

**From:** [Saurabh Vishnubhakat](#)  
**To:** [successact](#)  
**Cc:** [Alexandra Fuchs](#); [Lora Elkins-Naismith](#)  
**Subject:** Comment on Women in Innovation and Entrepreneurship for 2018 SUCCESS Act Study  
**Date:** Friday, June 28, 2019 5:05:32 PM  
**Attachments:** [Comment to the USPTO on Women in Innovation and Entrepreneurship.pdf](#)

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Dear Under Secretary Iancu:

We the undersigned law students and law professor offer this response to the USPTO's request for comments on studying and promoting the participation of underrepresented demographic groups in the U.S. patent system. We write based on personal and professional experiences in our own respective science and engineering fields and in the patent system, as well as based on our academic study of these issues. We appreciate the USPTO's attention to the value of studying and promoting diversity in the patent system, especially through evidence-based policymaking.

For the reasons that follow, we believe the USPTO should, indeed, collect demographic information on patent inventors, do so at the time of application, and do so on a mandatory rather than voluntary basis in compliance with relevant laws and subject to proper safeguards. The USPTO should also play a central role among public and private institutions to promote the participation of women in patenting and entrepreneurial activities. We address questions 1–3, 5–8, and 10–11. Among the demographic groups of interest, we focus in particular on women.

Sincerely,  
Saurabh Vishnubhakat  
Associate Professor of Law  
Associate Professor of Engineering  
Texas A&M University

<http://vishnubhakat.org/>

The Honorable Andrei Iancu  
Under Secretary of Commerce for Intellectual Property and  
Director of the United States Patent and Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

Attn: *Office of the Chief Economist*  
*Mail Stop OPIA*

Via email: [successact@uspto.gov](mailto:successact@uspto.gov)

**Re: Response to the Request for Comments and Notice of Public Hearings on the Report Required by the Study of Underrepresented Classes Chasing Engineering and Science Success Act of 2018, 84 Fed. Reg. 17809 (Apr. 26, 2019)**

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We the undersigned law students and law professor offer this response to the USPTO's request for comments on studying and promoting the participation of underrepresented demographic groups in the U.S. patent system. We write based on personal and professional experiences in our own respective science and engineering fields and in the patent system, as well as based on our academic study of these issues. We appreciate the USPTO's attention to the value of studying and promoting diversity in the patent system, especially through evidence-based policymaking.

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**1. What public data are available to identify the number of patents applied for and obtained by women?**

The USPTO's own publicly facing patent data is a sensible starting point. This data contains all published patent applications and issued patents and includes the names and nationalities of all inventors on each application and patent. Meanwhile, public data sources are also available from which to estimate the incidence of women among inventors.

These public sources include statistical tables issued by federal agencies, such as the Census Bureau, summarizing the frequency with which given names occur among men and women. Statistics of this sort have already been effective in estimating the participation of women in the patent bar.<sup>1</sup> However, such data would benefit from being updated. For example, the Census Bureau data in the 2014 patent bar study was published in 1995 and so was nearly 20 years old.

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<sup>1</sup> Saurabh Vishnubhakat, *Gender Diversity in the Patent Bar*, 14 J. MARSHALL REV. INTELL. PROP. L. 67 (2014), <http://ssrn.com/abstract=2433776>; NAT'L WOMEN'S BUS. COUNCIL [hereinafter "NWBC"], INTELLECTUAL PROPERTY & WOMEN ENTREPRENEURS (2012), <http://bit.ly/2YhM0EA> (Part I), <http://bit.ly/2Ft0kD9> (Part II).

Updating statistics by incorporating up to date Census Bureau data would have to comport with relevant privacy laws as well as norms of statistical validity. Because name frequency data across the population would be highly aggregated, federal agencies may be able to provide it to the USPTO without running afoul of relevant privacy laws. Moreover, the USPTO should consider obtaining name frequency data from multiple agencies. For example, both the Census Bureau and the Social Security Administration maintain detailed nationwide records of demographic information and would be well positioned to provide independent aggregated statistics.

Notably, the USPTO's own prior investigation into the diversity of patent applicants has taken this approach. Pursuant to Section 29 of the Leahy-Smith America Invents Act,<sup>2</sup> the USPTO provided public patent data to the Center for Economic Studies (CES) at the Census Bureau to be matched with Census Bureau demographic data.<sup>3</sup> The CES, in turn, provided only aggregated tabulations back to the USPTO in order to comply with the Paperwork Reduction Act,<sup>4</sup> Privacy Act,<sup>5</sup> and the confidentiality obligations of the Census Bureau itself.<sup>6</sup>

## **2 & 3. What social and private benefits would you identify as resulting from increasing the number of patents applied for and obtained by women? What public data are available to assess such social and private benefits?**

As a system of property rights that are widely distributed across individuals and firms, patents offer a correspondingly broad and diverse set of social and private benefits. We highlight some salient examples here based on the availability of well-developed databases to assess them.

