

# INCREASING INVENTOR DIVERSITY: U.S. PUBLIC POLICY RECOMMENDATIONS

Holly Fechner, Morgan Schreurs, and Eric Chung

Invent Together, Washington, DC, USA

Research has found that women, people of color, and individuals with lower incomes patent inventions at significantly lower rates than their representation in the population. Less than 13 percent of all inventors listed on U.S. patents are women, Black individuals are three times less likely to become inventors than white individuals, and children in families in the top one percent of income are 10 times more likely to patent in their lifetimes than children in the entire bottom half of family income. Research has also found that increasing participation in invention and patenting by under-represented groups would increase annual U.S. gross domestic product by up to \$1 trillion, quadruple the number of American inventors, and result in new and different inventions.

Public policy can promote equity, inclusion, and diversity in inventing and patenting. In a 2018 article in this journal, we discussed the existing research on disparities in invention and patenting and the role of the U.S. government, educational institutions, and private industry in ensuring women, people of color, and individuals with lower incomes can participate fully in the innovation economy. This article updates and expands on that article by providing specific public policy recommendations to increase equity, inclusion, and diversity in invention and patenting. These recommendations include improving data collection and research to measure and advance equity in patenting; supporting historically under-represented inventors by providing education, legal, and technical assistance and promoting workplace equity; and spotlighting historically under-represented inventors and promoting diversity among patent counsel and patent examiners.

**Key words:** Technology; Innovation; Inventors; Invention; Patents; Patenting; Diversity; Equity; Inclusion; Public policy; Congress

## INTRODUCTION

Envision a country with four times as many inventors as we have now. Imagine millions of new and different inventions that we cannot conceive of today. That is the opportunity before American policymakers, educators, and industry leaders.

American inventors developed the lightbulb, the airplane, the MRI, the mobile phone, and millions of other inventions that save lives, connect people, create jobs, and improve quality of life today and for generations to come. While the genius of the American inventor — supported by constitutionally

guaranteed patent rights (1) — allowed the United States to advance from its agrarian infancy to a global technology superpower, many more Americans have yet to share fully in the opportunity to invent and patent.

The U.S. Patent & Trademark Office (USPTO) and leading researchers have found that women, people of color, and individuals with lower incomes patent inventions at significantly lower rates than their representation in the population.

- **The gender gap:** Less than 13 percent of all inventors listed on U.S. patents are women (2).

Accepted: January 1, 2022.

Address correspondence to Holly Fechner, Invent Together, c/o Covington & Burling LLP, One CityCenter, 850 Tenth Street, NW, Washington, DC 20001-4956, USA, Tel +1-202-662-5475. Email: [hfechner@cov.com](mailto:hfechner@cov.com)

Men-owned businesses are twice as likely as women-owned businesses to hold a patent (3). Women hold only 5.5 percent of commercialized patents (4).

- **The race gap:** Black individuals are three times less likely to become inventors than white individuals (5). Black and Hispanic male college graduates apply for and obtain patents at half the rate of white male college graduates (6).
- **The income gap:** Children in the top one percent of family income are 10 times more likely to patent in their lifetimes than children in the entire bottom half of family income (5).

Research has also found that the United States dramatically trails China and South Korea in the percentage of women inventors (7).

Greater diversity in invention and patenting would create significant opportunities for individuals and families. Inventors tend to earn higher wages than the general population, with the majority of inventors (63 percent) in the top 10 percent of all earners (8). Patents also help businesses — especially small businesses and startups owned by women and people of color — access capital, attract customers and licensees, and create jobs. Startups that obtain a patent employ an average of 16 more new employees after five years compared to startups that do not obtain a patent (9). Women-owned businesses with patents pending have average revenues more than 16 times higher than women-owned businesses without any intellectual property (IP) (3).

Diversity in IP is also crucial to the strength of the U.S. economy. The USPTO has estimated that IP-intensive industries account for more than 40 percent of U.S. economic activity and support 63 million jobs — 44 percent of the U.S. workforce (10). Increasing participation in invention and patenting by under-represented groups would increase annual U.S. gross domestic product (GDP) by up to \$1 trillion, quadruple the number of American inventors, and result in new and different inventions (5,11).

This future is achievable through public policy change and private sector action. In a 2018 article in this journal, we discussed the early research on disparities in invention and patenting and the role of the U.S. government, educational institutions, and industry in ensuring women, people of color, and

individuals with lower incomes can participate fully in the innovation economy. This article updates and expands on that article by providing specific public policy recommendations to increase equity, diversity, and inclusion in invention and patenting.

Our recommendations are informed by research on the barriers to participation in inventing and patenting, analysis of government programs and proposed legislation, engagement with policymakers and other stakeholders, and our experience as public policy practitioners. We have organized our recommendations in three sections:

- **Measuring What Matters:** Using Data to Measure and Advance Equity in Patenting
- **Growing the Pie:** Providing Support to Historically Under-represented Inventors To Broaden Participation in Patenting
- **Representation:** Celebrating Historically Under-represented Inventors and Promoting Diversity Among Patent “Gatekeepers”

These recommendations are animated by a goal not only to broaden but also to sustain the participation of more inventors of all backgrounds in patenting. The first set of policy recommendations focuses on data collection to establish a baseline of the existing diversity gaps and to measure progress. The second set centers on government efforts to promote specific types of education, including invention, STEM, and patent education; provide inventors with legal and technical assistance; and ensure workplace equity to foster greater participation in inventing and patenting. The third set discusses the importance of increasing visibility of historically under-represented inventors and promoting diversity among patent counsel and examiners. The policy recommendations in this article are a starting point to empower inventors to participate in the American innovation economy.

The recommendations in this article are also intended to complement ongoing public policy initiatives, including the development and implementation of a national strategy by the federal government and the efforts of educational institutions and the private sector to address the inventor diversity gaps. This article is focused on public policy interventions, but progress will require action by all stakeholders, including companies and educational institutions.

## COMMON BARRIERS TO PARTICIPATION

As discussed throughout this article, women, people of color, and other under-represented groups face numerous barriers to equitable participation in inventing and patenting. These barriers include a lack of exposure to inventing; insufficient access to education, mentorship opportunities, and capital; and entrenched bias and discrimination. Overcoming these challenges will require a cultural shift and commitment by all stakeholders. This article addresses ways that public policy changes can contribute to lowering each barrier to participation.

### *Exposure to Innovation*

Lack of exposure to inventors inhibits invention and patenting. According to a study by Harvard researchers, “Children who grow up in areas with more inventors — and are thereby more exposed to innovation while growing up — are much more likely to become inventors themselves” (5). Indeed, children whose parents are inventors are nine times more likely to become inventors, and “children who grow up in a neighborhood or family with a high innovation rate in a specific technology class are more likely to patent in exactly the same class” (5).

### *Access to Education*

Access to high-quality STEM, invention, and patent education is crucial to help people develop the knowledge necessary to become inventors. STEM education helps students develop technical skills, and invention education helps students develop problem-identification and problem-solving skills as well as an invention mindset (12). Patent education helps inventors learn how to protect and commercialize their ideas.

