College of Liberal Arts & Sciences

TESTIMONY

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Introduction

Chairman Baird, Ranking Member Ehlers and distinguished members of the Subcommittee, thank you for the invitation to testify today. It is an honor for me to comment on specific provisions in the legislation pending before the Subcommittee.

My research, professional, and university service has centered on understanding the issues related to the advancement of women in science and social science careers and engaging in institutional transformation efforts to affect change for women academics. I have published eight articles and written six additional working papers on the topic of gender differences in employment outcomes in academia.[1] In 2003 I received a National Science Foundation grant to investigate "Gender Differences in Employment Outcomes for Academics in Science and Social Science" SES-0353703 which has provided financial support for this research agenda. In addition, I have served as a co-Principle Investigator for two NSF ADVANCE Institutional Transformation grant proposals submitted by the University of Kansas. I serve on the Board of Directors of the Committee of the Status of Women in the Economics Profession of the American Economics Association where my main duty is to run national mentoring workshops for junior faculty. Finally, I am currently the chair of the Faculty Compensation Committee at the University of Kansas where I have worked to create and implement tenure stop-clock and modified instructional duties policies for faculty engaged in family caregiving responsibilities. In these many capacities, I feel qualified to comment on *Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008*.

[1] These publications and working papers are listed in the references.

My research shows that women who have children are less likely to enter academic science careers. The single most important step Congress can take to fulfill the potential of women in academic science is to allow universities the opportunity to count child care facilities toward indirect costs in order to expand availability of childcare for academic caregivers.

Summary of Research Results

Many studies, most recently the National Academies Report, *Beyond Bias and Barriers,* have documented gender differences in hiring, salary, and promotion. However, interpreting the causes of gender disparities in employment outcomes requires an in-depth examination of the data.

Economic theory provides the underpinnings of my research on these issues. Economists start by assuming that employment outcomes are determined by market forces. Wages and hiring are determined by the supply of and demand for Ph.D. scientists. Equally productive workers, regardless of gender, will be paid the same and hired in similar numbers given market forces. Given these assumptions, one should not observe hiring, promotion, and salary differences by gender. However, persistent gender wage and employment differentials persist on average in the market as a whole (Altonji and Blank, 1999) and for scientists in particular (Ginther, 2001 2006).

Beginning with Becker's seminal work on discrimination (Becker, 1971), economists have developed models to understand gender and racial disparities in employment outcomes. Becker argues that taste-based discrimination (prejudice) will be eliminated by competitive forces. As a result, bias and prejudice are ruled out as explanations of the gender gap unless all other possible explanations posited by economic theory have been disproved. One alternative to discrimination, individual "preferences" or choices, are most-often used to examine the gender gap. Preference-based explanations argue that gender differences in employment outcomes result from choices, in particular differences in productivity. Since theory holds that equally productive workers are paid or promoted the same, it follows that gender differences in employment outcomes are the result of differences in productivity. A second preference-based explanation is that women choose to marry and have children, which in turn affects their attachment to their careers and overall productivity.

If the researcher cannot explain the gender differences in employment outcomes using one of the above explanations, then the residual gender difference in hiring, promotion, or salary may be attributed to discrimination. However, economists continue to search for rational explanations – ones that will not be eliminated by competitive forces. Statistical discrimination suggests that imperfect information on the part of employers generates wage differentials. In this model, an employer attributes the average characteristics of a group to an individual member of this group—essentially, the employer uses a stereotype in making hiring decisions or setting wages. As a result, we observe gender differences in employment outcomes. However, direct measures of statistical discrimination are difficult to come by. Thus, discrimination may be inferred when other plausible explanations have been ruled out.

Given these principles, my research poses the question: Does Science Discriminate Against Women? I have evaluated gender differences in hiring, promotion, and salary. I find that gender differences in hiring are largely explained by the presence of children—mothers are less likely to obtain tenure-track jobs in science and social science (Ginther and Kahn forthcoming, 2006). Once women are on the tenure track, we find no significant gender differences in promotion to tenure or full professor in the sciences (Ginther and Kahn

forthcoming). However, women are much less likely to get tenure or be promoted to full professor in the social sciences, especially in economics (Ginther and Kahn 2004, 2006). Finally, I find that female full professors in the sciences earn significantly less than men and the gap is not fully explained by observable characteristics (Ginther 2001, 2003, 2004, 2006c).

