentile of applicants (i.e., applicants who submitted more than twenty-nine patent applications between 2012-2019).

We found that “one-shotters,” or applicants who filed only a single application, faced obviousness rejections in 12% of their claims and non-novelty rejections in 5.7% of their claims. The top percentile of applicants confronted obviousness rejections in 31% of their claims and non-novelty rejections in 11% of their claims. Thus, the one-shotters received substantially fewer obviousness or non-novelty rejections. Still, obviousness remains the far most common ground for rejection by the patent office.

The following figures illustrate our results in detail:

¹⁵² Marc Galanter, *Why the ‘Haves’ Come Out Ahead: Speculations on the Limits of Legal Change*, 9 L. & SOC. REV. 95 (1974).

¹⁵³ *Id.*, at 110-112, 118-122.

¹⁵⁴ *Id.*, at 118-122.

Figure 7 – Distribution of obviousness and non-novelty as grounds for rejection by frequency of patent application filing

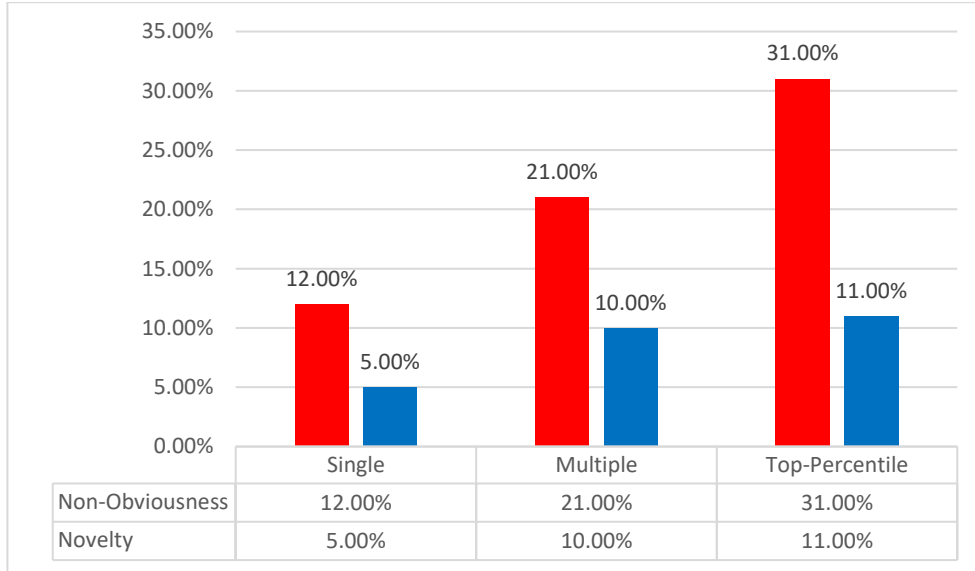


Figure 8 – Distribution of obviousness as a ground for rejection by frequency of patent application filing

