

**Statement of**  
**Holly Fechner**  
**Covington & Burling LLP**  
  
**Before the**  
**U.S. Patent and Trademark Office**  
**Elijah J. McCoy Midwest Regional Office**  
  
**Hearing on**  
**The Study of Underrepresented Classes Chasing Engineering and Science Success**  
**(SUCCESS) Act**  
  
**Detroit, Michigan**  
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Regional Director Porcari, District Director Logan, Mr. Toole:

Thank you for inviting me to participate in this important hearing on the SUCCESS Act. My name is Holly Fechner, and I am a partner at Covington & Burling in Washington, D.C. I'm also a proud graduate of the Adrian, Michigan public school system and the University of Michigan Law School. It was my honor to clerk for Judge John Feikens of the Eastern District of Michigan Federal Court.

I appreciate the opportunity to discuss the state of gender, race, income, and veteran diversity in our patent system, and to propose policy solutions for the United States Patent and Trademark Office (USPTO) and Small Business Administration (SBA) to consider as you prepare the SUCCESS Act report on these topics. We are indebted to the leading researchers in this field, including Dr. Lisa Cook at Michigan State University, who testified earlier, Dr. Barbara Gault and Dr. Jessica Milli at the Institute for Women's Policy Research (IWPR), and Alex Bell and his colleagues at Harvard. They have found that women, people of color, and lower-income individuals patent inventions at significantly lower rates than their male, white, and wealthier counterparts. Fewer than 20 percent of all U.S. patents today list a woman as an inventor. Among college graduates, fewer than half as many African Americans and Hispanics hold patents, compared to their white counterparts. Moreover, a child born in the United States to a family living below the median income level is ten times less likely to receive a patent in his or her lifetime than a child born to a family in the top one percent of income. We see disparities even at the very top income levels. Children born into the top one percent are 22 percent more likely to patent an invention in their lifetime than those born into the top five percent.

These disparities hold back economic growth and U.S. leadership in innovation. Achieving greater gender, race, and income diversity in inventing and patenting would unlock a

wealth of innovation, economic growth, and job creation that is now untapped, bringing new inventors, new ideas, and new technologies into the innovation pipeline.

Public policy plays a critical role in ensuring that our country creates equal opportunity for all innovators. We cannot afford to leave the full measure of our country's talent, creativity, and intelligence out of our innovation ecosystem. Closing the patent diversity gaps would bring more and better inventions to market, increasing productivity and growing the economy. And this is all on top of the lives that will be improved by the countless innovations that we simply cannot envision today. The SUCCESS Act report is an important first step in understanding these disparities, and in identifying public and private action to resolve them.

### **Importance of Patents to Economic Growth**

As the USPTO is well aware, patents are a critical driver of U.S. innovation and economic prosperity. Patent rights incentivize high risk, long horizon investments in innovation. By ensuring that inventors own their inventions, intellectual property rights provide monetary reward for resource-intensive research and development by inventors of all sizes, across all industries. Patent rights also facilitate commercialization, collaboration and follow-on innovation, especially for small inventors, by ensuring that an invention can be freely bought, sold, or licensed. This allows patents owners to reap the benefit of their invention, while transferring their invention directly to the party best positioned to commercialize it for use.

Intellectual property protections thereby unlock a vast innovation economy in the United States that, according to the USPTO, accounts for more than \$8 trillion in economic activity, or more than one-third of U.S. GDP. Research has also shown that a larger patent stock is linked to higher economic growth.

### **The Patent Gaps**

The U.S. Constitution protects patent rights by granting to Congress the power to “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.” Although for over 150 years Congress has extended patent rights to “*Whoever* invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof,” the advantages of U.S. patent ownership are not shared equally shared equally along gender, race, and income lines.

According to social science research, women inventors, inventors of color, and inventors from lower-income families patent their inventions at lower rates than male, white, and wealthier inventors. And fewer women, people of color, and people from lower-income backgrounds have access to the invention pipeline in the first place. This not only hurts these inventors and would-be inventors, it hurts our economy, and it holds back our collective technological progress by leaving a massive amount of talent on the sidelines, and a tremendous amount of economic potential untapped. As USPTO Director Andrei Iancu told the Senate Judiciary Committee this past March, “Broadening the innovation ecosphere to include women—and other underrepresented groups—is critical to inspiring novel inventions, driving economic growth, and maintaining America’s global competitiveness.”