One potential benefit is the increased formation and economic performance of firms, especially startup firms, on the basis of patents that were applied for by women, obtained by women, or both. Pending applications as well as patents are important sources of competitive advantage for small firms as well as young firms.<sup>7</sup> Firms of this type, in turn, are disproportionately likely to contribute to job creation and other indicators of macroeconomic growth.<sup>8</sup> For data on the formation and economic performance of firms, researchers have long relied on the CRSP and Compustat Merged Database maintained and provided by the Wharton Research Data Service.<sup>9</sup>

Another potential benefit is the increased public offering of securities by firms whose intellectual property portfolios include patents that were applied for by women, obtained by women, or both.

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<sup>2</sup> Pub. L. No. 112-29 (2011).

<sup>3</sup> USPTO, *Diversity of Applicants Findings* (June 24, 2015), <http://bit.ly/2WtEIFV>.

<sup>4</sup> 44 U.S.C. § 3501 et seq.

<sup>5</sup> 5 U.S.C. § 552a et seq.

<sup>6</sup> 13 U.S.C. §§ 9, 214.

<sup>7</sup> See, e.g., Stuart J.H. Graham, et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255 (2009), <https://ssrn.com/abstract=1429049>; Stuart J.H. Graham & Ted M. Sichelman, *Patenting by Entrepreneurs: An Empirical Study*, 17 MICH. TELECOMM. & TECH. L. REV. 111 (2010), <https://ssrn.com/abstract=1562678>.

<sup>8</sup> See, e.g., EWING MARION KAUFFMAN FOUNDATION, RESEARCH SERIES ON FIRM FORMATION AND ECONOMIC GROWTH (2010–2013), <http://bit.ly/2xdz4nm>; José Lobo, et al., PATENTING PROSPERITY: INVENTION AND ECONOMIC PERFORMANCE IN THE UNITED STATES AND ITS METROPOLITAN AREAS, Brookings Institution Report (2013), <https://brook.gs/2REElv1>.

<sup>9</sup> WHARTON RES. DATA SERV., *Overview of CRSP/Compustat Merged Data*, <https://whr.tn/2Z63gwV>.

The use of public offerings to participate in capital markets is a significant indicator of financial success for firms. This is all the more true for growing firms engaging in initial public offerings. The U.S. Securities and Exchange Commission maintains extensive, publicly searchable records of filings and disclosures that publicly traded firms must make.<sup>10</sup> Annual and quarterly reports—the so-called 10-K and 10-Q filings, respectively—from the SEC’s Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database would be a useful source to match with data on patents and patent applications associated with women.

A common thread between these benefits is that they represent downstream commercialization of patents. Whether women merely convey their patents to the firms assessed in CRSP/Compustat or EDGAR or join the firms themselves in positions of executive or technological leadership, the greater translation of women’s patents into productive economic activity also represents, to that extent, the greater participation of women in the economic life of the nation.

Conversely, still another potential benefit is the greater translation of basic scientific research, especially publicly funded research, into technological applications of the sort that tend to receive patent protection. Because inventorship in patent law is closely tied to intellectual conception, women who seek and obtain patents based on upstream research are correspondingly more likely to have played an important role in the upstream research as well. Put another way, though women engage in science and engineering research, only a subset of the eventually patentable results of their work enters the patent system.

Improving that yield would offer society a greater return on existing research investments that the public has already made. Data on much publicly funded university research would be available from relevant federal agencies and departments. These especially include the National Institutes of Health (NIH), National Science Foundation (NSF), Department of Energy, and Department of Defense, agencies that together administer the large majority of U.S. research funding.<sup>11</sup> Notably, a 2015 report by the U.S. Government Accountability Office revealed that three major agencies—the NIH, the NSF, and the U.S. Department of Agriculture’s National Institute of Food and Agriculture—already “routinely collect demographic information about the individual researchers who apply for and receive federal grants.”<sup>12</sup>

## **5. Should the USPTO collect demographic information on patent inventors at the time of patent application, and why?**

The USPTO should, indeed, collect this information and should do so at the time of application. Without collecting such information, the Office will remain limited only to information that must be estimated, inferred, or triangulated from secondary sources of data as discussed above. As a result, the quality and value of the Office’s analysis and policy making on issues of demographic diversity will remain correspondingly limited. By contrast, collecting demographic information on a direct and mandatory basis would instead offer a source of data from applicants themselves. With this more directly collected data, there would no longer be a need to reverse-engineer demographic

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<sup>10</sup> SEC. & EXCH. COMM’N, *Electronic Data Gathering, Analysis, and Retrieval System*, <https://www.sec.gov/edgar/>.

<sup>11</sup> NAT’L SCI. BD., *SCIENCE AND ENGINEERING INDICATORS 2018* ch. 4 tbl. 4-15 (2018), <http://bit.ly/2ZGaOGO>.