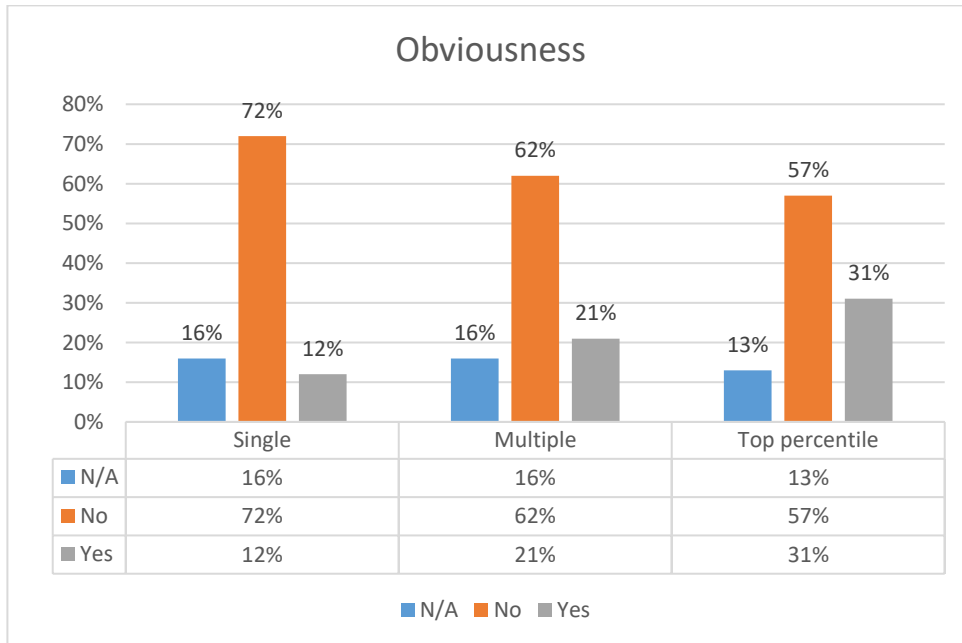
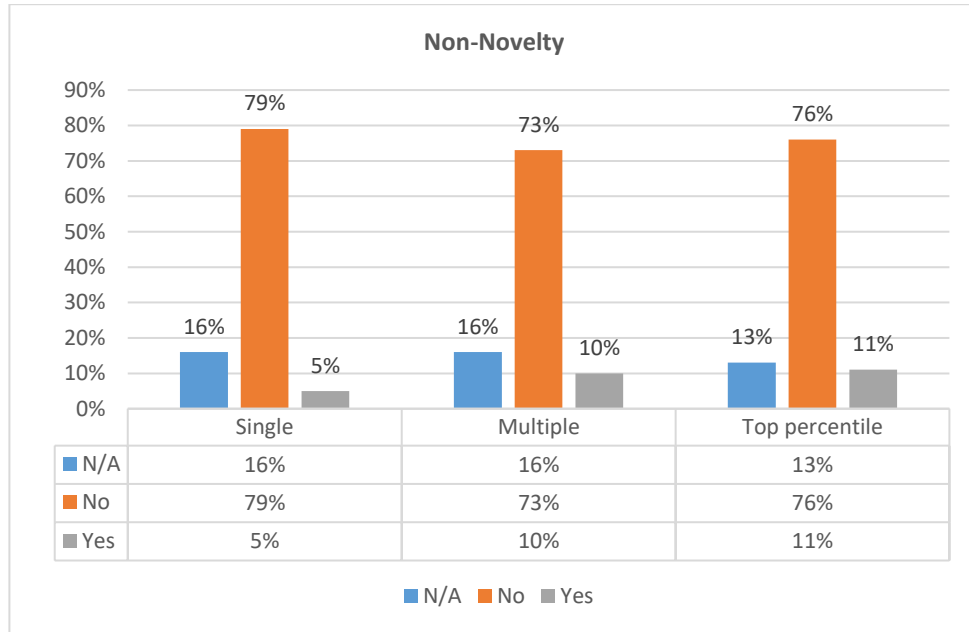


Figure 9 - Distribution of non-novelty as a ground for rejection by frequency of patent application filing



As illustrated above, there are significant differences in the ratio of obviousness and non-novelty assertions in the first round. Nevertheless, as can be seen from the table and figures below, when comparing the ratio of patent applications allowed or abandoned, there are no significant differences between single, multiple, and top percentile applicants. Using a chi-square test for proportions, no significant difference was found among these three groups (rounds) ($\chi^2_{(2,315)} = 0.51$, NS).

These results are further elaborated below:

Figure 10 - Distribution of patent application status by frequency of patent application filing