### *Social Networks and Mentorship*

Social networks and mentorship play significant roles in encouraging patenting. Social networks are key to helping inventors “evaluat[e] whether it would be worthwhile to pursue a patent” in the first place since an inventor is likely to seek advice from his or her peers (6). Moreover, the relative “exclusion from STEM fields” of women, people of color, and other under-represented groups has led to limited

mentorship opportunities and less extensive networks (6). Because mentors tend to seek mentees who share similar backgrounds (and vice versa), and because there are fewer women and people of color in positions to act as mentors for inventors, it is harder for individuals from historically under-represented groups to find inventors to mentor them (6).

### *Access to Capital*

According to estimates, female founders receive only one percent of all venture capital funding, and Black founders receive less than two percent (13,14). This massive funding gap penalizes women inventors and inventors of color, who are less likely to receive venture backing for their ideas than their white, male counterparts. Funding helps inventors not only research and develop their ideas but eventually bring them to market. Patents are also important assets for attracting investment capital in potential businesses (6). This creates a catch-22: Disparities in patent rates lead to disparities in investment rates, and vice versa.

### *Harassment, Discrimination, and Other Cultural Issues*

Harassment and discrimination against women, people of color, and other under-represented groups in the workplace, cultural inertia in academia and industry, and unconscious bias from gender and racial stereotypes all contribute to the inventor diversity gaps (15,16).

## PUBLIC POLICY RECOMMENDATIONS

Inventors and entrepreneurs have always powered our country’s technological progress. Indeed, the role of inventors in advancing American innovation was so top of mind that the framers of the U.S. Constitution granted Congress the power “to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries” (1). Congress has done just that over the last two centuries through the establishment and reform of the patent system as well as numerous federal programs that provide support to inventors. In fact, one of the first laws passed by Congress was the Patent Act of 1790. The text of the Patent Act did not exclude anyone from patenting. In practice, however,

legal, cultural, and other barriers have long inhibited the full participation of people of color, women, and other under-represented groups.

Public policy has always played a role in supporting American inventors — from our founding documents to recent legislation. Guided by this history and opportunity for improvement, this article’s policy recommendations address barriers to full participation by (i) gathering more data to advance our understanding of the inventor diversity gaps; (ii) providing meaningful support to inventors and potential inventors to broaden participation in inventing and patenting; and (iii) increasing visibility of and promoting diversity among inventors, patent counsel, and patent examiners to inspire and enable participation in the patent system.

### **Measuring What Matters: Using Data to Measure and Advance Equity in Patenting**

We must first understand the full extent of the inventor diversity gaps to be able to close them. For nearly 150 years, stakeholders have called on the USPTO to gather and publish data on the diversity of American inventors. Yet the USPTO still does not collect inventors’ demographic data. The USPTO and researchers have relied on name-matching software and other imperfect techniques to study gender, race, and income disparities in patenting. And we do not have data — however imperfect — on differences in patenting by other demographics, including sexual orientation, disability, veteran status, and family status. As President Biden said in his racial equity executive order, a lack of demographic data “impedes efforts to measure and advance equity” (17). Gathering information on the demographic characteristics of inventors is a crucial and necessary step toward closing diversity gaps in invention and patenting, strengthening our economy, and building a more diverse and inclusive innovation ecosystem complete with new inventors, new ideas, and new technologies.

#### *Historical Efforts To Gather Demographic Data on Inventors*

In the late 19th and early 20th centuries, advocates lobbied the USPTO to compile lists of women and Black inventors in an effort to combat bias and

discrimination, provide inspiration for future generations of women and Black inventors, and demonstrate these groups’ contributions to society. These early efforts to measure patenting activity by women and Black inventors relied on manual name matching and surveys of patent attorneys and agents. These flawed research methods are antecedents of the methods still used today.

In the late 19th century, activist Charlotte Smith led the campaign for compiling an official comprehensive list of women patent holders (18). Smith lobbied four successive patent commissioners — visiting one of them 17 times — but the commissioners claimed that they could not compile the list of women inventors because of a shortage of funds and clerical time (18). Undeterred, Smith testified before Congress and secured a \$300 appropriation (18). According to historian Eric S. Hintz, “Four clerks spent about ten days compiling what sounded like women’s names from the cumulative list of half a million patents” (18). In 1888 — nearly a decade after Smith’s campaign began — the Patent Office published an official chronological list of 2,297 patents by women (18). The list included the patent number, title, and issue date plus the inventor’s name and address (18). Two subsequent editions were published in 1892 and 1895 (18). Scholars have since identified significant errors and omissions in the list of women patentees — as much as one missing invention for every four recorded (18,19). Although some errors and omissions are expected with name matching, scholars have suggested that male clerks “reflected and reinforced” the stereotype that women only invented domestic technologies, leaving out women’s patents in military and industrial technologies as they compiled the list (19).

After Reconstruction, George Washington Murray, a Black inventor and congressman who was born into slavery, and Henry E. Baker, a Black patent examiner, led efforts to compile a comprehensive list of Black patent holders (18). Although the Patent Office resisted early calls for this list, noting that patent applications do not contain information on the race of inventors, it eventually acquiesced to the demands of elected officials who wanted this list for major fairs and expositions (18). According to Hintz:

Patent Commissioner Charles Duell directed Baker to compile the first comprehensive list of Black patentees in preparation for W. E. B. Du Bois's planned 'Negro Exhibit' at the 1900 Paris Exposition. Baker mailed a questionnaire to thousands of registered patent agents and attorneys seeking information about 'colored inventors.' Some racist respondents believed Baker's inquiry was a joke. However, Baker identified 370 patents by Black inventors. (18)

He subsequently published this list (18). Baker expanded his search in 1913 to mark the fiftieth anniversary of the Emancipation Proclamation (18). Baker's second list — The Colored Inventor — included nearly 800 patents (18).

#### *Contemporary Efforts To Gather Demographic Data on Inventors*

Unfortunately, a century later, we still lack robust data collection. Because the USPTO does not collect demographic data on inventors, USPTO and researchers rely on name-matching software and other imperfect techniques to study disparities in patenting. Recognizing that this data problem can be fixed, advocates have lobbied Congress to pass legislation to study and address it.

In 2018, Congress passed the Study of Underrepresented Classes Chasing Engineering and Science Success (SUCCESS) Act, which directed the USPTO, in consultation with the Small Business Administration (SBA), to identify publicly available data on the number of patents owned by women, minorities, and veterans; analyze the benefits of increasing the number of patents applied for and owned by women, minorities, and veterans; and make legislative recommendations on how to encourage and increase the participation of members of these groups as inventors and entrepreneurs (20). The USPTO's SUCCESS Act report ultimately reached an important, albeit expected, conclusion: "[T]here is a limited amount of publicly available data regarding the participation rates of women, minorities, and veterans in the patent system" (20). As a result, the USPTO recommended that Congress "enhance" the agency's authority to collect demographic information (20).