<sup>12</sup> GOV’T ACCOUN. OFFICE, *WOMEN IN STEM RESEARCH: FEDERAL AGENCIES DIFFER IN THE DATA THEY COLLECT ON GRANT APPLICANTS*, GAO-15-291R (2015), <https://www.gao.gov/products/GAO-15-291R>.

characteristics and introduce error at each stage of estimation or analysis. The result would improve the USPTO's analytical and decisional abilities.

### Statistical Validity vs. Privacy

However, in order to collect demographic information, the USPTO must first address important questions about its relevant legal authority that remain unresolved. The USPTO must balance two important and competing constraints. One is that demographic data is less worth collecting at all unless it can be collected in a way that is statistically representative and useful for analysis and policy making.<sup>13</sup> The other is that such demographic data cannot be collected in violation of the Paperwork Reduction Act, Privacy Act, and other relevant laws and regulations.<sup>14</sup> This tension casts immediate doubt over the utility of the common proposal that demographic data should not be required but merely requested from applicants on a voluntary basis.<sup>15</sup> For example, the American Intellectual Property Association (AIPLA) in response to the USPTO's 2013 request for comments supported the idea of collecting demographic information as long as it was submitted on a voluntary basis.<sup>16</sup>

One suggestion from the AIPLA was that the USPTO could "amend the cover sheet filed with provisional and non-provisional patent applications to include a line item for the inventor to voluntarily list his or her gender, ethnic background (i.e., White/Caucasian, African American, Hispanic, Asian, Other, and Rather Not Say) or whether they are a military veteran or not." Another suggestion was that the USPTO could amend the oath and declaration to ask for this information.<sup>17</sup> Still another was that the USPTO could conduct a voluntary survey at the time of allowance because applicants may be more likely to fill out the survey when they know that it will not have any impact on the prosecution of their patent applications.<sup>18</sup>

However, as the USPTO itself has recognized, these voluntary approaches may avoid privacy problems but would almost certainly suffer from selection effects, including self-selection among respondents, whose magnitudes and directions would be difficult to estimate or correct.<sup>19</sup>

Although voluntary data collection is inapt for the level of statistical rigor that the USPTO should seek, the privacy and other concerns that underlie this suggestion are legitimate and important. Respect for these values will require that the USPTO take necessary steps to collect the data in appropriate ways and to protect it both from unauthorized disclosure outside the agency and from undue influence inside the agency on patent examination or other processes. In particular, the Office should not allow the availability of demographic information about patent applicants to enable bias, whether conscious or unconscious, on the part of patent examiners.

### Further Safeguards for Mandatory Collection

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<sup>13</sup> USPTO, *Diversity of Applicants Findings*, supra note 3, at 3–4, <http://bit.ly/2WtE1FV>.

<sup>14</sup> *Id.*

<sup>15</sup> AIPLA, *Comments on Methods for Studying the Diversity of Patent Applicants* (2014), <http://bit.ly/2KgG2Qs>.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> USPTO, *Diversity of Applicants Findings*, supra note 3, at 3–4, <http://bit.ly/2WtE1FV>.

Indeed, the USPTO should consider carefully the concern that unconscious bias may already exist in patent examination to varying degrees across technology centers and art units. For example, the data in IP and Women Entrepreneurs shows nearly identical trends for the patents filed versus patents granted for both women and men.<sup>20</sup> However, despite this trend, another study showed that patent examiners tend to favor male inventors and judge applications with a female name more harshly: applicants with common names from which female inventors can easily be identified were 8.2% less likely to be granted a patent, whereas those with uncommon names that are harder to guess were only 2.8% less likely.<sup>21</sup> This suggests that there may already be some unconscious bias at work. If so, such bias is likely to be rooted in demographic inferences that may be drawn from inventor information that is already available.

However, it does not necessarily follow that collecting more information and better information about inventors will cause even greater gender bias or disparity.<sup>22</sup> To the contrary, by restricting access to any new demographic information that the USPTO collects, the Office could minimize the day-to-day effect of that information on patent examiner operations. If anything, the USPTO's more systematic and complete collection of demographic information may even aid in identifying and mitigating existing bias.

Accordingly, data on demographic information should be limited to usage only by relevant business units inside the USPTO, especially those involved in the analysis of data to inform agency policy. From the standpoint of policy, one natural candidate is the Office of the Chief Economist, which advises the Under Secretary and Director on the economic implications of IP policies and programs<sup>23</sup>—such as those that evaluate and promote demographic diversity in the patent system. Another may be the Office of the Chief Financial Officer, which advises the USPTO on budgetary and financial matters<sup>24</sup>—such as strategic planning based on the projected and actual participation in the patent system by different demographic groups.