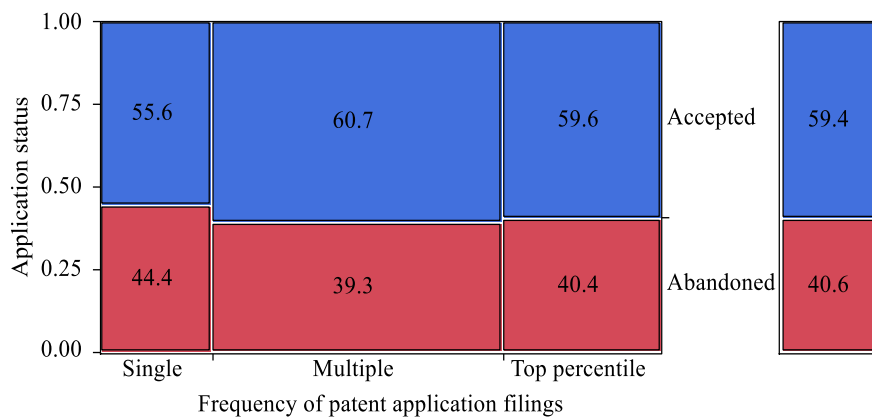


Table 8- – Frequency of patent application filings by application status

Frequency of patent application filings by application status

	Abandoned	Allowed	Total Count
			Row %
Single	28	35	63
	44.44	55.56	100%
Multiple	64	99	163
	39.26	60.74	100%
Top percentile	36	53	89
	40.45	59.55	100%
Total count	128	187	315

* Each row in each of the two groups (abandoned and allowed) totals 100%.

Although patent protection is jurisdiction-specific, the PCT makes it easier for an applicant to file a patent application in a large number of countries by filing an “international patent application.”¹⁵⁵ Filing an international PCT application requires the applicant to follow the international regime rules and regulations. In addition, the application must pay an international filing fee,

¹⁵⁵ See *supra* note 18 and accompanying text.

a search fee, and a transmittal fee that varies based on the receiving office. These requirements typically require the applicant to invest additional resources in comparison to a national patent application. Therefore, one can assume that the stronger a patent application is, the more likely the applicant is to file it through the PCT filing system.

Subsequently, we differentiated between patent applications that were filed through the PCT system and those that were not. Our results show that of the 315 patent applications in our sample, 265 were filed through the PCT system (whether through the Israeli Patent office as ISA or another International Search Office), while only 50 were not.

Not surprisingly, the highest percentage of non-PCT filings was within the group of one-shotters, or applicants who filed only a single application, while the top percentile of applicants tended to rely on the PCT system. This was found to be significant ($\chi^2_{(2,315)} = 5.712648, 0.0168$).

The following figures and tables illustrate our results in detail.

Figure 11 – Distribution of PCT filing by frequency of patent application filings

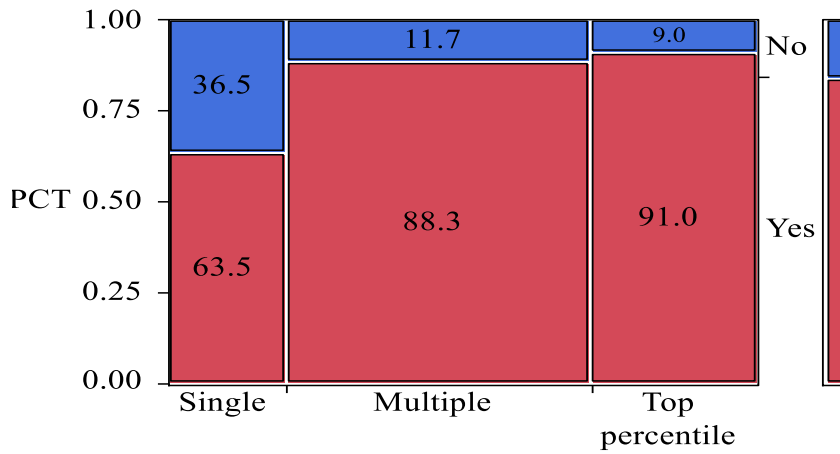


Table 9 - Distribution of PCT filing by frequency of patent application filings

	Yes	No	Total count / Row %
Single	40	23	63

	63.49	36.51	100%
Multiple	144	19	163
	88.34	11.66	100%
Top percentile	81	8	89
	91.01	8.99	100%
Total count	265	50	315

* Each row indicated in each of the groups totals 100%.

Combining these results shows that the top percentile of recurring applicants tends to rely on the PCT system (Figure 11), yet when comparing the ratio of patent applications allowed or abandoned, there are no significant differences between the “one shotters” group and this group of the top percentile recurring applicants (Figure 10). In other words, the group of the top percentile of recurring applicants, who tend to rely on the PCT system, do not enjoy any advantage in the prosecution process.