Stakeholders have proposed various voluntary data collection mechanisms for inventors' demographic data, all of which would help the USPTO and the public measure the inventor diversity gaps and monitor progress toward patent equity. The Inventor Diversity for Economic Advancement (IDEA) Act is a bipartisan, bicameral bill that would direct the USPTO to collect inventors' demographic data on a voluntary basis and make this information available in the aggregate for research (21,22). The bill states that the USPTO shall collect information on gender, race, military or veteran status, and any other demographic category deemed appropriate by the USPTO Director (21,22). The bill would require the USPTO to keep this information separate from patent applications to mitigate implicit bias in the patent examination process (21,22). Leading researchers in the field support the IDEA Act. In addition, the USPTO, in its SUCCESS Act report, recommended that the agency conduct a voluntary and confidential biennial survey of individuals named in patent applications to gather demographic data (20). Separate from the IDEA Act's data collection at the time of application, conducting a survey would allow the USPTO to gain additional insight into the characteristics of inventors who have applied for U.S. patents.

The USPTO also recommended enhancing federal agency data sharing and cooperation (20), which would be an important step forward. To that end, the White House Office of Management and Budget should designate the USPTO as a data-sharing agency under the Confidential Information Protection and Statistical Efficiency Act to allow the USPTO to share inventor demographic data with other federal agencies, provide access to critically needed information on the inventor-patentee population, and support cross-agency efforts to create linkages between disparate datasets. As President Biden acknowledged in his racial equity executive order, interagency information sharing is an important part of measuring and advancing equity (17).

The federal government should also conduct new research on the inventor diversity gaps to expand our understanding of the benefits of diversity in invention and patenting. For example, the White House Council for Economic Advisors (CEA) should study and report on the inventor diversity gaps among

women, people of color, and other under-represented groups and quantify the positive impact that greater participation in invention and patenting would have on individual income, wage gaps, national GDP, and U.S. technological leadership. This would complement the CEA's ongoing efforts to understand the impact of public policies on disadvantaged groups in our economy (23). The Federal Reserve should study the positive impact that expanding invention and patenting by people of color would have on existing racial economic gaps and U.S. economic growth and recovery in the wake of the pandemic. President Biden committed that his Administration would strengthen the Federal Reserve's focus on such racial economic gaps (23,24).

### **Growing the Pie: Providing Support to Historically Under-represented Inventors To Broaden Participation in Patenting**

Although gathering more information on the inventor diversity gaps is a crucial step toward closing them, there are actions Congress and the Administration can take now to support historically under-represented inventors and broaden participation in patenting. The beauty of the innovation economy is that there is no limit on how many people can invent or how many people can patent. We all benefit from new ideas, new technologies, and new contributions to the innovation economy. Moreover, invention begets further invention, as ideas can build and improve on each other over time. Historically under-represented inventors face a number of challenges that can be overcome with government support, including in the areas of education, legal assistance, outreach and technical assistance, and workplace equity.

#### *Invention and STEM Education*

Access to high-quality invention education can help people develop the skills and mindsets necessary to become inventors. Invention education "is a term that refers to deliberate efforts to teach people how to approach problem finding and problem solving in ways that reflect the processes and practices employed by accomplished inventors" (12). Invention education can also help children uninterested in STEM disciplines appreciate the value of STEM skills (25).

Access to STEM education is also important for developing technical skills and interest in patent-intensive fields. Studies show that early STEM education is instrumental in providing the critical-thinking skills and foundation for a successful career in STEM, and children who are not exposed to STEM before middle school are consequently less likely to pursue STEM careers (26.)

Yet many students lack access to sustained STEM and invention education because federal education standards, "[s]chool finance mechanisms, K-12 accountability standards, and college entrance requirements reinforce the siloed, linear approach to teaching and learning found in today's schools" and make it difficult to implement robust STEM and invention education (12). STEM and invention education programs are often designed as partnerships between schools and companies, higher education institutions, and other entities. Often, instruction occurs in makerspaces, industry locations, clinical settings, and libraries. Although these individual programs are an important component of the STEM and invention education ecosystem, their reach is far smaller than the public school system.

Congress has taken steps to support these efforts. The Every Student Succeeds Act of 2015 — the latest reauthorization of the Elementary and Secondary Education Act of 1965 — requires schools to use certain federal funds to "implement programs and activities that support access to a well-rounded education," including "programming and activities to improve instruction and student engagement in science, technology, engineering, and mathematics, including computer science" (27). Examples of such programming and activities include "supporting the participation of low-income students in nonprofit competitions related to STEM subjects (such as robotics, science research, invention, mathematics, computer science, and technology competitions)" (27). The Chips and Science Act, which Congress enacted and President Biden signed into law in August 2022, authorizes the National Science Foundation (NSF) to administer grants to support informal STEM opportunities at PreK-12 and higher education institutions, including research on "the use of a variety of engagement methods, including cooperative and hands-on learning" (28). Leading

up to the enactment of the legislation, each individual chamber of Congress also considered and passed bills that would have directed the NSF to establish a “Hands-on STEM Learning Program” to provide grants to eligible nonprofit programs for supporting hands-on learning opportunities in STEM education, including via afterschool activities and innovative learning opportunities such as robotics competitions (29,30). The Senate bill recognized that hands-on and experiential learning opportunities “are critical for student success in STEM subjects and careers, stimulating students’ interest, increasing confidence, and creating motivation to pursue a related career” and “can be particularly successful in inspiring interest in students who traditionally have been underrepresented in STEM fields, including girls, students of color, and students from disadvantaged backgrounds” (29). In December 2022, Congress appropriated \$125 million through September 2024 for the NSF out of \$1.95 billion authorized in Chips and Science for STEM education programs (28,31).

Congress and the Administration should build on these efforts to support STEM and invention education by (i) recognizing model curricula and programs for schools and community organizations to adopt; (ii) funding public and private programs that deliver STEM and invention education; and (iii) conducting national studies on the efficacy of STEM and invention education programs. As one example, South Korea has demonstrated that these efforts are possible at the national level by including invention education in their standard curricula (32).

### *Patent Education*

Even when individuals have the skills and mindsets necessary to invent, a lack of familiarity with patenting can keep inventors from securing patents. Several studies by the Institute for Women’s Policy Research (IWPR) have found that inventors are unlikely to receive any formal education on patenting (15,33). In one study, none of the 21 inventors interviewed by IWPR had received such training as part of their high school, undergraduate, or graduate education (15). Without formal education, patenting can be intimidating, even for sophisticated professionals at large companies and university researchers who have the support of technology transfer offices.

But it can be especially challenging for independent inventors, women, and people of color, whose access to guidance from mentors or others might be more limited. Training that helps inventors learn what inventions merit patent protection and how to navigate the patenting process would help demystify patenting and make it more accessible.