From the standpoint of patent examination, a natural candidate is the Office of Patent Quality Assurance, which assesses and analyzes examiner work product to ensure quality and compliance with best practices<sup>25</sup>—such as the insulation of patent examination from bias on the basis of gender or other attributes. Another may be the Patent Technology Centers Management, who mediate between USPTO Patent Operations and the examiner corps in implementing and overseeing policies and programs<sup>26</sup>—such as the continued unbiased examination of patents.

### Further Study through a Pilot Program

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<sup>20</sup> NWBC, *supra* note 1.

<sup>21</sup> Kyle Jensen, et al., *Gender Differences in Obtaining and Maintaining Patent Rights*, 36 NATURE BIOTECH. 307 (2018), <https://www.nature.com/articles/nbt.4120>.

<sup>22</sup> Austin Underhill, *New Findings: Male Inventors Have A Greater Chance of Success at the USPTO; Female Examiners Are Faster*, Juristat Blog (2015), <http://bit.ly/2ZFH5Of>.

<sup>23</sup> USPTO, Office of the Chief Economist, <http://bit.ly/2KIdDUf>.

<sup>24</sup> USPTO, Office of the Chief Financial Officer, <http://bit.ly/2ZU11gA>.

<sup>25</sup> USPTO, Office of Patent Quality Assurance, <http://bit.ly/2RG7V6f>.

<sup>26</sup> USPTO, Patent Technology Centers Management, <http://bit.ly/2ITJAXO>.

To explore the feasibility of these efforts and to ground its collection of demographic information on patent inventors in appropriate evidence and reasoned decision making, the USPTO should design and carry out a pilot program, as the Office has done with success in other contexts.

One potential structure for a pilot program may be to shed light on the selection effects themselves. For example, the USPTO could randomly select a group of patent applications and, through the attorney or agent of record, request demographic information about the inventors on a voluntary basis. The request could be drafted to explain the solely research-oriented use of the information and the purely voluntary basis for its collection. For the same group of patent applications, the USPTO could then use statistical methods such as those discussed above to reach an objective estimate of the same demographic information.

This objective estimate would put into perspective the rates at which men and women respond to requests for demographic information at all, respond completely, respond truthfully, and so on. The same approach might also be replicated with all identifying information about the inventors being hidden from the examiner—and with the selected applicants being informed of that fact when requesting demographic information.

The establishment of a soundly constructed, statistically informative pilot program would do much to guide the USPTO's decision making in the difficult balance between gathering useful data and respecting privacy values.

**6. To what extent, if at all, do educational and professional circumstances affect the ability of women to apply for and obtain patents or to pursue entrepreneurial activities?**

In general, patent holders are more educated than the general population of the United States.<sup>27</sup> For example, some 3% of the U.S. population has a professional or doctoral degree, but among patent holders that share is 45%.<sup>28</sup> Similarly, industries that employ more STEM employees tend to be granted more patents.<sup>29</sup> Meanwhile, recent NSF analysis revealed that the participation of women in engineering, life sciences, physical sciences, computer science, social science, and other related fields remains well below parity.<sup>30</sup> Women are less likely to have bachelor's degrees in these fields, and even further less likely to have masters or doctoral degrees in these fields.<sup>31</sup> While the number of women receiving STEM-related degrees at these respective levels increased from 1997 to 2016, the share remains low overall, especially in physics, computer science, and engineering.<sup>32</sup>

Figure: Science and Engineering Degrees Earned by Underrepresented Minority Women and Men, as a Percentage of All S&E Degrees Awarded of Each Degree, by Degree Type: 1996–2016<sup>33</sup>

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<sup>27</sup> See, e.g., Jay Shambaugh, et al., *Eleven Facts About Innovation and Patents* 5 (2017), <https://brook.gs/2WWtoZn>.

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

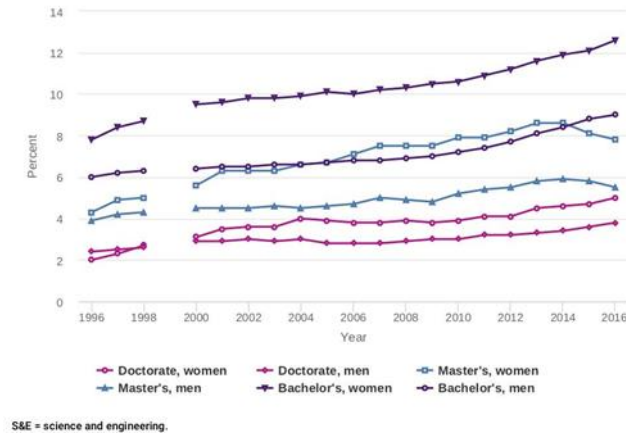
<sup>30</sup> NAT'L CTR. SCI. & ENG. STATS., *Women, Minorities, and Persons with Disabilities in Science and Engineering* (2019), <http://bit.ly/2Y8tHBV>.