(iv) Rejected Patent Applications

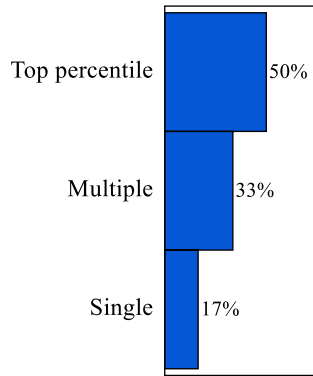
As noted above, we collected a wide assortment of data pertaining to the prosecution of each patent application included in our sample. Analysis of the sampled applications revealed several details about the patent prosecution process and the way obviousness and non-novelty rejections influence applicants’ prosecution conduct as well as the ILPO’s final decisions.

Due to the low percentage of patent applications finally rejected in the general population – 12 out of 32,997, or approximately 0.04% of all applications – and to gain some insight concerning this subgroup, we manually added these 12 patent applications to our study and examined them with reference to the same criteria as the remaining applications.

The finally-rejected patent applications fall into the following categories: chemistry; metallurgy; human necessities, and physics.¹⁵⁶ Seventeen percent (17%) of these applications were filed by one-shotters, while 50% of the finally rejected applications were filed by the top percentile of repeat players.

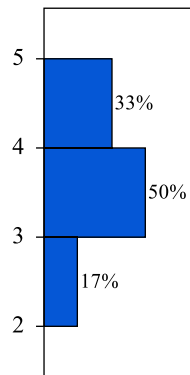
¹⁵⁶ Chemistry; metallurgy 4; Human necessities 7; and Physics 1.

Figure 12 - Distribution of frequency of patent application filings per rejected applications



We further found that rejected patent applications were subject to a higher number of examination rounds than the applications that were ultimately allowed. Specifically, in the case of rejected patent applications, the median number of rounds of examination equals 3, whereas the average is 3.166, while as described above in Figure 2 the average number of rounds of examination of allowed applications equals 1.87.

Figure 13 – Distribution of number of rounds per abandoned applications



Considering these manually-added, finally rejected applications to our sample did not alter our finding that obviousness was the most common ground for rejection throughout the substantive rounds of examination (either as the sole issue or in combination with other concerns).

Table 11 – Distribution of grounds for rejection per abandoned applications

Obviousness	Non-novelty	Other grounds	Column %
No	No	No	6%
		Yes	13%
	Yes	No	0%
Yes	No	No	35%
		Yes	29%
	Yes	No	1%
		Yes	15%

Where the group of rejected patent applications does reveal anomalies is with respect to examiner interviews. While an examiner interview occurred in only 4 of the 315 patent applications in our original sample, examiner interviews took place in 9 out of 12 applications culminating in rejection. Three of these rejected applications were subject to 3 examiner interviews in the course of prosecution, while a single interview took place with respect to five applications and two interviews took place in the remaining application.

These results are interesting, as these 12 rejected patent applications are not a sample and therefore represent a clear tendency in favor of conducting an examiner interview in the very rare cases in which a patent application ended with an official patent rejection. In other words, in these rare cases, applicants tend to invoke all possible measures in attempt to convince the examiner.

C. The Limitations of our Analysis

Patent prosecution statistics are hard to gather and even harder to interpret and link to policy analysis.¹⁵⁷ First, although patent prosecution files from 2012 and later are now publicly available in Israel, compiling the data contained in these files for empirical analysis requires individual, file-by-file review. Second, in many instances, exogenous factors such as cost considerations influence an applicant's strategic behavior.¹⁵⁸ These external factors are hard to capture and could not be assessed and analyzed within our empirical study.

Another limitation of this study relates to our inability to track the nature of the amendment(s) made to claims that were modified in response to an office action to determine whether the modifications were substantive or

¹⁵⁷ DRAHOS, *supra* note 22, at 39 (“*The increasing complexity and globalization of patent law has added to the difficulty of interpreting patent statistics*”).