Although I document substantial gender gaps in promotion and salaries, I cannot rule out the fact that productivity differences explain the salary gap in science and the promotion gap in social science. Also, the results in Ginther and Kahn (forthcoming) suggest that factors related to marriage and children during the postdoctoral period reduce the number of women in tenure track academic science. Until we have better data, as an economist, I am not in a position to conclude that bias is the sole determinant of the gender gap in science.[2]

Data Needed to Understand Gender Disparities

My research on gender differences in employment outcomes has used the Survey of Doctorate Recipients collected by the NSF. The SDR is the best data available for studying career outcomes of science doctorates. Like all data, the SDR is not without limitations. Namely, the SDR lacks information on academic productivity, publications and citations that would allow researchers to determine whether productivity instead of bias is the underlying cause of the gender gap in salary and promotion.

Although the SDR has collected information on publications and patents, the data are not available in every year of the survey and therefore cannot help us understand the point in a person's career where things turn around. Further, the SDR does not contain information on the quality of publications measured by citations. First and foremost, we need information on academic productivity measured by publications, citations, and journal impact in order to discern whether productivity differences explain the gender gap. Second, information on the size and duration of federal grants would provide another indication of scientific productivity. One could then examine the correlation between grant funding, publications, and citations to create a measure of the return on the federal investment in science. Finally, patent applications and patents granted from the U.S. Patent and Trademark Office could be included in the data set.

In 2003, I submitted "Gender Differences in Employment Outcomes for Academics in Science and Social Science" SES-0353703 to the NSF. This grant proposed to merge publication data from Thomson-ISI's *Web of Science* onto the SDR. I submitted this grant because reviews of the previous proposal indicated that SDR data without productivity measures was insufficient to answer the research question that I had posed. My grant was funded in 2004, and the creation of the SDR Productivity Database has been a work in progress ever since.

Essentially, a proposal to merge SDR data with other data sources puts legitimate research of importance to Congress at odds with the Confidential Information Protection and Statistical Efficiency Act of 2002. It took until 2006 for NSF to establish a policy permit matching SDR data with other sources. Since 2006, I have drafted several revisions of the data matching proposal as NSF gathered the necessary data to make the match a reality. In the interim, the NSF funded a research conference, "Collaborative Research: Workshop on linking NSF SED/SDR Data to Scientific Productivity" SRS-0725475 which brought together researchers interested in using the SDR Productivity data, statistical experts on linking data sets, and staff from the NSF Division of Science Resource Statistics to discuss the issues involved in

[2] Better data does make an important difference. In Ginther and Kahn (2004) we collect publication data and find that the gender gap in promotion in economics cannot be explained by productivity differences. These results indicate that bias likely explains the gender promotion gap in economics.

creating the data with the least amount of matching error, ensuring its confidentiality, and providing access to the research community.[3]

The creation of the SDR Productivity Database is still a work in progress. Since my original proposal, I have expanded the scope to including matching the SDR with U.S. Patent and Trademark Office patent data as well. I am exploring the possibility of merging information from the NIH trainee database as well as their grants database onto the SDR in order to examine the effect of early NIH fellowship awards on later career outcomes. Once the data are created, I plan to use it to evaluate the gender gap in salary and promotion in academic science in order to draw more definitive conclusions about the explanations for the gap.

Additional data beyond productivity would provide greater insight into the under-representation of women in science. To understand the effect of marriage and children during the postdoctoral period on the gender gap in obtaining a tenure track job, new questions would need to be added to the SDR survey instrument. These would include:

- Number, length, and institutional affiliation of post-doctoral appointments
- Spouse information including education, employment and earnings
- Childcare and housework time

This series of questions would allow researchers to determine whether the post-doctoral process, work-family tradeoffs, or a combination of both lead to fewer women in academic science.

In addition to the SDR, I recommend that federal agencies such as the NSF and NIH work with professional societies to collect information on the demand for scientists. In particular, researchers could make use of data on the number of academic and non-academic jobs available in scientific fields.[4] Information on the demand for scientists measured by the number of job openings could then be compared with the number of doctorates granted in the Survey of Earned Doctorates. This comparison would allow researchers and policy-makers to identify the effect of supply and demand on the market for scientists.

Workshops on Gender Bias

The proposed legislation mandates holding national workshops to educate grant review panels and department chairs about methods that minimize the impact of gender bias in evaluation. These workshops are likely modeled after an initiative in academic chemistry departments (http://www.chem.harvard.edu/groups/friend/GenderEquityWorkshop/). The goal of these workshops is to inform individuals about gender bias and its impact with the hope being that rational scientists who are presented with research that contradicts their prior beliefs will change both their attitudes and behavior. These changes will then translate into better outcomes for women in academic science. I strongly support the goal of this initiative.

