THE IMPACT OF IMPLICIT BIAS ON FEMALE PATENT APPLICANTS IN AN AGE OF INCREASINGLY VAGUE PATENT STANDARDS

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I. INTRODUCTION

No aspect of U.S. patent law explicitly or implicitly excludes women from patenting their inventions. Yet among the inventors listed on the thousands of patent applications filed each year in the United States, women remain vastly underrepresented. The names of female inventors were only listed on 21% of patents granted in 2016, with women making up only 12% of all United States patent inventors that year.¹ The allowance rate for patent applications by female applicants is 5% lower than male applicants, and studies show that female applicants face, on average, more office actions than male applicants before getting their patents allowed.² This Comment explores how a general trend away from bright line rules in U.S. patentability standards may be exacerbating gender biases faced by female patent applicants.

In Part II, this Comment offers a summary of recent U.S. Supreme Court patent decisions that have resulted in vague, less objective patent examination standards and evaluates how this might influence whether subjective biases enter the process. In Part III, this Comment considers how subjectivity and discretion in other areas of law and society have allowed implicit biases to affect decisionmaking. In Part IV, this Comment explores ways in which such subjectivity can allow examiners' implicit biases to impact female patent applicants. Finally, Part V proposes areas of future study on gender bias during the patent examination process and potential solutions for reducing or eliminating the impact of such biases.

II. CASE LAW IS TRENDING TOWARD VAGUE, SUBJECTIVE PATENTING STANDARDS

Over the past few decades, the U.S. Supreme Court has eschewed a more objective but, in its view, overly-mechanical application of patentability

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¹ OFFICE OF THE CHIEF ECONOMIST, USPTO, PROGRESS AND POTENTIAL: A PROFILE OF WOMEN INVENTORS ON U.S. PATENTS 3 (No. 2, 2019), https://www.uspto.gov/sites/default/files/documents/Progress-and-Potential.pdf.

² JESSICA MILLI ET AL., *EQUITY IN INNOVATION: WOMEN INVENTORS AND PATENTS* 8 (Institute for Women's Policy Research 2016), https://iwpr.org/publications/equity-in-innovation-women-inventors-and-patents/. *See generally id.* at 12 n.7 ("Office actions refer to written communications between the USPTO and the inventor. This correspondence from the USPTO requires a written and signed response from the inventor regarding any and all rejections or objections from the examiner. This is required to proceed with the patenting process.").

standards.³ This direction is an effort to stem the granting of too great a monopoly over certain technologies.⁴ The Court's move away from bright line rules in patent law appears to correspond with a growing concern regarding broad patents asserted by the oft-maligned non-practicing entities (popularly known as "patent trolls").⁵ These non-practicing entities are notorious for aggressively enforcing such overly-broad patent claims.⁶

In two landmark patent law decisions, the U.S. Supreme Court dramatically changed the way patent application claims are examined for patentability and subject-matter eligibility at the United States Patent and Trademark Office (USPTO). Specifically, *KSR International Co. v. Teleflex Inc.*⁷ created confusion and ambiguity over what is considered "obvious."⁸ The definition of "obvious" is important in patent examination, because to be patentable, a claimed invention is statutorily required to be novel and nonobvious.⁹ Then, in *Alice Corp. v. CLS Bank International*,¹⁰ the Supreme Court generated uncertainty over which inventions are patent eligible at all, regardless of their novelty.¹¹ As a result, what was previously a more "rule-based, evidentiary process" is now driven by examiners' discretion, allowing personal biases of individual examiners to control patent allowance and rejection determinations.¹²

To be patentable under U.S. federal law, a claimed invention must be novel and non-obvious.¹³ What is obvious to one person may seem like a massive logical leap to another but, prior to *KSR International Co. v. Teleflex Inc.*, a USPTO patent examiner determining which patent applications to grant could somewhat mechanically apply what is widely known as the "teaching, suggestion, or motivation" test (the "TSM" test) to determine if the concept was obvious.¹⁴ That is, the examiner needed to show explicit or implicit evidence in the prior art of some teaching, suggestion, or motivation that would have led a person of ordinary skill in the relevant technology to modify the prior art reference or to combine prior

³ See KSR Int'l Co. v. Teleflex, Inc. 550 U.S. 398, 415 (2007).

⁴ See Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp., 340 U.S. 147, 153 (1950).

⁵ See Saved by Alice, ELECTRONIC FRONTIER FOUNDATION, (June 23, 2017), https://www.eff.org/alice.

⁶ See id.

⁷ 550 U.S. 398.

⁸ See Gene Quinn, KSR the 5th Anniversary: One Supremely Obvious Mess, IPWATCHDOG (Apr. 29, 2012), https://www.ipwatchdog.com/2012/04/29/ksr-the-5th-anniversary-one-supremely-obvious-mess/id=24456/.

⁹ 35 U.S.C. §§ 102, 103 (2012).

¹⁰ 573 U.S. 208 (2014).

¹¹ See Manny Schecter, Congress Needs to Act So Alice Doesn't Live Here (in the Patent System) Anymore, IPWATCHDOG (Feb. 13, 2017), http://www.ipwatchdog.com/2017/02/13/congress-needs-to-act-so-alice-doesnt-live-here-in-the-patent-system-anymore/id=78241/.

¹² David Stein, *The Power of the Pen: The Role of Examiners' Discretion in Patent Examination*, USPTO TALK (Oct. 22, 2014), http://www.usptotalk.com/the-power-of-the-pen-the-role-of-examiners-discretion-in-patent-examination/.

¹³ 35 U.S.C. §§ 102, 103.

¹⁴ See ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577 (Fed. Cir. 1984).

art reference teachings to arrive at the claimed invention.¹⁵ Proponents of this standard praise its ability to guard against "hindsight bias," the tendency of examiners and most people to find something obvious once they see how it works (i.e., after the examiner has read the patent application), even if such a combination would not have truly been obvious to someone at the time of the invention without reading the inventor's patent application.¹⁶ However, many critics argued the TSM test made getting a patent too easy, resulted in patents on obvious inventions, and thus was "unnecessarily detrimental to competition."¹⁷

Addressing such concerns, the U.S. Supreme Court held that a mechanical application of the TSM test was too rigid and formalistic and instead required only that "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."¹⁸ Moreover, that articulated reasoning no longer needed to be found implicitly or explicitly within the prior art.¹⁹ For example, a patent claim can be found obvious by a showing that the combination of prior art elements was "obvious to try" and by applying "common sense."20

In the years since KSR International Co. v. Teleflex Inc., the Federal Circuit has clarified that the analysis supporting an obviousness rejection should be made explicit in an examiner's written rejection of a patent claim.²¹ However, the courts do not require record evidence within the prior art of an explicit teaching of a motivation to combine multiple references for an obviousness rejection.²² As one critic of the standard suggested:

Since the analysis does not have to quote or rely on reasoning articulated in the prior art, how much explicit reasoning . . . is dependent on how much verbiage the Examiner decides to put into his reasoning. The reasoning can be vague, abbreviated, lacking in detail. The reasoning can assume its own obviousness. The reasoning can be pure handwaving.²³

The flexible language used in KSR International Co. v. Teleflex Inc. makes it easier for an examiner to make an obviousness rejection without identifying any teaching, suggestion, or motivation to combine. Instead, examiners can rely on nebulous concepts such as "common sense" and "obvious to try." Proponents of

¹⁵ Id.