<sup>31</sup> *Id.*

<sup>32</sup> *Id.*

<sup>33</sup> *Id.*

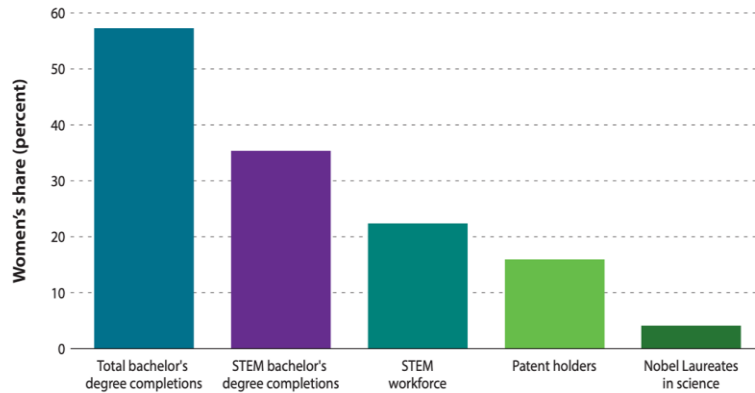
FIGURE 4-B  
Science and engineering degrees earned by underrepresented minority women and men, as a percentage of all S&E degrees awarded of each degree, by degree type: 1996–2016



Moreover, although the representation of women in higher education has increased, the significant relationship of STEM education as a direct pipeline into inventive activity means that the persistent underrepresentation of women in the patent system will likely remain until women become equally represented in higher education in STEM-related fields.

Figure: Share of Women, by Selected STEM and Innovation Measures<sup>34</sup>

FIGURE 9.  
Share of Women, by Selected STEM and Innovation Measures



<sup>34</sup> Shambaugh, et al., *supra* note 27, <https://brook.gs/2WWtoZn>.



Where women do receive patents, they are more likely to do so in academic institutions than in corporate or government occupations.<sup>35</sup> Universities tend to pay lower salaries and are less likely to give a bonus or a raise for obtaining a patent than corporate or government occupations.<sup>36</sup> This lack of incentive is exacerbated by the academic wage gap between women and men: men out-earn women by over \$13,000 at public universities and by over \$18,000 at private universities.<sup>37</sup> Additionally, women are less likely to hold leadership positions at higher education institutions, such as president, chief academic officer, full or associate professor, senior executive, or tenured positions.<sup>38</sup> The leadership positions women do fill tend to be in education, humanities, and social sciences rather than science and engineering.<sup>39</sup> Overall, these differences make jobs in science and engineering harder for women to obtain and to retain, worsening the disparity in patenting.

These findings, which represent a large and growing empirical literature, reveal that while a lack of educational attainment may not make it formally impossible for women to apply for patents, the disparity in the number of women who work in STEM-related fields and have received a STEM-focused education is likely a significant factor in women receiving fewer patents than men. Addressing these disparities and increasing the participation of women in STEM-related fields is a necessary step to increasing the participation of women in the patent system.

## **7. To what extent, if at all do socioeconomic factors facilitate or hinder the ability of women to apply for and obtain patents or to pursue entrepreneurial activities?**

The difficulty of both entering and remaining in STEM-related fields for women exacerbates the gender disparity in patenting. The impact of bias—rather than a pipeline problem of having too few qualified women or a problem of personal choice—is considerable in STEM disciplines. To frame these bias problems, we rely on the useful taxonomy recently proposed by Professor Joan Williams, et al.:

- (1) women having to provide more evidence of competence to prove themselves;
- (2) women having to behave in more masculine ways to be seen as competent;
- (3) women feeling pressured by their colleagues to work fewer hours after having children;
- (4) women feeling like they are competing with other women in the workplace; and
- (5) women feeling the need to isolate themselves from other women to maintain a sense of competency.<sup>40</sup>

Moreover, these biases more harshly affect minority women, who face a mixture of both gender and racial biases. For example, Asian American women were more likely to face workplace

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<sup>35</sup> Ann Bartow, *Patent Law, Copyright Law, and the Girl Germs Effect*, 90 ST. JOHN'S L. REV. 579, 588 (2016), [https://scholars.unh.edu/law\\_facpub/260/](https://scholars.unh.edu/law_facpub/260/) (citing Cassidy R. Sugimoto, et al., *The Academic Advantage: Gender Disparities in Patenting*, PLOS ONE (2015), <http://bit.ly/2N6Uy08>).

<sup>36</sup> AM. COUNCIL EDUC., *Pipelines, Pathways, and Institutional Leadership* (2017), <http://bit.ly/2xa79VF>.