Federal agencies that support inventors and entrepreneurs should coordinate with the USPTO to provide patent education. For example, the Administration should ensure that the SBA and the USPTO fully implement a law that requires the agencies to work together to provide patent education. The Small Business Innovation Protection Act of 2017 (SBIPA) required the SBA to develop a partnership agreement with the USPTO and to work with the USPTO to provide training on IP protection through Small Business Development Centers (SBDCs) by April 2019 (34). A 2020 Government Accountability Office (GAO) report found that the SBA and the USPTO had not fully implemented the SBIPA’s requirements (35). The GAO found that the SBA missed the April 2019 deadline to develop the partnership agreement with the USPTO and that SBA and USPTO coordination at the local level is inconsistent (35). Only two of 12 interviewed SBDCs reported working primarily with the USPTO to help small businesses protect their IP, and three SBDCs reported that they did not interact with the USPTO at all (35). In August 2022, the two agencies signed a three-year partnership agreement to enhance coordination and provide IP education (35). The Administration should ensure that the SBA and the USPTO fully implement the SBIPA’s requirements and fulfill the agencies’ agreement so that all small business owners have access to the information and support they need to patent.

Similarly, the Administration should ensure that the USPTO works with programs specifically designed to support women entrepreneurs and entrepreneurs of color. For example, the SBA supports a national network of Women’s Business Centers (WBCs) that provide women entrepreneurs with business training and other services, and the Minority Development Agency (MBDA) supports a national network of business centers that provide business owners of color with strategic business advice and

other services. The USPTO should work with WBCs and MBDA Business Centers to train women and inventors of color at the local level on IP protection.

In addition, the SBA should incorporate information on IP protection in its online resources for small businesses, such as the SBA Learning Center, SBA Business Guide, and SBA Emerging Leaders curriculum. By ensuring patent education is widely available online, the Administration can ensure that small business owners from all communities have access to the information and support they need to pursue patents.

Congress should also support under-resourced technology transfer offices in the offices' mission to help university-based researchers patent and commercialize their inventions and teach the importance of doing so. The Chips and Science Act takes important steps in the right direction. The Act establishes a "Planning and Capacity Building Awards" program, which requires the NSF to make awards to higher education institutions, nonprofits, and partnerships between these entities and industry leaders, among other groups, to "advance the development, adoption, and commercialization of technologies" (28). The \$3.1 billion authorized over five years can be used for identifying academic research with the potential for technology transfer and commercialization; providing training and support to inventors in these areas; and offsetting the costs of patenting and licensing, among other purposes (28). Stakeholders, including AUTM, have applauded these provisions and advocated for additional proposals, including Focused Action Supporting Technology and Economic Response, which would allocate \$840 million in federal funds over two years across 948 institutions, including \$1 million for each Historically Black College and University (HBCU) and Minority Serving Institution (MSI), to ensure that under-represented institutions that do not have a well-resourced technology transfer office — if they have one at all — receive federal funds to help level the playing field (36). In December 2022, Congress appropriated \$210 million through September 2024 to the NSF for research and related activities that could be used toward the Planning and Capacity Building Awards program (31). Congress should appropriate the full \$3.1 billion authorized for the program and continue

to pass legislation to support technology transfer.

#### *Legal Assistance*

The patenting process is not only complex but also expensive. The cost of preparing and filing a utility patent application for even a relatively simple invention can be as much as \$10,000 (37). This cost only continues to grow as an invention increases in complexity, reaching up to \$25,000 or more for certain biotechnology or software inventions (37). Further, in order to keep a patent enforceable throughout its full life, a patent owner must pay maintenance fees that can add up to more than \$13,000 (38). Enforcing a patent against an infringer is even more expensive — a patent owner can expect to pay at least \$700,000 to take even a small patent lawsuit through trial, with that number ballooning to \$8 million or more for cases with more at stake or with more complicated technology (39). When a patent owner tries to enforce their patent, the accused infringer often challenges the patent's validity at the USPTO's Patent Trial and Appeal Board, requiring the patent owner to defend their patent, which costs more than \$500,000 in the majority of cases (39).

Research has shown that patent costs can be disproportionately prohibitive to women and people of color due to lower earnings (33). Women and people of color also have less access to capital when they start businesses (13,14). This makes it difficult for them to afford the costs associated with filing a patent application, especially the expense of hiring a patent attorney. To help defray the costs of patenting for under-resourced inventors and small businesses, Congress and the Administration should strengthen and expand successful legal assistance programs like the Patent Pro Bono Program and the Law School Clinic Certification Program.

The Patent Pro Bono Program is a nationwide network of independently operated regional programs that match volunteer patent professionals with financially under-resourced inventors and small businesses to provide pro bono legal assistance in preparing and filing a patent application (40). The Leahy-Smith America Invents Act (AIA) established the program in 2011, directing the USPTO to "work with and support intellectual property law associations across the country in the establishment of pro bono programs



designed to assist financially under-resourced independent inventors and small businesses” (41). There are 22 regional programs (40). Regional programs currently set their own eligibility requirements, and most regions have set income eligibility at 300 percent of the federal poverty line (40). Regional programs are funded by a mix of USPTO support and private donations. Since 2011, the regional programs have matched more than 3,400 under-resourced inventors and small businesses with a volunteer attorney and helped them file more than 1,800 patent applications (42). Volunteer attorneys have donated more than 84,000 hours of legal services (42).

In honor of the 10th anniversary of the AIA, Senators Pat Leahy (D-VT) and Thom Tillis (R-NC) introduced the Unleashing American Innovators Act — a bipartisan bill directing the USPTO to study and improve the Patent Pro Bono Program and expanding eligibility for the program to individuals with gross household incomes below 400 percent of the federal poverty line (43). In August 2022, Representatives Deborah Ross (D-NC) and Nancy Mace (R-SC) introduced companion legislation in the House (44), and in December 2022, a modified version of the bill became law (31). This new law will help more under-resourced inventors access the no-cost legal assistance they need to navigate the complex patent system and afford to patent their inventions.

The USPTO’s Law School Clinic Certification Program allows students at more than 60 participating law schools to provide pro bono assistance to financially under-resourced inventors and small businesses seeking patent advice under the supervision of clinical faculty (45). The program began as a pilot in 2008 and has expanded several times since then (46). Between 2009 and 2016, more than 500 patent applications were filed as part of the program (46). Continuing to expand the Law School Clinic Certification Program will create more opportunities for under-resourced inventors to get the legal help they need to file successful patent applications.

#### *Outreach and Technical Assistance*

The USPTO and other federal agencies that support innovators should improve outreach to groups under-represented in invention and patenting. Approximately 240 million Americans live in states

without any USPTO offices. Although the USPTO has a robust public website with inventor resources, historically under-represented inventors are less likely to have mentorship and networks to guide them and might not know why they should pursue patents for their ideas and how they can get help to do so. The USPTO can help address this problem by meeting historically under-represented inventors where they are. For example, the bipartisan, bicameral Unleashing American Innovators Act discussed above also enhances the USPTO’s community outreach efforts, including by creating new USPTO community outreach offices to educate the public about patenting, the benefits of innovation and entrepreneurship, and the resources available to them. The USPTO should also hold more events at HBCUs and other MSIs to spread awareness about the value of invention and patenting and how to access the agency’s services. For the same reason, the USPTO should also use social media and other web-based tools to better reach potential inventors.