¹⁵⁸ Lemley & Sampat, *supra* note 3, at 114 (explaining that some of the abandonments occur for business reasons, rather than because the Patent Office – in this case in the USPTO – refused to issue the patent).

merely formal. Analyzing these factors would have required examination of each modification by an expert, a task that exceeded the scope of this study. Moreover, there is not always a clear line differentiating substantive issues from formal ones, making inquiry into the distinction difficult within our empirical analysis. Accordingly, we did not distinguish among types of modifications.

Additionally, our empirical study examines the patent prosecution process in Israel, and we did not compare the results with the outcomes in other patent offices, nor did we examine grounds for issuance of office actions in other jurisdictions. Yet, we believe this should not detract from the significance of our results. As noted above, empirical studies concerning the patent prosecution process are generally scant, and, to our knowledge, the most common grounds for issuance of office actions have not been examined in any jurisdiction.¹⁵⁹ There is much room to assume that the ILPO's practices are in line with global tendencies. Indeed, the foundational principles of patent law, as well as the major procedures of patent prosecution systems in key jurisdictions, are largely globalized.¹⁶⁰ Therefore, while patent law is still based on national application systems, it is nevertheless evolving into a globalized system of governance.¹⁶¹ Our Israeli case study thus might serve as an exemplifying model representative of global trends. Additionally, our evidence-based findings concerning both applicants' strategic behavior and the patent office's practice of relying heavily on obviousness in office action rejections merits policymakers' attention on a global scale.

IV. DISCUSSION AND POLICY IMPLICATIONS OF OUR RESULTS

Our study has produced two key, interrelated findings. First, obviousness significantly outweighed non-novelty as the predominant ground for both office action rejections of claims and final rejections of applications. Second, obtaining a patent is not a dichotomic game, but rather a lengthy,

¹⁵⁹ Frakes and Wasserman, *supra* note 1, at 77.

¹⁶⁰ See e.g., MARKETA TRIMBLE, GLOBAL PATENTS: LIMITS OF TRANSNATIONAL ENFORCEMENT Preface (Oxford Univ. Press 2012) (arguing that patent law is moving out of territoriality); Amir H. Khoury, *The End of the National Patent Office*, 52 IDEA 199, 202 (2012) (arguing that we have witnessed the end of the national patent office in its conventional form); Ben McEniery, *The Time Is Nigh: A Proposal for an International Patent System*, 16 CHI.-KENT J. INTELL. PROP. 167, 169 (2016) (explaining that because basic principles and standards of patent law are dictated by international treaties, they are becoming global law).

¹⁶¹ See Drahos, *supra* note 22, at 10 (arguing that "[t]he patent institution is in practical terms a fully globalized (but not harmonized) institution").

interactive process that resembles a negotiation between the applicant and the patent office. In the following part, we move away from our empirical discussion to address some of the potential policy implications of our findings.

It should be stressed at the outset that uncovering patent prosecution practices in itself serves the basic purpose of promoting transparency regarding how the patent office, *i.e.* the public authority responsible for granting monopoly rights, functions in practice.¹⁶² A better understanding of patent office trends thus has its own intrinsic goal that underlies any empirical study concerning public sector information.¹⁶³ Yet, leveraging raw data into meaningful knowledge that may be used to improve public and private decision-making, enhance public trust in the patenting authority, increase certainty, and promote efficiency requires analysis and interpretation.¹⁶⁴ In the following part, we turn the spotlight on some of the implications for patent law that stem from our empirical findings.

A. Obviousness, Judicial Review and AI

It is evident from our results that the ILPO tends to rely heavily on obviousness as a basis for rejection as compared to non-novelty and all other substantive grounds based on the requirements of patentability. This might not come as a shock to practitioners. Indeed, a good patent attorney is commonly thought capable of drafting a patent application around existing knowledge fully disclosed in a prior art reference and thus avoid rejections based on non-novelty. Obviousness rejections, however, are harder to anticipate and circumvent, as they involve questions of both fact and law and require application of a notoriously ambiguous legal standard by the examiner. As discussed above, the obviousness standard is an open standard by nature and is inherently vague, since its core concept is based on the assessment of a hypothetical person of ordinary skill in the relevant field.¹⁶⁵ Our finding that patent examiners rely heavily on obviousness as a basis for rejection leads to the conclusion that they are inevitably required to exercise legal judgment in addition to bringing their technical expertise to bear as fact-finders. This conclusion has several important policy implications.