For example, Jessica Matthews, the CEO of Uncharted Play, invented a soccer ball that can harness energy and power lamps—an invention inspired by a power outage during a family wedding in Nigeria. Today, Uncharted Play holds 15 patents for technology that can be installed in any device that “can harness kinetic energy,” such as baby strollers, floor panels, and furniture. Without broader perspectives and experiences, innovative ideas to solve significant problems might not emerge.

### *The Gender Patent Gap*

Compared to men, women are markedly less likely to become inventors and to obtain patents. Research has uniformly shown that women obtain patents at significantly lower rates than men. This is especially true for African American and Hispanic women, who, according to a study by the Institute for Women’s Policy Research, patent at less than a quarter the rate of their male counterparts. Nevertheless, the gender gap persists regardless of race and ethnicity. A study by the USPTO earlier this year found that only 20 percent of U.S. patents list a woman inventor. And, in 2016, only 12 percent of all inventors who obtained a patent were women.

These figures are certainly better than the early 1980s, when fewer than seven percent of patents named at least one woman. But they are not nearly good enough. If the trend continues, women will not be named on patents at the same rate as men until almost the end of this century.

The gender gap is largely a result of lower patent applications among women. While the IWPR study found that women are about six percent less likely than men to have their patent applications approved, men are more than six times as likely to apply for patents as women. White men are nine times more likely to apply than white women, Hispanic men are five times more likely to apply than Hispanic women, and African American men are 2.6 times more likely to apply than African American women.

### *The Race Patent Gap*

The disparity in patenting rates is even more stark among inventors of color. As I will discuss, there are significant data challenges that make it difficult to assess patenting rates by race, but existing research from the Institute for Women’s Policy Research, Dr. Lisa Cook, and others, makes clear that African Americans and Hispanic Americans hold disproportionately fewer patents than white, Asian, and Pacific Islander Americans.

From 1970 to 2006, 235 patents per million people were awarded. Six patents per million went to African Americans, compared with 40 patents per million people for women. African Americans and Hispanic Americans hold roughly half the number of patents that whites do. African Americans and Hispanic Americans also apply for patents at significantly lower levels than white men.

Though adjusting for income does narrow the gap between African Americans and whites, it does not eliminate it. Adjusting for income does not meaningfully change the gap between Hispanic Americans and whites.

## *The Income Patent Gap*

The gaps in invention and patenting also extend to parental income level. According to research by Alex Bell and his colleagues at Harvard, a person born into a family in the top one percent of income is ten times more likely to receive a patent than someone born into a family in the lower fifty percent of income. Even at the very top income levels, children born into top one percent are 22 percent more likely to patent an invention in their lifetime than those born into the top five percent.

A Pew Research Center report found that on average women make less money than men and African Americans and Hispanics make less money than whites. So at least some portion of the income gap intersects with the gender and racial gaps.

The benefits of closing the gaps are tangible—and significant. For example, a National Bureau of Economic Research study found that “eliminating the patenting shortfall of female holders of science and engineering degrees would increase GDP per capita by 2.7%.” Another study by Dr. Lisa Cook found that including more women and African Americans in the “initial stage of the process of innovation” would increase GDP somewhere between 0.64 percent and 3.3 percent per capita.

In addition to the specific GDP potential, the patent gaps are depressing new business creation, job growth, and innovation. Structural barriers that result in lower participation in patenting activities by segments of the U.S. population erect another barrier to entry in business and entrepreneurship.

For example, a report by the Center for Equitable Growth found that the rising inequality in the patent system is linked to the decline in the number of new start-ups in the U.S. economy and the decline in the number of new innovations. Noting that firms younger than five years old made up only 39 percent of all businesses in the United States just before the Great Recession, the report points to lower patenting rates among low-income individuals to underscore “just how far out of reach entrepreneurial success is for the vast majority of children born into low-income families in the U.S.”

### **Drivers of Diversity Gaps**

Researchers have identified numerous factors that contribute to these patent gaps, including lack of exposure to inventors in their family or neighborhood; lack of exposure to science, technology, engineering, and mathematics (STEM) education; a lack of formal and informal mentoring and support networks, systemic discrimination and bias; and the expense and complexity of the patent system.