However, I have a few comments and concerns about this proposal. First, the effectiveness of the proposed workshops needs to be judged by its impact on evaluation outcomes. All too often, people assess attitudes before and after a workshop and if the attitudes have changed, the workshop is judged a success. Attitude change is often fleeting, and success should be measured not simply by reference to internal states but by reference to external outcome variables.

[3] Information from this conference is available at http://www.albany.edu/~marschke/Workshop/.

[4] For example, the American Economic Association publishes *Job Openings for Economists* which contains a monthly list of all jobs for economics doctorates. This information could be compiled annually to get a count of jobs available as a measure of demand for economists.

To evaluate the effectiveness of the gender bias workshops, a valid research design is critical. First, I suggest having a treatment and control group evaluate the same request for funds in a funding panel setting. The funding agency could use previously evaluated proposals from prior years as the control group and then have a "treatment" review panel that participated in a gender workshop evaluate the proposals a second time. Any differences in evaluation between the treatment and control group scores can then be attributed to the gender bias workshop--the 'treatment.' Second, the review panel should focus on funding for individuals such as postdoctoral fellowships. This would reduce any bias related to the quality of the research proposal and would mimic evaluations of individuals that occur throughout scientific careers (e.g. for promotion and tenure). Researchers should then compare the evaluation scores of the same proposal by the treatment and control groups. If there are statistically significant differences in evaluations, this would be evidence that bias has a causal effect on funding outcomes. Once this fact has been established, it would make sense to implement these workshops as broadly as possible.

A second concern has to do with the problem of motivation among workshop participants. Changing beliefs is difficult, and workshops like this will be successful if the people who attend are motivated by the purpose and methods. I posit that this will not be a problem for grant review panelists, who are working on behalf of the funding agencies. However, I remain skeptical about the workshops' effectiveness among department chairs. While this may vary depending on the discipline, in Economics (where faculty typically believe in efficient labor markets), department chairs are likely to be a hostile audience. I think these workshops have to be structured and participants motivated very carefully to impact these decision makers.

Third, my research shows that women leave academic science during the postdoctoral period. Gender workshops focused on grant review panelists and department chairs would seem to miss the most critical group that could affect change for women in academic science--the postdoctoral supervisors. Thus, it makes sense that principle-investigators who are supervising postdoctoral students would be an important target audience for these workshops.

Finally, I recommend that the Subcommittee consider expanding the scope of the workshops to include mentoring activities for postdoctoral students and junior faculty in the science disciplines. COACh in chemistry and CeMENT in economics provide excellent examples of existing initiatives. I am currently serving as the Coordinator of the CeMENT National mentoring workshops for the Committee on the Status of Women in the Economics Profession. These workshops are funded by the NSF and the American Economic Association and are designed to help junior economists overcome the tenure hurdle, with a special focus on addressing the unique challenges that women face at the beginning of their careers. The workshops are aimed at junior faculty in institutions where tenure is primarily based on research output. At the workshops, participants are arranged into small groups based on their research areas and matched with senior mentors. The format and curriculum are designed to create and cement relationships among the participants, as well as between the participants and the mentors. Large group sessions address the publication process, grant writing, teaching, professional activities, the tenure process, and work-life balance. Small group sessions consisting of researchers in the same field provided feedback on junior scholar research papers and grant proposals.

As with most mentoring workshops, the participants are pleased with the information provided to them. However, the evaluation of the program does not end with participant surveys.

CeMENT is now in its third wave of six randomized trials designed to evaluate the effect of mentoring on career outcomes. Each workshop has had over 80 applicants of which approximately half are randomly invited to the workshop. The CeMENT research team follows the CeMENT treatment and control groups for several years to evaluate whether or not mentoring has an impact on publications, grants, and ultimately, the tenure decision. CeMENT is the only experimental evaluation of mentoring that we are aware of. We hope to have preliminary results to report in the coming year.

The mentoring workshops can complement the proposed workshops for review panels, postdoctoral supervisors, and department chairs. By providing information and education to both sides of the process, we can have a larger impact and expect to see more change than addressing either side independently.

Extending Grant Support for Caregiving

Both the NSF and NIH provide for no-cost extensions of grant monies. The NIH website indicates that grants can be extended because of caregiving responsibilities (http://grants.nih.gov/training/faq_childcare.htm). These practices can and should be implemented across federal funding agencies.

