

Q&A: Experts discuss the inequity problem with patents

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Patents and the protection of inventor rights have occupied a key place in American law and policy since the earliest days of the country. When the United States Constitution was ratified in 1788, it included what's

now known as the Intellectual Property Clause, and for centuries the ostensible driver of patent law has been to foster innovation. But what happens when inequities in patent law and standard industry practices impede that fundamental purpose?

On a recent episode of the Stanford Law School podcast, Stanford Legal, Lisa Larrimore Ouellette, the Deane F. Johnson Professor of Law, sat down with co-hosts Richard Thompson Ford, the George E. Osborne Professor of Law, and Pamela Karlan, the Kenneth and Harle Montgomery professor of public interest law, to discuss inequality in the patent system.

This was the focus of Ouellette's recent paper, "[Improving Equity in Patent Inventorship](#)," published in *Science*. Ouellette, who holds a Ph.D. in physics, is a Senior Fellow at the Stanford Institute for Economic Policy Research (SIEPR). The following is an edited excerpt of the full interview.

Ford: Can you tell us a little bit about the patent system generally? A lot of people have no direct knowledge or experience with this engine of innovation and yet it affects us all every day, doesn't it?

Interestingly, it's not even clear whether the patent system is an engine of innovation. Somewhat surprisingly to my students, there isn't actually rigorous evidence that stronger [patents](#) increase overall research investments, much less whether this benefit is large enough to outweigh the patent system's costs.

So, there are a lot of big questions around what an optimal innovation system would look like. But the U.S. has always had a patent system and

is unlikely to get rid of it. Given the current system, patents are a measure of innovation, and they definitely have clear benefits for people who are getting them, including increasing earnings, and generating reputational and professional benefits that can accumulate over a person's career.

Karlan: What does a patent actually do?

A patent gives an inventor an exclusive right over their invention for a limited time. The theory is that by having that exclusive right, you will have the ability to charge more for your invention, and that limited monopoly will give you the incentive to come up with a new design or invention in the first place.

You can patent all kinds of innovations as long as they are new, including pharmaceuticals, software innovations, AI. The pharmaceutical system is one of the areas where the patent system has had the biggest impact because it can contribute to the current high prices of pharmaceuticals—there's been a lot of policy debate over that.

Ford: Your paper focuses on a very specific issue with the patent system that involves inequity. Could you tell us a little bit about what you found?

The patent system has huge inequities by race, gender, income, and geography. Women are about 13 percent of inventors in the U.S., and at the current rate, it would take over 100 years to reach gender parity in patent inventors. Black Americans are around three times less likely than white Americans to be patent inventors. There are huge disparities by geography and income.

Surprisingly, it's very challenging to actually get good numbers on any of

these statistics because the Patent Office doesn't collect demographic information on inventors. All they collect is the inventor's name and location.

So, when the Patent Office was tasked with studying gender inequality in the patent system, they had to make estimates based on predictive name-gender dictionaries, like estimating that if an inventor is named Lisa, then probably that inventor identifies as female. Which of course gets lots of things wrong in individual cases, but is reasonably accurate if you're looking for an estimate over millions of patents.

Inequality in patents is a longstanding historical problem. There's really interesting work by legal historian Kara Swanson on racism and sexism in the early U.S. patent system, including how Black inventors and women sometimes hid their identities with false patent applicants to avoid the bias of the patent system and the marketplace.

Ford: Are fewer women and people of color inventing things or are fewer of them successfully applying for patents?

It is both. There are lower rates both of applying for patents in the first place and loss at every stage of the pipeline of innovation. In the science and engineering workforce, women and underrepresented minorities are a lower percentage of that workforce than they are of undergraduate science and engineering degrees. Also, they are a lower percentage of people getting scientific paper authorship.

I experienced this firsthand before I went to law school. I got a Ph.D. in physics, and I was often the only woman in the room. I saw my female counterparts dropping out of the Ph.D. program at a much higher rate than our male counterparts.

But the particular problem that we're focused on in this article is what we call the innovator-inventor gap. Women and underrepresented minorities, even when they are members of scientific research teams and getting authorship on papers, are still less likely to end up on the resulting patents.

There is evidence that when the same invention ends up being both patented and published in a scientific paper, which is called a patent-paper pair, the junior and female scientists who are authors on the paper are less likely to be named as inventors on the corresponding patents.

Karlan: Is that because they're junior, or because they're women, or people of color? What's the mechanism there?

That's the interesting question. In this paper, we are laying out more hypotheses than we think have been presented and marshaling the existing evidence to try to understand what role these different things could play. I think there are two potential mechanisms. One is simply bias and who gets credit for the inventions.

Once it comes time to decide who goes on the patents, then there may be unconscious bias against people who are lower on the status hierarchy in various ways, including because they're women, underrepresented minorities, or junior scientists. You're probably familiar with Rosalind Franklin, for example, not getting credit for her work on DNA, and there are many examples throughout history of women not receiving sufficient credit for similar scientific contributions.

But there's another potential explanation, which I think has gotten less attention, and that we're trying to highlight in this paper: that the standards for what it means to be a paper author are not the same as the

standards for what it means to be a patent inventor.