Likewise, federal agencies involved in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs should do more to support historically under-represented innovators and thereby achieve the programs’ stated goal of “foster[ing] and encourag[ing] participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons.” A National Women’s Business Council study on the SBIR/STTR programs found that less than 15 percent of SBIR/STTR applicants from 2013 to 2018 and less than 14 percent of SBIR/STTR awardees from 2011 to 2018 were women-owned small businesses (47).

To advance the SBIR/STTR program goals and ensure innovation funding is allocated equitably, Congress and the Administration should ensure that the SBA and all SBIR/STTR participating agencies expand outreach to under-represented groups, provide greater pre-application assistance to first-time and under-represented applicants, and engineer bias out of the application process. As a starting point, the SBA and SBIR/STTR participating agencies should develop outreach and education programs focused on expanding the participation of under-represented populations. Building on outreach efforts like the SBIR Road Tour and Regional SBIR Weeks, these

programs should include a regular “road tour” of SBIR/STTR program managers to HBCUs and other MSIs as well as nonprofit organizations that serve under-represented entrepreneurs. Congress should also authorize “Phase 0” application assistance — similar to the technology, budget, and IP advice and consultation, among other pre-application services offered to certain Department of Energy program applicants — for first-time and under-represented SBIR/STTR program applicants at all participating agencies. In addition, the National Academy of Sciences should study SBIR/STTR application and appeals processes, including the demographics of SBIR/STTR program applicants and awardees, to identify and make recommendations to address potential biases or barriers to participation. For a more equitable application review, participating agencies should also increase the diversity of application reviewer pools and conduct blind reviews of technical merit sections of applications when feasible.

#### *Workplace Equity*

Workplace equity issues also contribute to the inventor diversity gaps, and addressing them must be part of public policy efforts to broaden participation in invention and patenting.

Public investments in paid leave and quality, accessible, and affordable child care are crucial to ensuring that everyone has an opportunity to invent and patent. It is well established that caregiving responsibilities and other household tasks disproportionately fall on women. This has never been more visible than during the coronavirus pandemic when more people were caring for children while working from home. The additional responsibilities of caregivers create time constraints that can hinder or limit career advancement and opportunities to invent and patent (15). IWPR interviewed 21 inventors, including five men and 16 women, 11 of whom were women of color, about their experiences patenting inventions (15). Of those interviewed, roughly half the women and one man identified work-life balance as a challenge for women inventors (15). According to IWPR, in addition to time constraints, women inventors also face the “motherhood penalty” — “the perceived notion that if a woman has a child, she is less dedicated to her career” and therefore may not be given the

same opportunities for projects or promotions (15). Normalizing parental leave and caregiving through policy change will help to change these perceptions and broaden opportunities over time.

It is also important that policymakers recognize that harassment, bias, and discrimination continue to be real barriers to participation in invention and patenting. A recent study found that women are 58 percent less likely to be named on patents than their male collaborators, controlling for factors beyond gender, such as job title (48). This attribution problem suggests both bias — that women’s contributions are undervalued — and discrimination. The IWPR study on the experiences of women inventors also included striking findings on harassment, bias, and discrimination: Every woman inventor reported personal experiences or stories of other women’s experiences with gender or racial bias and discrimination in their careers and during the patenting process (15). These stories included instances of sexual harassment (15).

To help ensure that women, people of color, and other protected classes are able to participate fully in invention and patenting, the Administration should vigorously enforce existing nondiscrimination laws. In addition, policymakers should strengthen nondiscrimination laws. For example, Congress should pass the Equality Act, which would prohibit discrimination on the basis of sexual orientation and gender identity in employment and federally funded programs and thus ensure that LGBTQ+ inventors are fully protected from discrimination in employment and federal funding for innovation (49). The Chips and Science Act takes a step in the right direction by authorizing the NSF to fund research to combat sexual harassment in science and establishing a chief diversity officer at the NSF (28). The \$210 million appropriated through September 2024 for research and related activities at the NSF can be used for these purposes (31).

#### **Representation: Celebrating Historically Under-represented Inventors and Promoting Diversity Among Patent “Gatekeepers”**

Realizing a future in which individuals from all backgrounds can see themselves as inventors and turn their ideas into patented inventions will require mentorship, role models, and the opportunity to work

with people during the patenting process who have similar lived experiences.

### *The Importance of Representation to Historically Under-represented Inventors*

As Marian Wright Edelman famously said, “You can’t be what you can’t see.” Studies have shown that people often rely on normative representations and stereotypes when thinking about others (50). These images guide the inferences people make about who can fill certain social or occupational roles (50). Without broadening representation of inventors, we are left with inventor stereotypes, such as a white man tinkering in a garage or basement (18,50). Seeing historically under-represented inventors in media and hearing their stories can help change the inferences people make about who can be an inventor.

This is particularly important because many individuals from historically under-represented groups do not have access to inventor role models and often experience being the “only one” in the room — e.g., the only woman or the only woman of color (15). Roughly half of the women interviewed in the IWPR study talked about the difficulty of being the “only” in the room, and many said that it is important to see people who look like them succeeding in inventing (15). One Latina inventor explained, “[W]hen you don’t see people who look like you that are doing certain things, you just can’t picture yourself doing it” (15).

In addition, and as discussed in further detail in the Common Barriers section, research has shown that early exposure to inventors is crucial for developing the next generation of inventors. To help historically under-represented creators, scientists, engineers, and entrepreneurs see themselves as inventors, the federal government should initiate a national public awareness campaign to promote diversity in invention and patenting. This campaign should feature historically under-represented inventors with compelling stories, and it should be broadcast on a variety of media platforms, including the Internet, social media, and television/streaming to reach historically under-represented groups in multiple ways. The voices of the President, Vice President, Commerce Secretary, USPTO Director, and other senior officials in the Administration are crucial in

this campaign and other efforts to promote diversity in invention and patenting. In addition to celebrating the role of historically under-represented inventors in U.S. innovation, they should highlight the importance of the U.S. innovation economy in promoting fairness, advancing equity, creating jobs, and maintaining global technology leadership — all key priorities of the Administration (51). Federal agencies that support invention—including the USPTO, the SBA, and SBIR/STTR-participating agencies — should also feature historically under-represented inventors in public events and communications.

### *The Importance of Diversity Among Patent “Gatekeepers”*

Representation is also important in other parts of the invention ecosystem, particularly among the gatekeepers to patenting. Only 20 percent of patent attorneys are women, five percent are people of color, and two percent are women of color (52). The lack of diversity among patent examiners is similarly concerning. Research has found that only 28 percent of patent examiners are women (53).

Research demonstrates that more individuals from historically under-represented groups may patent when they can retain patent attorneys who look like them, understand them, and can relate to them (15,54,55). The women inventors interviewed in the IWPR study reported experiencing challenges when dealing with patent attorneys (15). For example, some women reported feeling talked down to by men attorneys, and others said they felt more comfortable working with women attorneys (15). One interviewee shared the following anecdote:

There was a time where we were sitting with lawyers...and then there was a point where they were explaining something to us and we were trying to explain something back to them. It was really frustrating because we understand what they were saying. They didn’t understand what we were saying, but they keep repeating the same basic information to us as if we didn’t understand it. (15)

Similarly, one Latina inventor suggested she only works with women patent attorneys because they are easier and “better” to work with (15). The men

inventors reported no such challenges or preferences (15).