¹⁶² Lemley & Sampat, *supra* note 3, at 106.

¹⁶³ Omer Tene & Jules Polonetsky, *Big Data for All: Privacy and User Control in the Age of Analytics*, 11 NW. J. TECH. & INTELL. PROP. [xxvii] (2013).

¹⁶⁴ See Barbara Ubaldi, OECD Open Government - Towards Empirical Analysis of Open Government Initiatives (2013), available at https://www.oecd-ilibrary.org/governance/open-government-data_5k46bj4f03s7-en.

¹⁶⁵ For the literature pertaining to rules vs. standards, see *e.g.*, Ehrlich & Posner, *supra* note 50; Kaplow, *supra* note 50; Duncan Kennedy, *Form and Substance in Private Law Adjudication*, 89 HARV. L. REV. 1685 (1976); Russell B. Korobkin, *Behavioral Analysis and Legal Form: Rules vs. Standards Revisited*, 79 OR. L. REV. 23 (2000).

First, greater clarity in the legal standard is needed.¹⁶⁶ This requires further development of the obviousness doctrine by courts; yet in practice, the patent office's final decisions are rarely subject to judicial review,¹⁶⁷ so the examiner's judgment remains the final judgment.¹⁶⁸ Indeed, we found that only 12 out of 32,997 utility patents filed between 2012-2019 ended with a final—and thus appealable—rejection. This leads to a particular problem in common law systems, where legal principles emerge from case-by-case judicial decision-making to build progressively clearer and more coherent legal doctrines.¹⁶⁹ Low rates of judicial review over patent office decisions thus hinder development of the obviousness standard, leaving the underdeveloped standard subject to the examiners' interpretation. As we explain below, it also leaves the patent office vulnerable to pressure by applicants. Additionally, regular judicial review of the decisions of the patent office is necessary to maintain public trust in this public authority.¹⁷⁰ For these reasons, policymakers should consider how to encourage greater judicial oversight of patent office decisions.

Another potential implication of our findings concerns the policy debate over incorporating AI and other advanced computational technologies in

¹⁶⁶ For further discussion see Ryan T. Holte & Ted Sichelman, *Cycles of Obviousness*, 105 *Iowa L. Rev.* 107 (2019) (after conducting an empirical study of obviousness outcomes and doctrine before and after the Supreme Court's decision in *KSR* in both the Federal Circuit and all federal district courts, the authors concluded that since the *KSR* decision, the Federal Circuit and the district courts implemented somewhat different doctrinal standards.)

¹⁶⁷ See Drahos, *supra* note 22, at 11 (explaining that “[i]n most cases the examiner’s judgment is also the last judgment because only a tiny fraction of patent cases end up being finally decided by a court. In the US the average patent litigation rate is a little less than 2% and in European countries it is about 1%”); Jay P. Kesano & Gwendolyn G. Ball, *How Are Patent Cases Resolved - An Empirical Examination of the Adjudication and Settlement of Patent Disputes*, 84 *WASH. U. L. REV.* 237, 249-254, 271, 276 (2006) (relating to general literature; conducting an empirical study inspecting in particular the rate of court rulings of invalidity of granted patents, which was concluded as very low).

¹⁶⁸ See Drahos, *supra* note 22, at 11.

¹⁶⁹ See *e.g.*, BENJAMIN N. CARDOZO, *THE NATURE OF THE JUDICIAL PROCESS* 10 (1921); William M. Landes & Richard A. Posner, *Legal Precedent: A Theoretical and Empirical Analysis*, 19 *J. L. & ECON.* 249, 249 (1976). See also Emily Sherwin, *A Defense of Analogical Reasoning in Law*, 66 *U. CHI. L. REV.* 1179 (1990); Andrew Stumpff Morrison, *Case Law, Systematic Law, and a Very Modest Suggestion*, 35 *STATUTE L. REV.* 159, 170 (2014) (“[The Judge], will typically attempt to identify the relevant objective guidelines that can be used to classify any fact pattern that might arise. The rule-writer will try to create some “system.”). Moreover, it should be noted that patent law was enacted in the U.S. and other common-law countries in a structure that delegated rule-making to the common law mechanism fulfilled by courts, see: Arti K. Rai, *Engaging Facts and Policy: A Multi-Institutional Approach to Patent System Reform*, 103 *COLUM. L. REV.* 1035, 1116-20 (2003); Craig Allen Nard, *Legal Forms and the Common Law of Patents*, 90 *B.U. L. REV.* 51, 53 (2010).