¹⁶ See In re Kahn, 441 F.3d 977, 987 (Fed. Cir. 2006).

¹⁷ SUSAN S. DESANTI ET. AL., TO PROMOTE INNOVATION: THE PROPPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 15 (Federal Trade Commission 2003), http://www.ftc.gov/os/2003/10/innovationrpt.pdf.

¹⁸ KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d at 988). ¹⁹ *Id.* at 420.

²⁰ *Id.* at 421.

²¹ Ball Aerosol v. Ltd. Brands, 555 F.3d 984, 993 (Fed. Cir. 2009).

²² Id.

²³ Kelsey Stout, Say Anything: The KSR Obviousness Rejection That Wasn't There, KELSEY STOUT INTELLECTUAL PROPERTY PATENT BLOG (Aug. 26, 2016), http://kstout.com/blog/2016/8/26/sayanything-the-ksr-obviousness-rejection-that-wasnt-there.

the KSR standard argue that although this multi-factor standard makes obtaining a patent more difficult, it also results in stronger, better quality patents.²⁴ Opponents assert that the standard provides no protection against hindsight reasoning and allows for uneven application by the USPTO's thousands of examiners, "most of whom are not lawyers."²⁵ Furthermore, critics assert that the "overly discretionary standard" has resulted in patent examiners who are less motivated to negotiate with patent applicants, thus increasing the cost of patent prosecution and the number of patent rejection appeals.²⁶

Alice Corp. v. CLS Bank International²⁷ represented another seismic shift toward increased discretion in the patent examining process. In that case, the Supreme Court applied a judicially-created and highly subjective two-part test to determine if financial software patent claims were directed toward patent eligible subject matter.²⁸ Following a preliminary determination that the claim is facially directed toward patent-eligible subject matter (i.e., a process, a machine, an article of manufacture, or composition of matter), this test first involves determining whether the pending patent claims are directed to one of three patent-ineligible judicial exceptions—laws of nature, natural phenomena, or abstract ideas.²⁹ If so, the next step involves examining the elements of the claim to determine whether it contains an "inventive concept" sufficient to "transform" the claim into patenteligible subject matter.³⁰ For example, the Court said that computer functions which were "well-understood, routine, conventional activit[ies]' previously known to the industry" were insufficient to transform the claimed abstract idea into a patent-eligible application.³¹ However, the Court did not provide any additional guidance as to what qualifies as an "abstract idea,"³² nor what exactly would be considered "sufficient" to transform the claimed abstract idea into a patent-eligible application.

The Alice Corp. v. CLS Bank International court further concluded that limiting the use of an abstract idea to a generic computer was not enough to make a computer program patent eligible,³³ creating general uncertainty over the patent eligibility of software.³⁴ The USPTO released updated guidelines for its examiners,

²⁴ See Andy Gibbs, Comparison of Statistical Quality Indicators of Patents in CAFC Decisions Before and After KSR V. Teleflex 4, (July 2008) (unpublished manuscript), http://www.ipo.org/wpcontent/uploads/2013/03/PatentQualityinCAFCprepostKSR.pdf.

²⁵ Quinn, *supra* note 8.

²⁶ See Timothy J. Le Duc, Apples Are Not Common Sense in View of Oranges: Time to Reform KSR's Illusory Obviousness Standard?, 21 DEPAUL J. ART, TECH. & INTELLECTUAL PROP. L. 49, 49 (2010). ²⁷ 573 U.S. 208 (2014).

²⁸ *Id.* at 217. ²⁹ *Id.*

³⁰ *Id*.

³¹ Id. at 225 (alteration in original) (quoting Mayo Collaborative Servs. v. Prometheus Labs, Inc., 566 U.S. 66, 73 (2012)).

³² Manual of Patent Examining Procedure (hereinafter MPEP) § 2106.04(a) (9th ed. Rev. Jan. 2018) (noting "the Supreme Court has not delimited the precise contours of the abstract idea exception"). 573 U.S. at 223.

³⁴ Anthony S. Volpe, 'Alice' and the Search for Patent Eligible Software Patents, LEGAL

indicating that software and business methods are not excluded categories of subject matter.³⁵ However, due to a lack of jurisprudence on the contours of what qualifies as an "abstract idea," for this first step in the Alice test, the USPTO was left with the task of determining how to best delineate what does and does not pass muster under this new standard. Initially, the USPTO instructed its examiners to determine if a claim recites an abstract idea by identifying the claimed concept that the examiner "believes may be an abstract idea" and comparing that to "concepts previously identified as abstract ideas by the courts to determine if it is similar."³⁶ This was difficult in practice because sometimes claims were directed to inventions not easily analogized to previously-identified abstract ideas. Such analysis led to "inconsistent subject matter eligibility determinations across different art units and technology fields" and "exaggerated imbalances in the body of precedent."37

To deal with these inconsistencies, the USPTO updated its guidelines for this prong of the Alice test early in 2019, limiting "abstract idea" to three categories (mathematical concepts, certain methods of organizing human activity, and mental processes).³⁸ Furthermore, these updated guidelines added a sub-step after the determination that the pending patent claims are directed to one of three patentineligible judicial exceptions (e.g., an abstract idea).³⁹ This sub-step requires the examiner to determine if the claim further recites additional elements that integrate the judicial exception into a practical application of that exception.⁴⁰ If such practical application is articulated, then the claim is found to not be directed to a judicial exception and is subject-matter eligible. If not, then the examiner proceeds to the second step of the *Alice* test.⁴¹

Regarding the second step of the Alice test, recent guidance by the USPTO has made strides toward clarifying what is considered "well-understood, routine, conventional activity" (and therefore not enough to transform the claimed abstract idea into a patent-eligible application).⁴² Specifically, following a 2018 Federal Circuit decision⁴³ on subject matter eligibility, the USPTO published a Subject Matter Eligibility Memo cautioning that claim elements are not automatically "well-understood, routine, conventional" activities or elements just because they are disclosed in a prior art reference.⁴⁴ Rather, the Subject Matter Eligibility Memo

INTELLIGENCER (May 1, 2018), https://www.law.com/thelegalintelligencer/2018/05/01/alice-andthe-search-for-patent-eligible-software-patents/.