Legal jargon and the technical language associated with invention can make effective communication difficult, particularly between individuals with different backgrounds and experiences (15). Because inventions are born of experiences, and because identities affect lived experiences, patent attorneys from historically under-represented groups may bring additional substantive expertise on goods that cater to customers from those groups, which can aid in the drafting of claims (56). They may also be able to develop valuable client relationships with robust and effective communication, which can in turn help inventors feel more comfortable with the patenting process and produce the evidence necessary for the attorney to draft a successful patent application (56).

Congress and the Administration have been working to increase diversity among patent attorneys. The USPTO sets the criteria for admission to the patent bar. Only candidates with certain scientific and technical qualifications may sit for the exam. These criteria allow individuals with certain degrees in engineering and physical sciences but not individuals with degrees in subjects more common among women — such as mathematics, industrial design, or fashion design — to sit for the exam. In addition, until recently, individuals with undergraduate degrees in certain majors automatically qualified for the exam, but those with master's degrees or doctoral degrees in the same subjects did not. A 2020 paper by Mary Hannon argued that the USPTO's criteria excluded qualified women from patent bar admission (57). Senators Mazie Hirono (D-HI), Thom Tillis (R-NC), and Chris Coons (D-DE) wrote to the USPTO in December 2020 regarding the criteria. The USPTO responded that they would evaluate the patent bar requirements to ensure they are up to date and do not discourage applications from women or other under-represented groups. The USPTO requested public comments on proposed changes to the registration criteria, including expanding the list of eligible degrees to encompass more bachelor's degrees, revising the automatic eligibility benefit to cover advanced degrees, and modifying scientific and technical coursework requirements (58). The USPTO subsequently announced that it has implemented these

updates to the registration criteria (59-61).

The USPTO's swift response to the Senators' letter is commendable — the agency sought stakeholder input and modified the registration criteria in a matter of months. In another positive step forward, the USPTO has requested additional public comments on the patent bar examination requirements, including whether the USPTO should further revise the scientific and technical criteria and review the requirements on a predetermined timeline to expand the pool of patent practitioners (62,63). The USPTO should continue to regularly review the patent bar examination requirements to ensure that they do not exclude qualified individuals.

Greater diversity among patent examiners should also be a goal of the Administration. Patent examiners review patent applications and determine if patents can be granted. Patent applications include claims defining an invention and the scope of the IP protection sought by the applicant. Interviews can help examiners understand the claimed patentable features of an invention. As with patent attorneys, it is helpful to have patent examiners who understand the experiences and communication styles of historically under-represented inventors and can relate to them. Furthermore, research suggests that implicit bias may exist in the patent examination process. Researchers have found that inventors with common female names have an eight percent lesser chance of getting their patents approved (64). They also found that patents listing common female names are cited 30 percent less frequently than those listing inventors with common male names (64). As further evidence of potential implicit bias, this disparity was reversed when women inventors had less common female names (64). Patents in those cases were cited approximately 20 percent more frequently than patents listing rare male names (64). Increasing diversity among patent examiners may help mitigate these potential implicit biases.

Because patent examiners are federal employees, Congress and the Administration have an important role to play in expanding diversity among the examiner corps. The Unleashing American Innovators Act includes provisions that promote diversity among patent examiners by refining the purposes of USPTO satellite offices to specifically

include retaining patent examiners from diverse economic, geographic, and demographic backgrounds (31). Enacting this legislation was an important first step, but the Administration should also increase the recruitment of patent examiners from diverse backgrounds. In addition, Congress should ask the National Academies of Sciences, Engineering, and Medicine to examine the potential presence of implicit bias in the examination process and recommend ways that the process could be reformed to address such issues if they exist.

## CONCLUSION

Four times as many inventors and millions of new ideas that will save lives, connect communities, create jobs, and transform life as we know it. This is our future — and it is within reach.

We can achieve real change through public policy. By using data to measure and advance equity in patenting, providing support to historically under-represented inventors to broaden participation in patenting, and enabling individuals to see inventors and work with patent gatekeepers who can relate to them, the federal government can help ensure that all Americans have an opportunity to participate fully in the invention economy.

## ACKNOWLEDGMENTS

The authors are grateful for the support of the Invent Together alliance and Qualcomm Inc.

## REFERENCES

1. United States Constitution. Art. I, § 8, cl. 8.
2. United States Patent and Trademark Office. Progress and potential 2020 update on U.S. women inventor-patentees. Alexandria (VA): USPTO, Office of the Chief Economist; 2020 [accessed 2021 Dec 27]. <https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf>.
3. Williams-Baron E, Milli J, Gault B. Innovation and intellectual property among women entrepreneurs: a report on women's business ownership. Washington (DC): Institute for Women's Policy Research; 2018 [accessed 2021 Dec 27]. [https://iwpr.org/wp-content/uploads/2020/10/C472\\_Report-Innovation-and-Entrepreneurship-9.6.18-clean.pdf](https://iwpr.org/wp-content/uploads/2020/10/C472_Report-Innovation-and-Entrepreneurship-9.6.18-clean.pdf).
4. Hunt J, Garant J, Herman H, Munroe D. Why don't women patent. Cambridge (MA): NBER; 2012 [accessed 2021 Dec 27]. [https://www.nber.org/system/files/working\\_papers/w17888/w17888.pdf](https://www.nber.org/system/files/working_papers/w17888/w17888.pdf). Working Paper No. 17888.
5. Bell A, Chetty R, Jaravel X, Petkova N, Van Reenen J. Who becomes an inventor in America?: the importance of exposure to innovation. Cambridge (MA): NBER; 2019 [accessed 2021 Dec 27]. [https://www.nber.org/system/files/working\\_papers/w24062/w24062.pdf](https://www.nber.org/system/files/working_papers/w24062/w24062.pdf).
6. Milli J, Williams-Baron E, Berlan M, Xia J, Gault B. Equity in innovation: women inventors and patents. Washington (DC): Institute for Women's Policy Research; 2016 [accessed 2021 Dec 27]. <https://iwpr.org/wp-content/uploads/2020/12/C448-Equity-in-Innovation.pdf>. In our references to this research, we use the same demographic category terms as the researchers.
7. European Patent Office. Women's participation in inventive activity: evidence from EPO data. Munich (Germany): EPO; 2022 [accessed 2022 Dec 30]. [https://documents.epo.org/projects/babylon/eponet.nsf/0/7A4224E289AA190B-C12588EF0035BD67/\\$File/womens\\_participation\\_in\\_inventive\\_activity\\_2022\\_en.pdf](https://documents.epo.org/projects/babylon/eponet.nsf/0/7A4224E289AA190B-C12588EF0035BD67/$File/womens_participation_in_inventive_activity_2022_en.pdf).
8. Akcigit U, Goldschlag N. Measuring the characteristics and employment dynamics of U.S. inventors. Washington (DC): Center for Economic Studies; 2022 [accessed 2022 Dec 30]. <https://www2.census.gov/ces/wp/2022/CES-WP-22-43.pdf>.
9. Farre-Mensa J, Hegde D, Ljungqvist A. What is a patent worth? evidence from the U.S. patent "lottery." Cambridge (MA): NBER; 2018 [accessed 2021 Dec 27]. [https://www.nber.org/system/files/working\\_papers/w23268/w23268.pdf](https://www.nber.org/system/files/working_papers/w23268/w23268.pdf).
10. United States Patent and Trademark Office. Intellectual property and the U.S. economy: third edition. Alexandria (VA): USPTO; 2022 [accessed 2022 Apr 14]. <https://www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf>.
11. Cook LD. Addressing gender and racial