¹⁷⁰ See Frederick Schauer, *Rules and the Rule of Law*, 14 *HARV. J.L. & PUB. POL’Y* 645 (1991).

the patent prosecution system. In the past few years, many scholars and institutions have been debating whether, and to what extent, AI-based systems can be utilized to improve the process of patent prosecution and the quality of patents granted.¹⁷¹ Considering the rapid development of these technologies, there is no doubt that the use of AI and big data in patent prosecution will be a reality in the near future. Some patent offices worldwide are already using such technologies for at least some stages of patent prosecution. Nevertheless, in light of our results, it is important to be mindful of how these technologies will be incorporated into the process and what data will be fed into the system. We do not argue that policymakers should abandon the idea of AI, but we suggest, as a practical matter, that patent offices employ a two-tiered system, using AI tools more extensively for fact-based inquiries than for analyses requiring legal interpretation. Specifically, AI systems can be utilized to help examiners search the prior art and determine whether the invention passes the novelty threshold. But for purposes of determining non-obviousness, such systems should serve only as a tool to support the examiner's exercise of legal analysis.

In sum, the centrality of the obviousness doctrine in patent prosecution, and the uncertainty in the legal standard that governs its application, suggest the need for policymakers to consider whether judicial review of patent office decisions should be encouraged, and if so, how best to achieve that outcome so that courts are able to fulfill their role in developing the patent system.¹⁷² Meanwhile, in-depth analysis of patent office decisions around the world is critical in view of the increasingly globalized nature of patent law and procedure, as these administrative decisions reflect global trends that

¹⁷¹ See *supra* notes 37-38 and accompanying text.

¹⁷² See Arti K. Rai, *Patent Validity Across the Executive Branch: Ex Ante Foundations for Policy Development*, 61 DUKE L.J. 1237, 1267-8 (2012) (explaining that: “Congress’s limited ability to act has caused the institutional discussion to focus on courts and agencies. Typically, scholars have viewed the PTO as the main agency engaged in policymaking involving patent validity. This attention is understandable, given that Congress has conferred upon the PTO the sole authority to adjudicate the validity of patent applications. Moreover, now that the PTO has the power to conduct post-grant review proceedings that resemble formal adjudications, the focus on the PTO is likely to intensify. Numerous scholars argue that, as between courts and the PTO, courts represent the more appropriate policymaker. These scholars assert that because the Patent Act has a structure similar to the Sherman Act’s, Congress has thereby delegated authority to the courts to make federal common law. Moreover, the history of court and common-law primacy arguably dates back to the first patent statute of 1790”). Rai also argues that policymaking by courts should be favored over policymaking by the Patent Office, mainly due to concerns about the administrative authority’s potential “capture,” meaning bias in favor of its “clients,” i.e., patent applicants. See *id.* at 1270 (“The most compelling objection to an administrative approach to patent policymaking arises from concerns about capture”). In contrast, Drahos perceives the relationship between the various Patent Offices and their “clients” as allowing an evolutionary development of global patent law governance. See Drahos, *supra* note 22, at 16.

may be equally important to stakeholders as judicial decisions in specific jurisdictions.¹⁷³

B. Negotiation and Patent Office Policy

Our second key finding confirms that patent prosecution resembles a negotiation through which the applicant clarifies the boundaries and scope of the patented invention, increasing the likelihood that a patent will issue. Within this negotiation process, the applicant and the patent office exchange letters and telephone calls and may even conduct face to face meetings.¹⁷⁴ At the beginning of the negotiation process, the applicant articulates her claims so as to maximize the scope of the patent. Later, following examination of the application, the applicant is likely to alter the scope of the claims. This process is repeated until an outcome is reached (agreement or disagreement; allowance or rejection).