³⁵ Id

³⁶ MPEP § 2106.04(a) (9th ed. Rev. Jan. 2018).

³⁷ USPTO, 2019 REVISED PATENT SUBJECT MATTER ELIGIBILITY GUIDANCE: INTRODUCTORY MODULE, 16 (presenter notes) (Mar. 6, 2019), https://www.uspto.gov/patent/laws-andregulations/examination-policy/training-materials-subject-matter-eligibility.

²⁰¹⁹ Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019).

³⁹ USPTO, *supra* note 37, at 12-14.

⁴⁰ *Id*.

⁴¹ Id.

⁴² See William C. Rowland, USPTO Issues New Alice Guidance, BUCHANAN INGERSOLL & ROONEY PC (Apr. 26, 2018), https://www.bipc.com/uspto-issues-new-alice-guidance.

⁴³ Berkheimer v. HP Inc., 881 F.3d 1360 (Fed. Cir. 2018).

⁴⁴ USPTO, Memorandum on Changes in Examination Procedure Pertaining to Subject Matter

says that "only when the examiner can readily conclude that the element(s) [are] widely prevalent or in common use in the relevant industry" can such elements be considered "well-understood, routine, conventional" activities or elements.⁴⁵ The memo further establishes evidentiary requirements of factual support for an assertion that the element is "well-understood, routine, or conventional" and, therefore, fails the second step of the *Alice* test.⁴⁶

The USPTO's recent guidance, such as its bright line rule limiting "abstract idea" to three discrete categories,⁴⁷ does lessen the subjective nature of an examiner's subject matter eligibility analysis. However, it was the Supreme Court's attempt to move away from the rigidity of bright lines (such as those drawn by the TSM test)⁴⁸ that brought about the KSR standard and the Alice test in the first place. If future rulings follow that trend, they may perpetuate the subjective nature of the patent examination process. This is in addition to a host of other longexisting discretionary aspects of the patent examination process, such as the extent of prior art searched by each examiner, how detailed of an explanation an examiner provides in patent claim rejections, and how broadly an examiner construes particular terms in the patent claims.⁴⁹ For example, patent examiners are charged with interpreting the words and phrases used in patent claims according to their "broadest reasonable interpretation."⁵⁰ Even though the USPTO has clarified that this does not mean giving claims their broadest *possible* interpretation,⁵¹ exactly what interpretations are "reasonable" is highly subjective and varies widely from one examiner to the next.⁵² Nevertheless, decidedly unreasonable claim interpretations and rejections can be appealed to the Patent Trial and Appeal Board (PTAB).⁵³ Still, critics note that examiners are allowed to place many obstacles in front of a patent applicant that "require much less effort from the examiner to raise, than for the applicant to overcome."⁵⁴

Eligibility, Recent Subject Matter Eligibility Decision (Berkheimer v. HP, Inc.) (Apr. 19, 2018), https://www.uspto.gov/sites/default/files/documents/memo-berkheimer-20180419.PDF.

 $^{^{45}}_{46}$ *Id.* at 3.

 $^{^{46}}_{47}$ *Id.* at 2.

⁴⁷ 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50.

⁴⁸ KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398 (2007).

⁴⁹ Stein, *supra* note 12.

⁵⁰ MPEP § 2111 (9th ed. Rev. Jan. 2018).

⁵¹ Id.

⁵² See Scott A. Hogan, *Can We Just Be Reasonable?*, in The International Comparative Legal Guide to: Patents 2019, INTERNATIONAL COMPARATIVE LEGAL GUIDES SERIES (Katharine Stephens ed. 2018), https://iclg.com/practice-areas/patents-laws-and-regulations/2-can-we-just-be-reasonable.

⁵³ MPEP § 1204 (9th ed. Rev. Jan. 2018).

⁵⁴ Stein, *supra* note 12.

III. THE IMPACT OF IMPLICIT BIAS IN SUBJECTIVITY AND DISCRETIONARY DECISION-MAKING

To understand how subjectivity and discretion in the patent examination process may be impacting female patent applicants, it can be helpful to look to other areas of law and society where discretion plays a key role in decision-making. Law, by necessity, always includes a certain amount of subjectivity, which is why discretion is considered necessary in many areas of law, particularly in areas such as law enforcement. However, studies have shown that "highly subjective decision-making systems render decisions vulnerable to bias and stereotypes."⁵⁵

Note that references to "subjectivity" in this Comment are not made in reference to the legal definitions of subjective versus objective standards. Indeed, the USPTO trains examiners to analyze patent applications from the standpoint of a "person having ordinary skill in the art"—a legally "objective" standard.⁵⁶ However, objective standards applied by individuals can be inherently subjective, with the degree of subjectivity dependent on the specifics of the tests or factors to be considered. Indeed, standards considered legally "objective" become less objective in practice when bright-line rules are replaced with vague or confusing rules like those outlined in *KSR International Co. v. Teleflex Inc.* and *Alice Corp. v. CLS Bank International*, discussed above.

Because the application of these subjective rules is left to individual patent examiners, the bias of examiners may harm patent applicants. One such bias, sometimes called "implicit bias," refers to a subconscious process in which people's brains "automatically classify information in racially biased" or gender biased ways.⁵⁷ Under the implicit bias theory, even people not consciously ascribing to racist or sexist views may unintentionally and unknowingly allow such biases to influence their decision-making, particularly regarding issues where greater subjectivity is required.⁵⁸

One such area of law where a large amount of discretion is exercised is in criminal prosecution.⁵⁹ Prosecutors are given discretion to determine what charges to bring or whether charges should be brought at all in a variety of fact scenarios.⁶⁰ Prosecutors are also given discretion in plea bargaining agreements, various aspects of jury selection, and numerous other situations during trial.⁶¹ Some studies have found that black defendants are more likely than white defendants to be offered plea deals that include jail time.⁶² Critics have pointed to such outcomes as

⁵⁵ Tristin K. Green & Alexandra Kalev, *Discrimination-Reducing Measures at the Relational Level*, 59 HASTINGS L.J. 1435, 1444 (2008).

⁵⁶ MPEP § 2141 (9th ed. Rev. Jan. 2018).