<sup>37</sup> *Id.*

<sup>38</sup> *Id.*

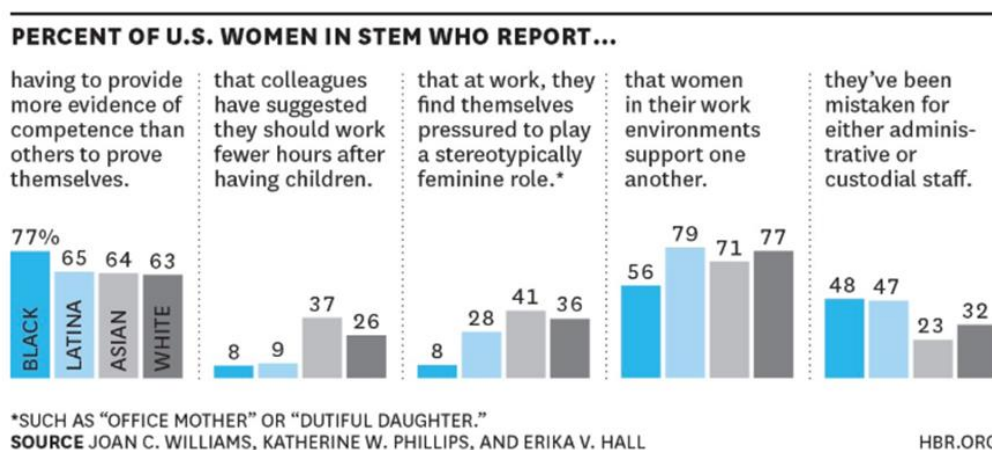
<sup>39</sup> *Id.*

<sup>40</sup> Joan C. Williams, et al., *Tools for Change: Boosting the Retention of Women in the STEM Pipeline*, 6 J. RES. GENDER STUD. 11 (2016), <http://bit.ly/2RzOfAW>. Professor Williams has also summarized the findings for a more general audience. Joan C. Williams, *The 5 Biases Pushing Women Out of STEM*, HARV. BUS. REV. (Mar. 24, 2015), <http://bit.ly/2x9Mvor>.

pressures to fulfill traditionally feminine roles, and masculine behaviors such as being assertive and self-promoting led to greater backlash.<sup>41</sup> Latina women were similarly judged for being assertive, were also penalized for expressing anger, and reported having higher expectations to do “office housework” than black or Asian American women.<sup>42</sup>

Meanwhile, black women reported to have to provide more evidence to prove their competence than Latina, Asian American, and white women.<sup>43</sup> Though black women faced the least backlash when being assertive or self-promoting, this was only so long as they were not perceived as a so-called “angry black woman.”<sup>44</sup> Three-quarters of women agreed that women in science tended to support one another, but one-fifth also reported a feeling of competition with other women in professional environments consisting primarily of men.<sup>45</sup> Individually and in the aggregate, these biases reflect marked barriers to entry and success for women in STEM-related careers.

Percent of U.S. Women in STEM Who Report...<sup>46</sup>



In addition to race, socioeconomic status is also a source of disparate impact. Indeed, women from less-advantaged backgrounds are even more significantly affected as to education, occupations, and patenting.<sup>47</sup> In addition to the gender and racial or ethnic biases, minority women face less robust access to higher education and, when they do pursue it, lower quality of education and greater debt.<sup>48</sup> These factors, in addition to the biases women face at work, are likely to create an even larger disparity in the share of patenting by women.

Addressing the gender gap in patenting is a multi-layered issue that requires systematic study of the implicit or explicit biases—including intersectional problems of race and socioeconomic status—that impede the participation of women in STEM-related education and careers. These

<sup>41</sup> *Id.*  
<sup>42</sup> *Id.*  
<sup>43</sup> *Id.*  
<sup>44</sup> *Id.*  
<sup>45</sup> *Id.*  
<sup>46</sup> *Id.*  
<sup>47</sup> See generally Lorelle L. Espinosa, et al., RACE AND ETHNICITY IN HIGHER EDUCATION: A STATUS REPORT, AM. COUNCIL EDUC. (2019), <http://bit.ly/2X3n2fS>.  
<sup>48</sup> *Id.*

threshold problems have lasting impacts on the innovative and entrepreneurial activities in which women can even meaningfully participate. In turn, these threshold problems limit the ability of women to seek and successfully obtain patents.

## **8. What entities or institutions, if any, should or should not play an active role in promoting the participation of women in the patent system and entrepreneurial activities?**

The USPTO's obligation to ensure the integrity of, and equitable access to, the patent system means that it must not only play an active role in promoting the participation of women but also lead and coordinate the related efforts of other institutions. Recent empirical findings on the demographics of patenting, especially the underrepresentation of various demographic groups including women,<sup>49</sup> suggest that greater involvement and leadership by the USPTO would be well founded.<sup>50</sup> As discussed above, collecting demographic information from inventors at the time of application, with safeguards to minimize examiner bias, would be a strong first step.<sup>51</sup>

To explore next steps, the USPTO should consider private organizations as well as government institutions with whom to collaborate in promoting the participation of women in the patent system. Among private organizations, we encourage the USPTO to focus on those that directly promote women in STEM-related fields, such as the Women in Engineering Proactive Network,<sup>52</sup> Million Women Mentors,<sup>53</sup> the Scientista Foundation,<sup>54</sup> the American Association of University Women,<sup>55</sup> and the Association for Women in Science.<sup>56</sup> These groups are well placed to reach different subgroups of women and to make an impact in their respective areas of focus.