- disparities in the U.S. labor market to boost wages and power innovation. Washington (DC): Washington Center for Equitable Growth; 2021 [accessed 2021 Dec 27]. <https://equitablegrowth.org/addressing-gender-and-racial-disparities-in-the-u-s-labor-market-to-boost-wages-and-power-innovation/>.
12. Skukauskaitė A, Couch S, Flynn L. Researching invention education. *InventEd*. 2019 Nov 19.
  13. Hinchliffe E. Female founders' share of venture capital funding shrank to 2.2% in 2020. *Fortune*. 2021 Feb 8 [accessed 2021 Dec 30]. <https://fortune.com/2021/02/08/female-founders-venture-capital-funding-2020/>.
  14. Norman J. A VC's guide to investing in Black founders. *Harv Bus Rev*. 2020 Jun 19 [accessed 2021 Dec 30]. <https://hbr.org/2020/06/a-vcs-guide-to-investing-in-black-founders>.
  15. Shaw E, Mariano H. Tackling the gender and racial patenting gap to drive innovation lessons from women's experiences. Washington (DC): Institute for Women's Policy Research; 2021 [accessed 2021 Dec 27]. [https://iwpr.org/wp-content/uploads/2021/07/Tackling-the-Gender-and-Racial-Patenting-Gap\\_FINAL38.pdf](https://iwpr.org/wp-content/uploads/2021/07/Tackling-the-Gender-and-Racial-Patenting-Gap_FINAL38.pdf).
  16. Fechner H, Shapanka M. Closing diversity gaps in innovation: gender, race, and income disparities in patenting and commercialization of inventions. *Technol Innov*. 2018;19(4):727–734.
  17. Biden J. Advancing racial equity and support for underserved communities through the federal government. 2021 Jan 20 [accessed 2021 Dec 27]. Executive Order 13985. <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>.
  18. Hintz ES. *American independent inventors in an era of corporate R&D*. Cambridge (MA): MIT Press; 2021. p. 118–124.
  19. Hintz ES. *Counting women inventors*. Washington (DC): Lemelson Center for the Study of Invention and Innovation; 2017 [accessed 2021 Dec 28]. <https://invention.si.edu/counting-women-inventors>.
  20. United States Patent and Trademark Office. Report to Congress pursuant to P.L. 115-273, the SUCCESS Act. Alexandria (VA): USPTO; 2019 [accessed 2021 Dec 27]. <https://www.uspto.gov/sites/default/files/documents/USPTOSuccessAct.pdf>.
  21. *Inventor Diversity for Economic Advancement (IDEA) Act of 2021*, S. 632, 117th Cong., 1st Sess (2021).
  22. *Inventor Diversity for Economic Advancement (IDEA) Act of 2021*, H.R. 1723, 117th Cong., 1st Sess (2021).
  23. Press Briefing by Press Secretary Jen Psaki, Chair of the Council of Economic Advisers Cecilia Rouse, and Member of the Council of Economic Advisers Heather Boushey. Washington (DC): The White House; 2021 [accessed 2021 Dec 27]. <https://www.whitehouse.gov/briefing-room/press-briefings/2021/03/24/press-briefing-by-press-secretary-jen-psaki-chair-of-the-council-of-economic-advisers-cecilia-rouse-and-member-of-the-council-of-economic-advisers-heather-boushey-march-24-2021/>.
  24. The Biden plan to build back better by advancing racial equity across the American economy. Washington (DC): Democratic National Committee; 2021 [accessed 2021 Dec 27]. <https://joebiden.com/racial-economic-equity/>.
  25. Lemelson-MIT Program. 3 questions: Stephanie Couch on invention and inspiring young people to pursue STEM education. Cambridge (MA): MIT News; 2016 [accessed 2022 Jan 18]. <https://news.mit.edu/2016/stephanie-couch-inspiring-young-people-to-pursue-stem-education-0601>.
  26. Milgrom-Elcott T. STEM starts earlier than you think. *Forbes*. 2018 [accessed 2022 Jan 18]. <https://www.forbes.com/sites/taliamilgromelcott/2018/07/24/stem-starts-earlier-than-you-think/#1fbc0938348b>.
  27. Every Student Succeeds Act, Pub. L. No. 114-95 (2015 Dec 10).
  28. Chips and Science Act, Pub. L. No. 117-167 (2022 Aug 9).
  29. United States Innovation and Competition Act (USICA) of 2021, S. 1260, 117th Cong., 1st Sess (2021).