Federal Role in Gender Equity

Throughout this testimony I have argued for the need for better data to evaluate gender disparities, more effective evaluation of gender bias workshops, and the addition of mentoring workshops. I will now make specific recommendations that will allow the Federal government to directly address barriers to gender equity in academic science.

1. Provide grant support to caregivers through direct and indirect costs. Availability of daycare on campus is in short-supply. No faculty member can be productive if they are preoccupied with the care of their children while they are at work. The Federal government should allow universities to count facilities for daycare provided on campus towards indirect costs, in particular, the number of spaces available for infant care.[5] This would provide a subsidy for the expansion of daycare centers on campus which would free up the time of caregivers. In addition, I want to echo Myron Campbell's testimony before the committee in recommending that Federal OMB guidelines[6] be modified to allow faculty members to charge grants for the cost of childcare during a conference, or the cost of having small children travel to conferences be charged against direct or indirect grant costs (http://democrats.science.house.gov/Media/File/Commdocs/hearings/2007/research/17oct/Campbell_testimony.pdf).

2. Provide financial support for improved data collection and research analysis to better understand gender disparities in academic science. The SDR Productivity Database described previously is very much a work in progress. Additional funding could expand the scope of the database and improve its quality. In particular, information on publications, citations, and patents should be updated with each new wave of the SDR. Both the NSF and President Bush's science advisor, John Marburger, cite the need to devise new measures of the status of science and technology (S&T) in the economy, as it is widely believed that current formulations insufficiently represent current S&T practices. Linking existing data sets together provides

[5] According the NIH website http://grants.nih.gov/training/faq_childcare.htm, no NIH grantee covers childcare as an indirect cost.
[6] http://www.whitehouse.gov/omb/circulars/a021/a021.html.

several advantages in producing new information on S&T because of the time it takes to implement changes to existing national surveys. I justify matching existing data along a number of dimensions. First, innovation in the U.S. changes more rapidly than the data are collected. Researchers and the NSF can save time by matching existing data sets to measure and understand changes in innovation. Second, matched data are complementary to and enhance existing national surveys. The findings from research using the matched data can help in reformulating national surveys and suggest modules that could explore more fully phenomena discovered in the matched data. Third, matched data provide increased flexibility for research. Researchers will not need to wait up to ten years to gain access to revised national surveys. Finally, matched data will allow researchers and policy-makers to examine questions that have not been adequately addressed because of data limitations.

In addition to matched data, questions should be added to the SDR that directly address the postdoctoral experience, education and employment of the spouse, and time allocated to caregiving duties.

Once these data are created, steps must be taken to maintain the confidentiality of the data while providing broad access to the research community. I recommend two approaches to confidentiality. First, synthetic data could be site-licensed to individuals in research community to allow preliminary estimates to be performed. Second, the NSF should explore technological solutions for maintaining the confidentiality of the SDR Productivity Database such as a virtual private network with encrypted access. Final estimates could be performed on the secured data.

3. Evaluate gender intervention programs and disseminate best practices. Since its inception in 2001, the NSF ADVANCE program has funded 32 institutional transformation grants as well as several leadership grants such as the CeMENT workshops. Each institution has devised interventions to improve the climate, hiring, retention, and compensation of women in science. This year, the NSF has begun an evaluation to document the effectiveness of institutional transformation programs. It is my hope that the evaluation results in a series of best-practices that can be used as a model for other federal agencies.

Conclusion

Mr. Chairman, once again I thank you for this opportunity to testify today. The under-representation of women in academic science results from more than implicit or explicit bias. Although bias may play a role, my research suggests that the difficulties women face in balancing work and family and in the postdoctoral years cause too many women to leave science. Immediate childcare support on campus for graduate students, postdoctoral students, and faculty, better data and greater access to the data, and rigorous evaluation of interventions will allow for a more-complete picture of the problem and point to the necessary solutions.

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Dr. Ginther has been published in several journals, including the *Journal of the American Statistical Association*, *Journal of Economic Perspectives*, *Demography*, and the *Papers and Proceedings of the American Economic Association*. She has also received research funding from the National Science Foundation, the National Institutes of Health, and the Ewing Marion Kauffman Foundation. She is currently a member of the Board of the Committee on the Status of Women in the Economics Profession of the American Economic Association in charge of organizing the CeMENT national mentoring workshops.

A native of Wisconsin, Dr. Ginther received her doctorate in economics in 1995, master's degree in economics in 1991, and bachelor of arts in economics in 1987, all from the University of Wisconsin-Madison.