Meanwhile, government institutions that should be especially active include some whose expertise and research we have already noted: the NSF, NIH, and National Women's Business Council. Agencies such as the NSF are important because of the so-called "bottom up" approach that they take to the research that they fund. This approach means that they not only provide funding for research by women and other demographic groups but also remain involved and interested in the outcomes and translational potential of that research toward further socially productive ends.<sup>57</sup>

One particularly potent collaboration between the NSF and NIH is the Science and Technology for America's Reinvestment Measuring the EffECtS of Research on Innovation, Competitiveness and Science (STAR METRICS) initiative designed to "create a repository of data and tools that will be useful to assess the impact of federal R&D investments."<sup>58</sup> With tools such as STAR

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<sup>49</sup> Jensen, et al., *supra* note 21; Alexander M. Bell, et al., *Who Becomes an Inventor in America? The Importance of Exposure to Innovation*, NBER Working Paper No. 24062 (Dec. 2017), <https://www.nber.org/papers/w24062>.

<sup>50</sup> Amy Motomura, *New Research on Gender Differences in Obtaining and Maintaining Patent Rights*, STANFORD LAW AND BIOSCIENCES BLOG (Nov. 23, 2018), <https://stanford.io/2LaDQdx>.

<sup>51</sup> See *supra* p. 5.

<sup>52</sup> Women in Engineering Proactive Network, <https://www.wepan.org/>.

<sup>53</sup> Million Women Mentors, <https://www.millionwomenmentors.com/>.

<sup>54</sup> Scientista Foundation, <http://www.scientistafoundation.com/>.

<sup>55</sup> American Association of University Women, <https://www.aauw.org/>.

<sup>56</sup> Association for Women in Science, <https://www.awis.org/>.

<sup>57</sup> NSF, *How We Work*, <https://www.nsf.gov/about/how.jsp>.

<sup>58</sup> Star Metrics, <https://www.starmetrics.nih.gov/>.

METRICS, the NSF and NIH are well positioned to track research for long periods of time and to ensure that public money is invested in programs that have concrete and significant positive impacts on women’s participation in STEM-related activities, patenting, and entrepreneurship.

The USPTO would benefit from working directly with those organizations that foster interest in STEM education among women. The USPTO would also benefit from educating women on the particular values that patents offer in innovation, entrepreneurship, capital investment, and market entry in light of the NWBC’s finding that “[m]ost women entrepreneurs are ambivalent about the benefit of a patent.”<sup>59</sup> To this end, the USPTO could partner formally with the NWBC to continue conducting and disseminating research such as the 2012 reports.<sup>60</sup> The more data that is collected, the easier it will be to address the imbalanced involvement of women in the patent system.

#### **10. What action could the USPTO take to address the participation of women in the patent system and entrepreneurial activities?**

As an initial matter, the USPTO should collect demographic information at the time of application on the application data sheet, the cover letter, or the oath and declaration. Collecting this information will give the USPTO more direct and reliable data about the incidence of women among inventors over time, across geography and technology, and along many other dimensions of interest. As we discuss above, making this data available to relevant business units within the USPTO while properly insulating it from the examination process would provide the Office a framework for minimizing bias and ensuring equitable access to the patent system.<sup>61</sup>

Another action that the USPTO should take is to maintain user-friendly access to the USPTO’s own services. For those who are already inclined to take part in the patent system, the Office can increase the accessibility of relevant information. The 2012 NWBC reports identified a common theme that the USPTO’s website was confusing and hard to navigate.<sup>62</sup> Since then, the USPTO has invested in updating its website to make it more user-friendly and should continue to do so.

More generally, the key to increasing participation of women in the patent system is to increase the number of women who have careers in STEM-related fields.<sup>63</sup> We refer the USPTO to three actionable suggestions in this regard by Professor Annette Kahler:

- (1) to increase participation by women in engineering and computer science, as these are areas of great innovation in the patent system and they are the most gender imbalanced;
- (2) to study the impact of women on the innovation system so that there is hard data on the benefits to innovation from a more balanced workforce; and
- (3) to take more of a leadership role in increasing the participation of women in the patent system—specifically, that the USPTO should collect gender data from practitioners and publish frequent studies about women inventors.<sup>64</sup>

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<sup>59</sup> NWBC, *supra* note 1 (Part II), at 13.

<sup>60</sup> *Id.*

<sup>61</sup> *See supra* p. 5.

<sup>62</sup> NWBC, *supra* note 1 (Part II), at 26–27.

<sup>63</sup> Annette I. Kahler, *Women Joining the Patent Workforce*, 5 No. 4 LANDSLIDE 48 (Mar./Apr. 2013).