30. America Creating Opportunities for Manufacturing, Pre-Eminence in Technology, and Economic Strength (COMPETES) Act of 2022, H.R. 4521, 117th Cong., 1st Sess (2021).
31. Consolidated Appropriations Act, 2023, Pub. L. No. 117-328 (2022 Dec 29).
32. Kwon H, Lee E, Lee D. Meta-analysis on the effectiveness of invention education in South Korea: creativity, attitude, and tendency for problem solving. Šiauliai (Lithuania): Journal of Baltic Science Education [accessed 2022 Jun 21]. <https://www.proquest.com/openview/45cf53d28e0349aee7cf528cc8e1d0f0/1?pq-origsite=gscholar&cbl=4477238>.
33. Shaw E, Hess C. Closing the gender gap in patenting, innovation, and commercialization: programs promoting equity and inclusion. Washington (DC): Institute for Women's Policy Research; 2018 [accessed 2021 Dec 29]. [https://iwpr.org/wp-content/uploads/2020/10/C471\\_Programs-promoting-equity\\_7.24.18\\_Final.pdf](https://iwpr.org/wp-content/uploads/2020/10/C471_Programs-promoting-equity_7.24.18_Final.pdf).
34. Small Business Innovation Protection Act of 2017, Pub. L. No. 115-259 (2018 Oct 9).
35. Government Accountability Office (US) [GAO]. Additional agency actions can improve assistance to small businesses and inventors. Washington (DC): GAO; 2020 [accessed 2021 Dec 29]. <https://www.gao.gov/products/gao-20-556>.
36. AUTM. AUTM policy: advocacy. Washington (DC): 2021 [accessed 2022 Jan 18]. [https://autm.net/AUTM/media/About-AUTM/Documents/AUTM\\_Advocacy-Policy\\_October2021.docx](https://autm.net/AUTM/media/About-AUTM/Documents/AUTM_Advocacy-Policy_October2021.docx).
37. Fogel LE, Van Horn S. In brief: patent prosecution in USA. London (UK): Lexology; 2020 [accessed 2021 Dec 30]. <https://www.lexology.com/library/detail.aspx?g=08f84c85-7e5b-4917-a9cd-d4ddaf145557>.
38. United States Patent and Trademark Office. USPTO fee schedule. Alexandria (VA): USPTO [accessed 2023 Jan 4].
39. American Intellectual Property Law Association. Report of the economic survey 2021. Arlington (VA): AIPLA; 2021.
40. United States Patent and Trademark Office. Patent Pro Bono Program for independent inventors and small businesses. Alexandria (VA): USPTO [accessed 2021 Dec 30]. <https://www.uspto.gov/patents/basics/using-legal-services/pro-bono/patent-pro-bono-program>.
41. Leahy-Smith America Invents Act, Pub. L. No. 112-29 (2011 Sept 16).
42. Hirshfeld D. The USPTO's Patent Pro Bono Program: promoting equity in innovation since 2011. Alexandria (VA): USPTO; 2022 [accessed 2022 Apr 14]. <https://www.uspto.gov/blog/director/entry/the-uspto-s-patent-pro>.
43. Unleashing American Innovators Act of 2022, S. 2773, 117th Cong., 1st Sess (2021).
44. Unleashing American Innovators Act of 2022, H.R. 8697, 117th Cong., 2d Sess (2022).
45. United States Patent and Trademark Office. Law School Clinic Certification Program. Alexandria (VA): USPTO [accessed 2021 Dec 30]. <https://www.uspto.gov/learning-and-resources/ip-policy/public-information-about-practitioners/law-school-clinic-1>.
46. United States Patent and Trademark Office. Report to Congress on the Law School Clinic Certification Program. Alexandria (VA): USPTO, Office of Enrollment and Discipline; 2016 [accessed 2021 Dec 30]. [https://www.uspto.gov/sites/default/files/documents/USPTO\\_Law\\_School\\_Clinic\\_Cert\\_Program\\_Report-Dec\\_2016.pdf](https://www.uspto.gov/sites/default/files/documents/USPTO_Law_School_Clinic_Cert_Program_Report-Dec_2016.pdf).
47. National Women's Business Council. Women's inclusion in Small Business Innovation Research & Small Business Technology Transfer programs. Rochester (NY): NWBC; 2020. [https://cdn.www.nwbc.gov/wp-content/uploads/2020/08/03125152/SBIR-STTR-ReportSummary\\_Final.pdf](https://cdn.www.nwbc.gov/wp-content/uploads/2020/08/03125152/SBIR-STTR-ReportSummary_Final.pdf).
48. Ross M, Glennon B, Murciano-Goroff R, Berkes E, Weinberg B, Lane J. Women are credited less in science than are men. *Nature*. 2022 Jun 22 [accessed 2022 Jun 23]. [https://www.nature.com/articles/s41586-022-04966-w\\_reference.pdf](https://www.nature.com/articles/s41586-022-04966-w_reference.pdf).
49. Equality Act, H.R. 5, 117th Cong., 1st Sess (2021).
50. Voiklis J, Barchas-Lichtenstein J, LaMarca N, Thomas UG, Field S. Public perceptions of inventors & their work. New York (NY): Knology; 2020 [accessed 2021 Dec 27]. <https://www.datocms-assets.com/15254/1596135227-invention-stereotype-reportweb2020-07-29.pdf>.

51. The Biden-Harris Administration immediate priorities. Washington (DC): The White House; 2021 [accessed 2021 Dec 27]. <https://www.whitehouse.gov/priorities/>.
52. Spector E. Ensuring women and diverse candidates in the patent bar: we must address the root of the problem. IPWatchdog; 2021 [accessed 2021 Dec 27]. <https://www.ipwatchdog.com/2021/03/15/ensuring-women-diverse-candidates-patent-bar-must-address-root-problem/id=130896/>.
53. Does gender affect work? Evidence from U.S. patent examination. New York (NY): NYU Stern School of Business. 2019 [accessed 2021 Dec 27]. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3339555](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3339555).
54. Spector, E. 5 hiring strategies for diversifying the patent bar. New York (NY): Law360; 2021 [accessed 2021 Dec 27]. <https://www.law360.com/articles/1359154/5-hiring-strategies-for-diversifying-the-patent-bar>.
55. Raz G. Spanx: Sara Blakely [podcast]. How I Built This with Guy Raz. NPR; Sept 12 2016, 30 min. [accessed 2021 Dec 27]. <https://podcasts.apple.com/us/podcast/spanx-sara-blakely/id1150510297?i=1000396023160>.
56. Goldman E, Miers J. Boosting patentee diversity by relaxing the technical barriers to patent bar membership. Alexandria (VA): USPTO; 2019 [accessed 2021 Dec 27]. <https://www.uspto.gov/sites/default/files/documents/SUCCESSAct-Goldman-et-al.pdf>.
57. Hannon, M. The patent bar gender gap: expanding the eligibility requirements to foster inclusion and innovation in the U.S. patent system. IP Theory. 2020 [accessed 2021 Dec 27]; 10(1)(1). <https://www.repository.law.indiana.edu/ipt/vol10/iss1/1>.
58. United States Patent and Trademark Office. Administrative updates to the general requirements bulletin for admission to the examination for registration to practice in patent cases before the USPTO. Fed Regist. 2021 [accessed 2021 Dec 27]. <https://www.regulations.gov/document/PTO-P-2021-0005-0001>.
59. United States Patent and Trademark Office. Administrative updates to the general requirements bulletin for admission to the examination for registration to practice in patent cases. Fed Regist. 2021 [accessed 2021 Dec 27]. <https://www.regulations.gov/document/PTO-P-2021-0005-0034>.
60. United States Patent and Trademark Office. General requirements bulletin for admission to the examination for registration to practice in patent cases before the USPTO. Alexandria (VA): USPTO, Office of Enrollment and Discipline; 2021 [accessed 2021 Dec 27]. [https://www.uspto.gov/sites/default/files/documents/OED\\_GRB.pdf](https://www.uspto.gov/sites/default/files/documents/OED_GRB.pdf).
61. IPWatchdog. USPTO moves ahead with changes to patent bar registration. 2021 Sept 23 [accessed 2021 Dec 27]. <https://www.ipwatchdog.com/2021/09/23/uspto-moves-ahead-changes-patent-bar-registration/id=137960/>.
62. United States Patent and Trademark Office. Expanding admission criteria for registration to practice in patent cases before the USPTO. Fed Regist. 2022 [accessed 2023 Jan 5]. <https://www.govinfo.gov/content/pkg/FR-2022-10-18/pdf/2022-22569.pdf>.
63. Kass E. 'It's time to rethink everything,' Vidal says. New York (NY): Law360; 2022 [accessed 2023 Jan 5]. <https://www.law360.com/articles/1492820>.
64. Jensen K, Kovács B, Sorenson O. Gender differences in obtaining and maintaining patent rights. Nat Biotechnol. 2018;36:307-309.