⁵⁷ Robert J. Smith & Justin D. Levinson, *The Impact of Implicit Racial Bias on the Exercise of Prosecutorial Discretion*, 35 SEATTLE U. L. REV. 795, 796-97 (2012).

⁵⁸ *Id* at 798.

⁵⁹ *Id.* at 806.

 $^{^{60}}$ Id.

⁶¹ *Id.* at 816-20.

⁶² Sanaa Nagi, Ethical Prosecution: Combating Racism in the Criminal Justice System, JUSTICE LAB

indicative of prosecutorial discretion allowing implicit bias to unfairly impact racial minorities in the criminal justice system.⁶

Jury members are also susceptible to the effects of implicit bias on their decision-making. In one study, the simple act of changing the name and race of a criminal suspect "caused participants to remember case-relevant information in racially biased ways."64 Various other studies have likewise shown that even brief exposure to racial information can "activate a vast network of racial stereotypes" in the minds of decision makers.⁶⁵ Similarly, evidence suggests that when examiners analyze patent applications of female inventors, gender stereotypes may be triggered automatically in the minds of those examiners, as later explored herein.

The most pervasive stereotypes about women tend to trigger implicit biases that are likely to hurt women seeking a patent. According to implicit bias tests, Americans still associate men with having careers and women with staying home.⁶⁶ Such gender stereotypes can affect hiring practices. In professional orchestras, for example, female musicians were more likely to be hired when concealing their gender by auditioning behind a screen.⁶⁷ Even more relevant to female inventors is that, in implicit association tests of more than half a million people, 70% of respondents more readily associated "male" with "science" and "female" with "arts" than the opposite.⁶⁸

Similar results were found in an experiment performed by the National Academy of Sciences of the United States of America, where participating scientists were each asked to rate an applicant for a position as a lab manager based on identical application materials—half labeled with a male applicant's name and half with a female applicant's name.⁶⁹ While a significant majority of scientists judged the female applicants more harshly, they did not use sexist language or reasoning, but rather identified the female applicants as not competent enough.⁷⁰ These studies indicate that implicit biases can cause a person to act in ways that are anti-women without using anti-female language or even harboring anti-female beliefs. Thus, it follows that a patent examiner faced with an applicant name that is traditionally female may be influenced by stereotypes regarding women as less

⁻ A CRITICAL ANALYSIS FOR JUSTICE (Mar. 19, 2018), https://medium.com/race-law-a-criticalanalysis/ethical-prosecution-combating-racism-in-the-criminal-justice-system-a59158d07a4e. ⁶³ *Id.*

⁶⁴ Smith & Levinson, *supra* note 58, at 801.

⁶⁵ *Id.* at 798

⁶⁶ *Id.* at 803.

⁶⁷ Claudia Goldin & Cecilia Rouse, Orchestrating Impartiality: The Impact of "Blind" Auditions on Female Musicians, 90 AM. ECON. REV. 715, 715 (2000).

⁶⁸ CATHERINE HILL, ET AL., WHY SO FEW? WOMEN IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS 76 (American Association of University Women 2010). https://www.aauw.org/research/why-so-few/.

⁶⁹ See Corinne A. Moss-Racusin, et al., Science Faculty's Subtle Gender Biases Favor Male Students, 109 PROC. NAT'L ACAD. SCI. 16474, 16474 (2012).

⁷⁰ Id. See also Ilana Yurkiewicz, Study Shows Gender Bias in Science Is Real. Here's Why It Matters, SCI. AM. (Sept. 23, 2012), https://blogs.scientificamerican.com/unofficial-prognosis/study-showsgender-bias-in-science-is-real-heres-why-it-matters/.

scientific and less competent than men, possibly causing the examiner to view the female applicant's patent application with more skepticism than a similar patent application submitted by a man.

IV. HOW SUBJECTIVITY ALLOWS EXAMINERS' IMPLICIT BIASES TO IMPACT FEMALE PATENT APPLICANTS

How examiner discretion and implicit biases affect the patent application process can be subtle and multi-faceted, similar to the effects of implicit bias on prosecutorial discretion. According to Olav Sorenson, a professor at the Yale School of Management, "The extent to which women are facing tougher hurdles is relatively small at every stage, [but] those are going to add up and mean that the [overall] disparities . . . are going to be much larger than they are at any individual stage of the process."⁷¹

The actual allowance rate of patents filed by women versus those filed by men is difficult to pinpoint, since most studies have used various methodologies based on applicants' names to determine whether they are male or female.⁷² One study found that from 2000 to 2016, the ultimate patent allowance rate for women applicants at the USPTO was 67.2%, compared to a 73.0% ultimate allowance rate for men.⁷³ Meanwhile, another study found that patent applications submitted by women between 2001 and 2014 were 21% less likely to be accepted than those from their male counterparts, with that difference declining to 7% when accounting for technology-related variables.⁷⁴ In either case, women faced lower patent allowance rates overall than men.

Women also faced more office actions rejecting or objecting to their patent applications before finally negotiating an allowance.⁷⁵ Each additional office action costs patent applicants additional attorney fees⁷⁶ and often results in a narrower claim scope in an attempt to overcome rejections.⁷⁷ Narrower claims generally make the patent application less economically valuable to the inventor.⁷⁸

In an effort to determine how much of this disparity is due to the examiners' biases as opposed to other unanalyzed variables, a Yale study compared not only the disparity between allowance rates for clearly male-

⁷¹ Diana Kwon, Women Less Successful When Applying for Patents, SCIENTIST (Apr. 18, 2018), https://www.the-scientist.com/news-opinion/women-less-successful-when-applying-for-patents-30853 (alteration in original).

⁷² See, e.g., id.

⁷³ Milli, *supra* note 2, at 12.

⁷⁴ Kyle Jensen et al., Gender Differences in Obtaining and Maintaining Patent Rights, 36 NATURE BIOTECHNOLOGY 307, 307 (Apr. 2018).

⁷⁵ Milli, *supra* note 2, at 12.

⁷⁶ See Steve Bean, How Much Does a U.S. Patent Cost?, LEGENDS LAW (2018), http://www.legendslaw.com/how-much-does-a-u-s-patent-cost/ (estimating that each office action typically costs anywhere from \$1,500 to \$4,500, including attorney fees and USPTO fees).