<sup>64</sup> *Id.*

**11. Are there policies, programs, or other targeted activities shown to be effective at recruiting and retaining women in innovative activities? Are there policies, programs, or other targeted activities that have proved ineffective?**

While a great many programs work to recruit and retain women in innovative activities, the NSF is a leader both in making such recruitment and retention efforts directly through grant funding and in studying the effects of such efforts. For example, the NSF established the ADVANCE program to “increase the participation and advancement of women in academic STEM careers.”<sup>65</sup>

Notable success has also come from university initiatives such as the Accelerating Women and Underrated Entrepreneurs (AWARE) program at the University of Illinois Research Park. The AWARE program provides women in academic STEM careers with networking opportunities and individualized support, with special emphasis on underrepresented faculty and graduate women.<sup>66</sup> These initiatives report a number of successful case studies of women who have used the program to launch technology-based startups.<sup>67</sup>

The Empowering Women in Technology Startups (EWITS) initiative at the University of Florida has shown similar success.<sup>68</sup> Like many university efforts, EWITS is organized around existing university infrastructure for technology licensing and business incubation.<sup>69</sup> Of the women who have participated in EWITS, 7% have started their own businesses and 29% went to work for technology companies.<sup>70</sup> Partnership and collaborative research with EWITS, AWARE, and similar organizations would be useful to the USPTO as an independent source of case study data.

Naturally, those entities and institutions that we have previously identified as deserving an active role in promoting the participation of women in the patent system<sup>71</sup> are also sources of programs that successfully recruit and retain women in innovative activities, especially upstream STEM-related activities. These include the Women in Engineering Proactive Network,<sup>72</sup> Million Women Mentors,<sup>73</sup> the Scientista Foundation,<sup>74</sup> the American Association of University Women,<sup>75</sup> and the Association for Women in Science.<sup>76</sup> They also include Girlstart,<sup>77</sup> Girls Who Code,<sup>78</sup> and the National Girls Collaborative Project.<sup>79</sup>

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<sup>65</sup> NSF ADVANCE, *Organizational Change for Gender Equity in STEM Academic Professions*, <http://bit.ly/2LaM4SZ>.

<sup>66</sup> UNIV. OF ILLINOIS RES. PARK, Accelerating Women and Underrated Entrepreneurs, <http://bit.ly/31QDTB7>.

<sup>67</sup> *Id.*

<sup>68</sup> UNIV. OF FLORIDA, Empowering Women in Technology Startups, <http://ewits.org/>.

<sup>69</sup> *Id.*

<sup>70</sup> *Id.*

<sup>71</sup> *See supra* pp. 10–11.

<sup>72</sup> Women in Engineering Proactive Network, <https://www.wepan.org/>.

<sup>73</sup> Million Women Mentors, <https://www.millionwomenmentors.com/>.

<sup>74</sup> Scientista Foundation, <http://www.scientistafoundation.com/>.

<sup>75</sup> American Association of University Women, <https://www.aauw.org/>.

<sup>76</sup> Association for Women in Science, <https://www.awis.org/>.

<sup>77</sup> Girlstart, <https://girlstart.org/>.

<sup>78</sup> Girls Who Code, <https://girlswhocode.com/>.

<sup>79</sup> National Girls Collaborative Project, <https://ngcproject.org/>.

## **Conclusion**

The demographic information about inventors that the USPTO currently collects and makes available requires much additional data-matching, inference, and estimation for study. The resulting empirical research into demographic diversity in the U.S. patent system represents an important first generation of careful study. However, the unique ability of the Office to collect data more directly and reliably and to provide necessary leadership and coordination points the way to a second generation of even more sophisticated and rigorous analysis—and ultimately to well-informed and evidence-based policymaking. The path of this policymaking must lead through the challenges of increasing women’s participation in educational attainment as well as professional success in STEM-related fields. Only from addressing these upstream challenges can there be meaningful impact on women’s participation in patenting.

The legal and institutional constraints that the USPTO faces in these endeavors are significant, and we agree with those who give priority to concerns about privacy, burdens on applicants, and the potential for bias in examination. Nevertheless, we believe that these obstacles can be overcome through procedural safeguards, the judicious use of pilot programs, and the transparent and inclusive strategic planning that the USPTO is already demonstrating. Moreover, we see and have worked to identify a host of public and private organizations that are similarly committed to the success of women in innovation and entrepreneurship and that stand ready to assist the USPTO—indeed, that should look to the USPTO for leadership.

Respectfully submitted,

**Alexandra M. Fuchs**

Juris Doctor Student, Class of 2020  
Texas A&M University  
USPTO Reg. No. 78,140

**Lora Elkins-Naismith**

Juris Doctor Student, Class of 2021  
Texas A&M University

**Saurabh Vishnubhakat**

Associate Professor, School of Law  
Associate Professor, Dwight Look College of Engineering  
Texas A&M University