At the outset, it is important to recognize that we know what does *not* drive diversity gaps. It is clear that gaps have nothing to do with innate ability. For example, the Bell study found that as young children, girls and boys score equally well on math tests, and that differences only emerge as children progress through school, tracking, in part, with differences in family income. Moreover, controlling for various factors like the type of technology, women were cited at least as much as men when they actually were able to receive patents. It is between these two bookends that diversity gaps begin to grow.

Nor does the gap come from differing levels of inherent interest. Research shows that women, for instance, are no less interested in commercial science than men.

Exposure to invention and inventors has effects that are hard to understate. Most obviously, according to the Bell study, those with inventor parents, or parents in high-innovation fields, are substantially more likely to hold patents later on. Indeed, Bell found that simply growing up in an area with a high-number inventors makes a child more likely to grow up to be an inventor.

Exposure effects help explain why Midwestern regions around cities like Detroit, Minneapolis, and Madison have among the highest patenting rates in the country. These areas have high rates of innovation already, and children who grow up there are more likely to become inventors themselves.

Early participation in STEM education plays a role in feeding the patent pipeline. For example, according to the IWPR study, women make up only a quarter of the STEM workforce. And underrepresentation of women in STEM fields is only part of the story. Even among women STEM degree holders, women patent at significantly lower rates than their male counterparts.

Gender disparities in patenting are not evenly dispersed across fields. Women have made greater progress in certain fields. For example, the IWPR study found that between 40 and 50 percent of patents in chemistry and biology-related fields are held by at least one women inventor. In other fields, including telecommunications, and certain computing devices, less than 40 percent of patents listed at least one woman inventor.

Relatedly, research shows that these gaps are driven in part by a lack of social networks and mentoring. Informal social networks contribute to professional development and lead to innovation. Because women are underrepresented in many patent-heavy fields, women may be less able than their male counterparts to tap into networks in industry or academia. The same applies to people of color and those from lower-income families. Social networks are particularly important in patenting because invention is a collaborative enterprise and the patent system is hard to navigate.

## **Public and Private Policy Solutions**

Public policy plays a role in ensuring that our country creates equal opportunity for all innovators. We cannot afford to leave the full measure of our country's talent, creativity, and intelligence out of our innovation ecosystem. Closing the patent diversity gaps would bring more and better inventions to market, increasing productivity and growing the economy. And this is all on top of the lives that will be improved by the countless innovations that we simply cannot envision today.

A key step in closing the gaps is diagnosis. While the research I have discussed today is an important step, it is critical that the government, led by the USPTO and SBA, the agencies most connected to individual inventors and small businesses, assess the patent gaps and begin to think critically about how we as a nation can best support innovators and entrepreneurs. The passage of the SUCCESS Act, these hearings, and the upcoming report are important advances.

The USPTO's recent report on women inventors is another significant contribution to the research in this area. The House and Senate Judiciary Committees also held bipartisan hearings on increasing diversity in the patent system earlier this year.

Who becomes a U.S. patent-holding inventor is extraordinarily difficult for researchers to study now. The USPTO does not currently collect any demographic data on patent applicants. Researchers have to rely on sophisticated "name-matching" software to estimate whether a U.S. inventor is male or female. It is therefore critical that the USPTO collect this data, both to fully evaluate the scope of the patent gaps—including studying other metrics, like education level—and to properly track the progress toward greater diversity among inventors. As in other federal programs, this information would be separated from the patent application itself to ensure that consideration of the application is free from bias.

More broadly, we need to expand opportunities to expose young Americans from all demographic groups to inventors and entrepreneurs. Michigan is an important case-in-point. According to the USPTO study, the state ranks near the very bottom of states when it comes to women patent holders. At the same time, the Bell study shows that Detroit is among the top five areas in the United States where children are most likely to grow up to be inventors.

Midwestern regions around cities like Detroit, Minneapolis, and Madison have among the highest patenting rates in the country. Detroit and its environs are fertile ground for closing the diversity gaps in patenting. As a high-innovation area with significant room for diversity growth, policies and programs that expose children to innovation, support STEM education, promote patenting among university and industry inventors, and teach women and people of color about the importance of patents to the commercialization process would accelerate the reduction of race, gender, and income disparities in patenting.