 ⁷⁷ See Jensen, supra note 75, at 308.
⁷⁸ Id. at 307.

associated first names and clearly female-associated first names, but also contrasted these results with an analysis of male and female applicants having unusual first names that are more gender ambiguous.⁷⁹ The men were granted patents at a higher rate than the women in both cases, but the women with unusual names had only a 2.8% lower probability of being granted a patent than the male applicants, whereas the women with common female-associated names had an 8.2% lower probability of being granted a patent.⁸⁰ Furthermore, the patents of the women with unusual first names were cited approximately 20% more often than patents of male applicants, leading the study authors to conclude, "To the extent that citations reflect patent quality, this result suggests that women inventors must clear a higher hurdle than men and therefore that the average patent granted to a man."⁸¹

Allowance rates for women patent applicants, in comparison to men, vary widely depending on the technological field of their inventions.⁸² Specifically, once filed with the USPTO, patent applications are divided into a variety of different technology centers based on subject matter for review by examiners with expertise in that subject.⁸³ According to one study, which assessed allowance rates for eight different technology centers, the most challenging technology centers for female inventor allowance rates are TC 3600 and TC 3700—two technology centers notoriously beset with *Alice*-type "abstract idea" subject matter eligibility claim rejections.⁸⁴ As discussed above, the lack of guidance by the Court on what qualifies as an "abstract idea" has allowed for more discretion by individual examiners, so it is telling that those are the technology centers where women face the greatest allowance rate disparity in comparison to men. This is at least circumstantial evidence that greater discretion and uncertainty in the standards used by patent examiners may lead to more implicit bias against women patent applicants.

The specific impact of *KSR International Co. v. Teleflex* and a more flexible non-obviousness standard are slightly more difficult to observe, because the issue of non-obviousness impacts all technology centers and types of inventions. Furthermore, no studies thus far have tracked whether, after *KSR International Co. v. Teleflex*, obviousness-type rejections increased more for female patent applicants than male patent applicants. However, in practice, "examiners have wide latitude in analyzing obviousness," and "[r]ejections based

⁷⁹ *Id.* at 309 (explaining "The gender differences associated with common names therefore should capture both differences in behavior on the applicant side as well as differences in treatment of those inventors by others. Any gender differences associated with rare names, in contrast, should stem only from the behavior of the applicant side.").

⁸⁰ Id.

⁸¹ *Id.*

⁸² See Kwon, supra note 72.

 ⁸³ Sarah Garber, *Gender and the USPTO*, ABOVE THE LAW (Mar. 16, 2016, 2:03 PM), https://abovethelaw.com/2016/03/gender-and-the-uspto/?rf=1.
⁸⁴ Id.

on common sense appear to be fabricated to justify their own logic."⁸⁵ Law professor Nancy Levit is generally critical of overly subjective legal criteria such as "common sense" because they "encourage reliance on accumulated lore of a specifically nonscientific nature."⁸⁶ That "lore" often includes stereotypes of women that persist despite evidence to the contrary.⁸⁷

It is impossible to quantify the full extent of the effects of implicit bias on female patent applicants, because in addition to the Court moving away from bright-line rules for issues like obviousness and subject matter eligibility, patent examiners are given discretion on countless other decisions within the patent examination process. For example, patent examiners are instructed to judge patent applications for compliance with statutory rules (including issues like obviousness, discussed above) from the viewpoint of the fictional "person having ordinary skill in the art."⁸⁸ However, these supposedly objective standards have been criticized by feminist scholars as oriented toward a masculine default that is not actually gender neutral.⁸⁹ Furthermore, as previously mentioned, the amount of prior art searched, how broadly an examiner construes patent claim terms, and how detailed of an explanation is made in patent rejections all provide numerous opportunities for implicit biases to affect the quantity and quality of rejections faced by female patent applicants.⁹⁰

Due to the subtle nature of implicit bias, patent applicants may not always notice when these biases are impacting examination of their patent applications. Yet each additional obstacle faced by a patent applicant may consciously or unconsciously affect an inventor's future patent filings. Although it is impossible to document how often something does not happen, it seems likely that a person facing more obstacles in obtaining a first patent would generally be less enthusiastic about pursuing future patents than a person facing fewer obstacles.

This is relevant when considering the low participation of women in the U.S. patent system, because a significant percentage of patents overall are filed by serial inventors (generally defined as inventors with three or more patents).⁹¹ One multi-university study found that only 10% of faculty inventors accounted for 50% of the patents generated at those universities.⁹² Lists of top inventors globally, as

⁸⁵ James Yang, *Common Sense Used to Evaluate Obviousness with Caveats*, OC PATENT LAWYER (Aug. 31, 2016), https://ocpatentlawyer.com/common-sense-used-to-evaluate-obviousness-with-caveats/.

⁸⁶ Nancy Levit, *Listening to Tribal Legends: An Essay on Law and the Scientific Method*, 58 FORDHAM L. REV. 263, 291 (1989).

⁸⁷ See Catherine H. Tinsley & Robin J. Ely, *What Most People Get Wrong About Men and Women*, HARV. BUS. REV. (2018), https://hbr.org/2018/05/what-most-people-get-wrong-about-men-and-women.

 ⁸⁸ See Dan L. Burk, *Do Patents Have Gender?*, AM. U. J. GENDER, SOC. POL'Y & L. 881, 883 (2011).
⁸⁹ Id. at 885.

⁹⁰ Stein, *supra* note 12.

⁹¹ Devrim Göktepe-Hultén, Academic Inventors and Research Groups: Entrepreneurial Cultures at Universities, 35 SCI. & PUB. POL'Y 657, 660 (2008).

⁹² Louisiana Tech Researchers Study Prevalence, Impact of 'Serial Inventors', LA. TECH UNIV. (Feb.

^{17, 2016),} https://www.latech.edu/2016/02/17/louisiana-tech-researchers-study-prevalence-impact-

ranked by their total number of patents, demonstrate a dearth of female representation.⁹³ If facing greater obstacles in the patent examination process does discourage female applicants from seeking out additional patents in the future, this may be contributing to the low percentage of patents listing female inventors. Each additional reply to a rejection amounts to time and money that could be going toward new inventions and new patent application fees.⁹⁴ Furthermore, the financial burden of such obstacles may dissuade women more than men, due to women having fewer financial resources on average.⁹⁵

Despite strides toward gender equality, modern society still often views women as inferior to men, particularly in the realms of career and technological competence.⁹⁶ Another area in which such stereotypes negatively impact women is in negotiation—an important aspect of the patent examination process—due to a broader societal bias against women negotiating for what they want. Specifically, in the employment context, "women are less likely to negotiate their starting salaries," but those who do negotiate face "a penalty 5.5 times that faced by men."⁹⁷ In the patent context, effects of such negotiation penalties or implicit bias may be more muted, since many applicants have attorneys negotiating on their behalf. However, negotiation penalties like those found in employment may be hurting female pro se applicants and female individual inventors, two types of female patent applicants less likely to have a corporate legal team or law firm pleading on their behalf. It would also be interesting to explore if the gender of patent attorneys negotiating with the examiners affects patent outcomes, but that is beyond the scope of this Comment.