For a paper author, those rules are governed by scientific norms, and usually anyone who's made any kind of important contribution to the paper can end up as an author. But the rules for who gets to be a patent inventor are quite different. Patent law has long favored coming up with an idea over doing the work to implement that idea in practice. And that's reflected in the rules for patent inventorship.

The patent inventorship standard is that you need to have contributed to the idea, what [patent law](#) calls the "conception of the invention." And if you didn't contribute to conception, you can't legally be listed as an inventor. And that means that work that qualifies for authorship often doesn't qualify for inventorship.

Karlan: And what's the consequence if you're named on the paper, but you're not on the patent? How does that affect your life going forward as the person who is on one but not the other?

That's a good question, and we don't have enough evidence about that, but there are studies showing that patents have benefits in terms of raising a person's lifetime earnings and making them more valuable within a company and more likely to stay there. There also are reputational and professional benefits.

It also might affect your self-conception. If you're not being listed as an inventor on the patents, then you're less likely to think of yourself as an inventor. That could affect your likelihood to invent things going forward.

Ford: That leads us to one of the comments that you

made in your paper that if women, racial minorities, and people from low-income backgrounds invented at the same rate as high-income white men, the overall invention rate would quadruple. Could you tell us a little bit more about that?

That was a result from [Harvard economist] Raj Chetty's group that received a lot of attention a few years ago. They overcame the lack-of-demographic-information problem by matching the [patent office](#)'s data with tax records and some school district records. And they found these really striking descriptive results, like the innovation rate would quadruple if everyone was inventing at the same rate as high-income white men.

I think that's an illustration that this isn't just a problem of equity. Disparities in patenting mean that we are likely missing out on a lot of new technologies that we might have if everyone had the same opportunities to innovate.

Karlan: Do you have any hypotheses about whether it would change the types of innovations as well? Is there data to suggest that the innovations would be in different areas or be of a different kind?

There's some rigorous empirical evidence showing that all-female inventor teams are more likely to focus on issues of women's health than other teams, and there's also a lot of anecdotal evidence.

Here in Silicon Valley, you hear about tech companies that are largely staffed by young white male inventors and are often focused on problems faced by young white male people in the population. If you

have more diverse invention teams, then the kinds of problems that they're going to view as socially important can change as well.

Ford: How do you think we should tackle this challenge? On one hand, you suggested earlier that maybe the patent system isn't really driving innovation in the first place, so that might suggest that the solution would be we just stop granting as many patents. But another solution might be that we try to increase the number of patents that these underrepresented groups are getting.

It's unclear why women and underrepresented minorities are not succeeding in the patent system to the extent as other groups. And I think it's really important that the policymakers think about ways to rigorously test this. And the Patent Office—including under the current director, Kathi Vidal, who's very interested in increasing equity in the patent system—has been starting to think about this.

Obtaining a patent is not currently a user-friendly process. When you come to the patent office as a first-time inventor, what you will typically get is a confirmation that they received your invention, and then the first thing you'll get is something called a rejection, or even a final rejection, which does not sound very friendly. So if you're new to the patent system, you think, "well, they don't want me here," not recognizing that the vast majority of patent applications start with a rejection and this usually begins a process of back and forth where you eventually will end up with an issued patent.

One study suggested about half of the patent gender gap is due to women being more likely to abandon their patent applications after these

discouraging replies. The Patent Office has been thinking about ways to address this.

It now sends applicants a welcome letter rather than just a confirmation and then the rejection. They also recently did their first randomized trial within the [patent system](#) of having a new set of patent examiners whose role is to deal with applicants who aren't represented by an attorney.

They have had special training on how to deal with these pro se applicants. And they found that this experimental examiner unit completely closed the gender gap in the application success rate in the areas in which women were doing the worst and among first-time U.S. applicants. That's a small percentage of inventors—the ones who don't have an attorney—but I think that's promising that the office is willing to experiment like that.

Karlan: I wonder if you might speculate a little bit about AI. Once generative AI starts coming up with ideas for things that haven't yet been patented, but would otherwise be patentable, are those ideas patentable if the idea comes from generative AI?

The Patent Office is struggling with this right now. They had a listening session here at Stanford in the spring to hear thoughts from people in this community about whether the AI should be an inventor, how it should be credited, how the Patent Office should deal with that. Currently, the rule is that you have to be a human applicant in order to get a patent, and AI is a tool that's being used by the applicant.

About a year ago, I asked ChatGPT to write a non-obvious patent claim without giving any guidance at all. It wrote a non-laughable claim about a wireless powered technology that would have taken some time for

someone to figure out like why this actually isn't patentable.

I think this is going to be an issue that the Patent Office will need to grapple with going forward, and that it will exacerbate some of the existing problems with the patent examination system as the Patent Office gets flooded with patent claims that are easier to generate with these tools.

More information: Colleen V. Chien et al, Improving equity in patent inventorship, *Science* (2023). [DOI: 10.1126/science.adj2911](https://doi.org/10.1126/science.adj2911)

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