A number of public, private, and university programs offer models for promoting the patenting and commercialization of inventions among underrepresented communities. For example, Qualcomm, Inc. partners with the Detroit Public Schools and the University of Michigan to offer its Thinkabit Lab in downtown Detroit. Thinkabit is an initiative that engages elementary and middle school students with cutting edge technologies through a hands-on approach. Students participating in the Thinkabit program learn about 5G wireless, the Internet of Things (IoT), and careers in technology, and then program a simple circuit board to act as the core of their own IoT invention. Over the past three years, Qualcomm has created Thinkabit Labs in libraries, school districts, and university hubs in underserved parts of the country, leveraging these organizations expertise to promote STEM education. In addition to Detroit, Qualcomm has entered into public/private partnerships to create "hub" Labs with Virginia Tech in the National Capitol Region, with the Chula Vista Public Library in California, and with the Porterville Unified School District in the rural, agricultural central valley of California.

While the Thinkabit initiative focuses on early childhood STEM education, other models focus on engineering students and faculty at more senior levels. The Accelerating Women And under-Represented Entrepreneurs (AWARE) program at the University of Illinois Urbana-Champaign, for example, hosts seminars and networking events at the University to connect graduate student and faculty inventors with mentors and investors. The program also employs an Entrepreneur in Residence (EIR) who works one-on-one with participants to guide them through

the patenting and commercialization process. The AWARE program also provides small proof of concept or seed grants to participants to start the innovation process.

Likewise, the Empowering Women In Technology Startups (EWITS®) at the University of Florida offers a 10-week hands-on experiential learning program focused on helping professional women understand the process of commercializing an invention. The women in the program are split into teams and asked to develop a business model for a real technology (not their own) and develop the elements of a company to commercialize the innovation.

Another initiative, STEM to Market, is a two-part program run by the Association for Women in Science with cohorts based in Washington, D.C.; Chicago, Illinois; and the San Francisco Bay Area. STEM to Market provides entrepreneurial training and support to women working in science, technology, engineering, and math fields, and works with key decision makers, investors, and funders to increase innovation and entrepreneurship among diverse groups of women through systems change

The federal government also offers programs that can help engage underrepresented communities in innovation and commercialization. For example, the U.S. Department of Energy's (DOE) Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) Phase 0 Assistance Program strives to increase diversity in DOE SBIR/STTR programs by helping women- and minority-owned small businesses field competitive applications for DOE SBIR/STTR Phase I awards. The program works one-on-one with participants, helping them develop their applications and connecting them with business mentors and industry experts who provide assistance on a range of topics. The Phase 0 Assistance Program includes an Intellectual Property Consultation, which helps connect applicants with registered patent attorneys to help navigate the patenting process.

In addition to dedicated programs that reduce barriers to patenting, U.S. businesses should take steps to build pro-patent and pro-diversity initiatives into their culture. This includes efforts to recruit a more diverse pool of scientists and engineers, to educate employees about the importance of patenting and how to seek patent protections for their work, and to support formal and informal networks for women inventors, inventors of color, and other affinity groups to promote invention. For example, in her testimony before the House Judiciary Committee this past March, Qualcomm Senior Vice President Susie Armstrong explained that her company has modified its recruitment process to ensure that diverse engineers participate in on-campus recruiting. Qualcomm also has a formal program to train engineers on the patenting process, and offers special recognition to engineers and other employees who hold patents. The company also trains all senior management about the value of diversity and inclusion, and supporting the development of employee-led networks to promote professional development and collaboration among different employee groups.

Congress and the USPTO can also directly reduce some disparities in patenting. For example, Congress and the USPTO can unilaterally lower the high costs associated with patenting that create barriers to entry. High fees associated with filing and defending a patent also pose a substantial barrier to patenting. Attorney fees alone for filing a patent application can cost \$5,000 to \$16,000, excluding other associated costs. Programs like the USPTO Pro Bono Assistance Program and Pro Se Assistance Program can help to mitigate the high costs of

patenting an invention, but they could be expanded to help small businesses and others for whom attorneys' fees are a major barrier to entry.

Efforts to promote equality in innovation must ensure that nondiscrimination laws in education and employment are fully enforced. It is also essential to promote paid family and medical leave and work-life balance to ensure that everyone can contribute to the innovation economy while participating fully in both their personal and professional lives.

Greater inclusion in the innovation ecosystem means more perspectives and more ideas in the innovation pipeline. Without broader perspectives and experiences, innovative ideas to solve significant problems might not emerge. Equal opportunity to invent, patent, and commercialize innovative ideas will drive the U.S. innovation economy ever forward, creating countless new products and cures that will create jobs, stimulate economic growth, and improve the quality of life for millions of people.

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