In addition to this negotiation penalty, women are often still stereotyped as being ignorant of technology even when working in technical fields. For example, implicit bias tests show that most people more readily associate men with the word "science."⁹⁸ One study found that among women working in technology-focused fields, 25% say they regularly witness a phenomenon dubbed "mansplaining"—"when men unnecessarily over-explain concepts to women in a

of-serial-inventors.

⁹³ See, e.g. Mark Summerfield, *The Most Prolific Inventors of the Past 25 Years, and the Connections Between Them*, PATENTOLOGY (Jan. 16, 2017, 12:01 AM), https://blog.patentology.com.au/2017/01/the-most-prolific-inventors-of-past-25.html.

⁹⁴ See Bean, supra note 77.

⁹⁵ See Young Women in STEM Fields Earn Up to One-Third Less Than Men, OHIO STATE UNIV. (May 9, 2016), https://news.osu.edu/young-women-in-stem-fields-earn-up-to-one-third-less-than-men.

⁹⁶ See Audrey Nelson, *How Unconscious Bias Impacts Women and Men*, PSYCHOL. TODAY (June 25, 2018), https://www.psychologytoday.com/us/blog/he-speaks-she-speaks/201806/how-unconscious-bias-impacts-women-and-men.

⁹⁷ Joan C. Williams, *Women Don't Negotiate Because They're Not Idiots*, PSYCHOL. TODAY (Jan. 31, 2013), https://www.psychologytoday.com/us/blog/family-friendly/201301/women-dont-negotiate-because-theyre-not-idiots (stating "Women who negotiate often trigger backlash for gender deviance. Women are supposed to be nice and not overly demanding. Women who negotiate flout these mandates.").

⁹⁸ Kevin Miller, *Are You Biased Against Women Leaders?*, AM. ASS'N OF UNIV. WOMEN (AAUW) (Feb. 10, 2016), https://www.aauw.org/article/implicit-association-test/.

patronizing way."⁹⁹ Because patent applicants are specifically seeking to patent new technologies, many of these same stereotypes and resulting biases experienced by women working in technical fields seem likely to have some effect on the patent examination process as well.

V. FUTURE AREAS OF STUDY AND PROPOSED SOLUTIONS FOR REDUCING THE IMPACT OF IMPLICIT GENDER BIAS ON THE PATENT EXAMINATION PROCESS

Implicit bias has become a popular area of study in the last decade, but specific studies of U.S. patent examiners for implicit bias has not been undertaken as of 2019. The USPTO does not collect gender data from its patent applicants, so most gender studies of patent applicants are based on various techniques for matching names with their most-likely gender.¹⁰⁰ For more reliable data, the USPTO would need to begin collecting demographic data from its patent applications. Nevertheless, the most in-depth analysis of USPTO examination statistics would still only tell part of the story.

Even if patent applications of female inventors are rejected more often than those of male inventors generally, such statistics alone cannot reveal whether other societal or systemic reasons for this disparity exist. Empirical studies that control for non-gender-bias-related reasons for such rejections would be more useful in determining the extent to which implicit bias influences the decisions of patent examiners. For example, if it was determined that women are less likely to hire an attorney to draft and prosecute their patent applications than men, then a disparity in allowance rates could merely be attributed to that non-bias-related advantage. Countless such alternative explanations may exist for the statistics described herein, and without a controlled study, there is no way to precisely analyze the impact of implicit gender bias.

Such future studies of gender bias in patent examination could be modeled after an empirical study conducted by academics at the University of Wisconsin-Milwaukee, in which a portion of participants were given a curriculum vitae with a traditionally male-sounding name and another portion were given the identical curriculum vitae with one change—the applicant was given a traditionally female-sounding name.¹⁰¹ Both male and female participants were more likely to hire the male job applicant than the female job applicant, despite their identical records.¹⁰² Such a study could be duplicated for patent examination by providing an identical patent application to a representative sample of patent examiners, half of such patent applications including a traditionally male name and half including a traditionally female name.

⁹⁹ Kristina Cappetta, *Women, Technology, and the Epidemic of "Mansplaining,"* PROJECT EVE (Dec. 7, 2016), https://projecteve.com/women-technology-and-the-epidemic-of-mansplaining/.

¹⁰⁰ Milli, *supra* note 2, at 3.

¹⁰¹ See Rhea E. Steinpreis et. al., *The Impact of Gender on the Review of the Curricula Vitae of Job Applicants and Tenure Candidates: A National Empirical Study*, 41 SEX ROLES 509, 509 (1999). ¹⁰² *Id.* at 522.

The challenge with such a gender-blind study in an experimental setting is that it would be difficult to advance it beyond a first office action, since subsequent actions require a back and forth between the applicant (or the applicant's attorney) and the examiner. Nevertheless, analyzing any statistically-significant differences in how the male applicant's patent application is initially examined versus that of a female applicant could be enlightening. If female patent applicants are indeed judged more harshly than male patent applicants in an empirical study, then the next challenge is how to address such biases.

Similar to the gender-blind study described above, the USPTO could consider implementing gender-blind examination across the board, assigning a number to applicants or otherwise omitting their names so that the gender of the patent applicant cannot be determined by the examiner. Some employers have used such a gender-blind applicant screening process to decrease the effects of gender bias in hiring.¹⁰³ Although such hiring practices have increased the number of first interviews received by female and minority job candidates, implicit bias issues in hiring still exist at the in-person interview stage, where a person's gender and race is not so easily hidden.¹⁰⁴ As with gender-blind hiring practices, gender-blind patent examination faces many obstacles making it difficult or impossible to implement.

Before examining a patent application, a patent examiner is required to conduct an extensive prior art search for published patents, published patent applications, and any other publications that disclose the same or obviously-similar inventions to the claimed invention being examined.¹⁰⁵ However, if the inventor or author of the published prior art is the same inventor of the claimed invention in a patent application, then the examiner must consider if the discovered prior art can be cited against the new claimed invention or not in an official rejection of the recited claims therein. For example, if the same inventor published a paper disclosing his or her invention less than a year before filing the patent application, that published paper cannot be cited against the patent application of that inventor in rejecting his or her patent application claims.¹⁰⁶

Thus, knowing the legal name of the inventor can be important to the examination process. Indeed, sometimes the name alone is not enough, particularly if the inventor has a common name, so published patent applications also generally list the city, state, and country of the patent applicant.¹⁰⁷ Using unique inventoridentification numbers or simply a first initial and last name could arguably lessen the effects of gender bias on the patent examination process. However, there would

¹⁰³ See John Feldmann, The Benefits and Shortcomings of Blind Hiring in the Recruitment Process, FORBES 3. 2018. 9:00 AM), (Apr. https://www.forbes.com/sites/forbeshumanresourcescouncil/2018/04/03/the-benefits-andshortcomings-of-blind-hiring-in-the-recruitment-process/#c19dd3838a3a.