Our results show that the overwhelming majority of office action rejections either were overcome by the applicant (either through argument or by narrowing or abandoning the rejected claims) or caused the applicant to abandon the application entirely. These findings raise concerns that patent offices—the gatekeepers of the public interest—may lack the resources, expertise, and/or analytical tools necessary to ensure that only meritorious patents are granted. Indeed, patent applicants—particularly well-resourced applicants assisted by experienced legal counsel—may exert excessive influence over the prosecution by raising sophisticated legal arguments to take advantage of uncertainties in the obviousness doctrine that patent examiners—ordinarily technical, not legal experts—are ill-equipped to counter. Moreover, patent examiners—whose role is to grant or reject patent applications in an *objective* manner that reflects interpretation of the law by courts—may find it difficult to do so consistently due to the individualized give-and-take that occurs in case-by-case negotiations with applicants. In addition, applicants may act strategically by including weak claims they do not expect to be allowed as “bargaining chips” they can later modify or abandon in exchange for allowance of stronger claims. Such strategic conduct potentially results in the inefficient use of patent office resources by requiring examiners to devote time to claims the applicant does not expect to survive the process.

¹⁷³ See Drahos, *supra* note 22, at 11 (stating in general, in light of the globalized nature of the patent system, that “[w]hat happens in patent offices around the world is just as important to the multinational users of the patent system as what happens in the courts”).

It also raises concerns about the patent office's ability to withstand pressure by applicants.

Accordingly, our results suggest that in the current environment, the interactive patent prosecution process may lead to undesirable outcomes, such as the issuance of low-quality patents that frustrate, rather than encourage, innovation, undermining the essential *quid pro quo* at the heart of patent law.¹⁷⁵ Moreover, in the rare instances an applicant receives a final rejection, she may be reluctant to seek judicial review, given the significant resources she is likely to have expended already in intensive, interactive proceedings in the patent office. That is, applicants who fail to emerge successful from their negotiations with the patent office may wish to cut their losses rather than pursue appeals in the courts. While perhaps understandable from the perspective of the individual applicant, this outcome fails to correct the problem of inadequate judicial oversight of patent office decisions and preserves the underdevelopment of the obviousness standard by courts. Therefore, a close inspection of the negotiation between the applicant and the examiner is of great importance. Policymakers may wish to consider whether to impose limits on such negotiations to ensure that decisions by the patent office are free from the influence of applicant "bargaining" and produce predictable results that maximize the public good. For example, they might consider whether to limit the number of claims an applicant can include in a patent application and/or the number of times she can modify those claims in response to office actions.¹⁷⁶ Additionally, they should consider the types of expertise examiners must have to conduct the patent prosecution process in a rigorous and consistent manner.

V. CONCLUDING REMARKS

Patents stand at the heart of public-policy discourse, yet basic aspects of the patent prosecution process are under-examined. Uncovering patent prosecution practices is essential for conducting an informed and evidence-based discourse. Most data pertaining to patent applications in worldwide patent offices is open to the public; yet raw data alone is insufficient to draw meaningful insights about how patent laws are applied in practice. Our study delves into the details of patent prosecution in Israel, aiming to ascertain the

¹⁷⁵ See e.g. Jay P. Kesan & Andres A. Gallo, *Why "Bad" Patents Survive in the Market and How Should We Change The Private and Social Costs of Patents*, 55 EMORY L.J. 61, 69 (2006).

¹⁷⁶ For the similar argument that applicants should be limited in their ability to refile modified applications, as endless refilings unduly burden the patent office and result in the grant of unmerited patents, see Frakes & Wasserman *supra* note 4.

most active grounds for office action rejections and to better understand the interactive process that takes place between an applicant and the patent office. Our study, based on statistical sampling, offers two interrelated key findings: first, that obviousness is by far the most common basis for office action rejections, and second, that applicants generally overcome these (and other) rejections through a process of negotiation culminating in the issuance of a patent. These findings reveal that prosecuting a patent is not only an art and a science, it is also an exercise in legal analysis as well as fact-finding that raises important policy questions calling for further investigation.