⁴ Id.

¹⁰⁵ MPEP § 706 (9th ed. Rev. Jan. 2018).

¹⁰⁶ Id. at § 717.02(a). ¹⁰⁷ Id. at § 601.01, 1120.

be no way for examiners to determine if the most relevant prior art shared the same inventor as the patent application being examined.

One possible solution to this challenge is for the examiner to simply use all relevant prior art in a first round of claim rejections. Then the applicant could respond with evidence that he or she is the same inventor responsible for the cited prior art, thus overcoming this initial rejection. Still, the inefficiencies of such a system may face resistance at the USPTO, since the average application takes approximately two-years from filing until allowance or abandonment.¹⁰⁸ Furthermore, once applications or patents publish, many inventors want their name associated with their patents, giving them public credit for their inventions. With few exceptions, patent applications are published automatically eighteen months after filing,¹⁰⁹ but these same applications do not receive an initial office action until, on average, 16.3 months after filing.¹¹⁰ With backlogs varying by technology center, some patent applications likely are published before even receiving a first office action by an examiner, let alone a final office action or notice of allowance. Given this frequent overlap of patent application examination and publication, as well as the importance of attribution, it is difficult to see how gender-blind examination practices could be made feasible at the USPTO, even in the initial stages of review.

Law firms could similarly consider factors for and against implementing gender-blind processes in their representation of patent applicants.¹¹¹ For example, patent attorneys Caroline Greenwood and Antonia L. Sequeira suggest "removing the inventors from the email templates," so that "in-house counsel can make decisions without the inventors' genders unconsciously impacting their decisions."¹¹² Admittedly, there would be some instances where conversations with the inventor(s) are required and keeping gender information secret is neither practical nor prudent.¹¹³ Furthermore, clients could be turned off by the idea that their attorney needs such measures in order to mitigate his own biases before making a client-related decision. Still, remembering that the patent examiners are not the only individuals susceptible to the effects of implicit bias may allow patent practitioners to better represent their female patent applicant clients.

¹¹² Id.

¹⁰⁸ USPTO, Data Visualization Center, https://www.uspto.gov/corda/dashboards/patents/main.dashxml?CTNAVID=1004 (last visited on Oct. 6, 2018).

¹⁰⁹ MPEP, *supra* note 32, at 1120.

¹¹⁰ USPTO, PERFORMANCE AND ACCOUNTABILITY REPORT 2017 27 (2017), https://www.uspto.gov/sites/default/files/documents/USPTOFY17PAR.pdf (showing that this average pendency until a first office action only just dipped below eighteen months in 2015).

¹¹¹ See Caroline Greenwood & Antonia L. Sequeira, *Gender Diversity in Patenting. Current Landscape and Recommendations*, FINWICK & WEST LLP (Oct. 30, 2018), https://www.fenwick.com/Publications/Pages/Intellectual-Property-Bulletin-Fall-

^{2018.}aspx#_idTextAnchor1?utm_source=Mondaq&utm_medium=syndication&utm_campaign=Vi ew-Original.

¹¹³ Id.

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Though a certain amount of bias is innate in everyone and cannot be eliminated completely, many cultural and systemic changes can lessen the effects of such biases on the patent examination process. Some companies and universities have turned to implicit bias training.¹¹⁴ The USPTO currently offers voluntary workplace implicit bias training for its managers but does not require it of its examiners in relationship to the examination process.¹¹⁵ Whether it is prudent to require such training of patent examiners is subject to debate. Critics of such training generally assert that it not only does not work in reducing implicit bias, but that it creates a "toxic environment" in the corporations that have implemented it and can even chill free speech to an undesirable degree.¹¹⁶

Another potential method of reducing implicit bias is to pursue diverse hiring practices, since only about one quarter of patent examiners are female.¹¹⁷ However, while it is tempting to assume that female examiners would not be as hard on female applicants, statistics show the opposite. Indeed, some studies indicate that female patent examiners are as tough or tougher on female patent applicants than male patent examiners,¹¹⁸ perhaps due to internalizing the same cultural messages as their male counterparts over the years.¹¹⁹

Nevertheless, hiring more female examiners has the potential to improve the outcome for patent applicants in the long term. This is because implicit bias studies have shown that diverse environments tend to have a positive effect on challenging implicit biases.¹²⁰ For example, in the field of education, students exposed to "counter-stereotypical role models," such as women engineering professors, exhibited a lessened amount of implicit bias.¹²¹ Law professor Jerry Kang and social psychologist Mahzarin Banaji refer to these individuals as "debiasing agents," where women in a male-dominated profession serve as "countertypical exemplars" in the work environment.¹²² Male examiners currently outnumber female examiners nearly three to one,¹²³ but the USPTO has made gender diversity a focus in recent years through family-friendly work schedules,

¹¹⁴ See Lee Jussim, Mandatory Implicit Bias Training Is a Bad Idea, PSYCHOL. TODAY (Dec. 2, 2017), https://www.psychologytoday.com/us/blog/rabble-rouser/201712/mandatory-implicit-bias-training-is-bad-idea.

¹¹⁵ See Email from Molly Kocialski, Regional Mountain Director, USPTO (Oct. 31, 2018) (on file with author). See also Reducing the Impact of Bias in the STEM Workforce, USPTO, https://www.uspto.gov/about-us/organizational-offices/office-equal-employment-opportunity-and-diversity/reducing-impact (last visited Nov. 3, 2018).

¹¹⁶ See, e.g. Jussim, *supra* note 115.

¹¹⁷ See Linda Hosler, Mind the Gap: The USPTO's Efforts to Narrow the Gender Gap in Patenting and Innovation, 19 TECHNOLOGY & INNOVATION 759, 760 (2018).

¹¹⁸ See Garber, supra note 84.

¹¹⁹ See Yurkiewicz, supra note 71.

¹²⁰ See e.g. Smith & Levinson, supra note 58, at 825-26.

¹²¹ *Id.*

¹²² See Jerry Kang & Mahzarin R. Banaji, *Fair Measures: A Behavioral Realist Revision of* "Affirmative Action," 94 CALIF. L. REV. 1063, 1107-08 (2006).

¹²³ See Hosler, *supra* note 118, at 760.

telework programs, and leave options for child or elder care.¹²⁴ Although the percentage of female examiners is only slightly higher than the science, technology, engineering, and math (STEM) workforce overall, the attrition rate for female USPTO examiners after twelve years is less than 5%—compared to a 50% attrition rate generally for women who begin their career in STEM.¹²⁵

Note that this Comment is focused on implicit bias only. When explicit bias is displayed toward a patent applicant, that applicant may request the examiner's supervisor attend interviews or otherwise get involved.¹²⁶ Furthermore, the applicant can report the offending examiner to the USPTO Ombudsman.¹²⁷ The USPTO's Ombudsman program is designed to "assist applicants when the normal processing has stalled, helping to get applications back on track."¹²⁸

Unfortunately, arguably few if any legal remedies exist for groups affected by implicit bias under U.S. law, in intellectual property or otherwise. Instructive in this regard is a U.S. Federal Circuit trademark appeal, *In re Shinnecock Smoke Shop*,¹²⁹ which rejected claims of racial discrimination, stating that legitimate, non-discriminatory reasons existed for denying registration. Notably, there will almost always be other non-discriminatory reasons for decisions being made when the bias is implicit, which makes implicit bias incredibly difficult to detect and even more difficult to remedy.

Though training and more gender diversity among examiners may help, subjective patentability standards allow gender biases to continue to play a role in the patent examination process. The current director of the USPTO, Andrei Iancu, appears focused on decreasing the confusing and often subjective nature of the patent examining process. Specifically, Director Iancu recently emphasized the need for simplification and clarification of patent eligibility standards that keep "rejections in their lane and . . . clearly categoriz[e] the subject matter of any exception."¹³⁰ Creating more clarity and certainty for examiners can also create greater certainty for patent applicants, which in turn assists efforts to level the playing field for male and female applicants alike.

In addition, the SUCCESS Act, signed into law on October 31, 2018, requires the USPTO to conduct a study of the number of patents applied for and obtained by women, minorities, and veterans, as well as small businesses owned by these under-represented groups and to "provide legislative recommendations to

¹²⁷ Id.

 $^{^{124}}$ *Id.* at 759.

 $[\]frac{125}{10}$ Id. at 760.

¹²⁶ Raina Haque, *Breaking Through the Culture of Examiner v. Applicant at the USPTO*, IPWATCHDOG (July 28, 2016), https://www.ipwatchdog.com/2016/07/28/culture-examiner-applicant-uspto/id=71323/.

¹²⁸ Patents Ombudsman Office, USPTO (last visited Nov. 9, 2018), https://www.uspto.gov/patent/ombudsman-program.

¹²⁹ 571 F.3d 1171, 1174-75 (Fed. Cir. 2009).

¹³⁰ Kevin A. Rieffel, *What Is Director Iancu Proposing the USPTO Do for §101 Analysis?*, IPWATCHDOG (Sept. 25, 2018), https://www.ipwatchdog.com/2018/09/25/director-iancu-proposing-uspto-%C2%A7101-analysis/id=101682/.

increase the number of women, minorities, and veterans who participate in entrepreneurship activities and apply for patents."¹³¹ This required study does not specifically address explicit or implicit biases. However, increasing the number of patent applications submitted by female inventors in general could have a normalizing or debiasing effect in the minds of examiners. When receiving a patent application with a woman's name on it becomes more common, perhaps examiners can subconsciously begin associating the terms "science" and "technology" with women as much as men.

VI. CONCLUSION

There was a time where a large portion of women in America could not even legally patent their own invention.¹³² Today, the USPTO actively encourages greater female participation in the U.S. patent system.¹³³ That is progress. However, implicit bias still plays a powerful role in contemporary American culture.¹³⁴ Such pervasive biases presumably influence the many and varied decisions made by the thousands of U.S. patent examiners examining patent applications each day. Admittedly, this is a complex problem to tackle, because these biases are, by their very nature, imperceptible in most individual instances.

The greater discretion patent examiners are given, the greater the risk that implicit biases may unduly influence their decisions at various stages of the patent examination process. As discussed herein, the trend toward more subjective, vague patentability and subject-matter-eligibility standards put forward in key Supreme Court decisions in recent years¹³⁵ has increased patent examiners' discretion in the patenting process. The Court was justifiably concerned that bright-line rules were leading to patents that were overly-broad, and that the outsized monopolistic effect was chilling innovation.¹³⁶ However, in the absence of such bright line rules, patent claim rejections left to the "common sense" of patent examiners' implicit biases are not particularly favorable for female patent applicants.

¹³¹ Study of Underrepresented Classes Chasing Engineering an Science Success Act of 2018, Pub. L. No. 115-273 § 132 Stat. 4158 (2018).

¹³² See Mary Kies Becomes the First Woman to Receive a U.S. Patent, in America's Story from America's Library. U.S. Library CONG. OF (Feb. 2001). 1. http://www.americaslibrary.gov/jb/nation/jb nation maryk 1.html (noting that many women could not hold patents because they were not allowed to hold property in many states, and a patent is personal property). ¹³³ Hosler, *supra* note 118, at 760.

¹³⁴ See Emerging Technology from the arXiv, Computational Linguistics Reveals Pervasive Gender Rias in Modern English Novels. MIT TECH. REV. (Aug. 7. 2018). https://www.technologyreview.com/s/611820/computational-linguistics-reveals-pervasive-genderbias-in-modern-english-novels/.

¹³⁵ See KSR Int'l Co. v. Teleflex, Inc. 550 U.S. 398, 419 (2007); Alice Corp. v. CLS Bank Int'l, 573 U.S. 208, 217 (2014).

¹³⁶ See KSR, 550 U.S. at 415-16; Alice, 573 U.S. at 217.

The patent examination process is intricate and complex. Eliminating implicit bias at every stage of this process is impossible. However, if increasing female participation in patenting is the goal, a commitment to ensuring that women are treated fairly once they do choose to participate in the U.S. patent system is important. True parity between male and female patent applicants does not just require a greater number of women to apply for patents, but also for more of those women to apply for multiple patents. The research described in this Comment strongly indicates that women face greater obstacles during the patent examination process than men¹³⁷—obstacles that may dissuade female applicants from filing future patent applications on new inventions.

Developing stronger, clearer evidentiary requirements for examiners making highly subjective patent determinations is an important step for tempering the effects of such biases, particularly in the areas of obviousness and patent eligible subject matter. Gender-blind examination studies may also offer additional insight into this topic, spurring innovative solutions for how to reduce the effects of implicit bias in patent examination.

¹³⁷ See Jensen, supra at note 75, at 309.