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**Women across Subfields in Economics:
Relative Performance and Beliefs**

P. Beneito
(University of Valencia and ERI-CES)

J. E. Boscá
(University of Valencia and FEDEA)

J. Ferri
(University of Valencia and FEDEA)

M. García
(FEDEA)

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¿Por qué la Economía está consolidándose como una disciplina con escasez de mujeres? Esta pregunta, aun no siendo nueva, está siendo objeto en los dos últimos años de una gran atención por parte de la profesión, especialmente en la academia. El bajo porcentaje de mujeres en la investigación académica en economía es un hecho desde hace décadas, pero, al contrario de lo que podría esperarse, dicha escasez relativa no parece haber evolucionado positivamente en los últimos años. Las tasas se sitúan entre el 20 y el 25 por ciento, dependiendo de la base consultada.

Relacionado con lo anterior, la tasa de estudiantes mujeres de economía se sitúa entre el 25 y el 40 por ciento, dependiendo del país considerado, y con tendencia a la baja. Los motivos por los que se argumenta que esto puede estar ocurriendo son variados y recurrentes, si bien la evidencia existente al respecto es todavía limitada. Algunas de las explicaciones más comunes son que: i) las mujeres no optan por carreras de contenido matemático (algo desmentido actualmente por las tasas crecientes de mujeres en matemáticas); ii) las mujeres no encuentran la economía interesante (a juzgar por encuestas pasadas a estudiantes pre-universitarios que han seguido cursos de economía en bachiller); iii) el estereotipo del economista como una figura de varón.

Las consecuencias de esta escasez relativa de mujeres en la profesión no se reducen, aun siendo muy importante, a una cuestión de igualdad de género. Una primera línea de investigación reciente pone de manifiesto que los puntos de vista sobre temas centrales en economía pueden mostrar diferencias considerables por género. Esto, junto con el hecho de que las mujeres investigadoras en economía tienden a concentrarse en ciertos temas de investigación más que en otros, puede acabar generando un sesgo bastante marcado en los temas que reciben mayor atención, y en el tipo de respuestas que reciben. Una segunda línea actual de investigación ha puesto el énfasis en la idea de que la investigación se enriquece con la diversidad dentro de los grupos que la llevan a cabo, siendo el género una de las dimensiones más destacadas de dicha diversidad.

Nuestro trabajo aporta una explicación nueva al escaso atractivo relativo que la economía parece ejercer sobre nuestras jóvenes estudiantes. En resumen, obtenemos que las áreas de investigación económica donde las mujeres tienen más presencia académica se relacionan con las áreas de estudio donde las mujeres estudiantes en la universidad obtienen mejores calificaciones en relación a los hombres. Sin embargo, justamente estas áreas son las menos conocidas por nuestros estudiantes, que tienden a asociar la mayoría de los trabajos de un economista con un macroeconomista, mayoritariamente varón.

Esta explicación surge a partir del análisis que efectuamos en tres frentes. En primer lugar, utilizamos técnicas de extracción de información web aplicadas a los trabajos presentados en el congreso anual de la American Economic Association durante años recientes. A partir de la clasificación de los trabajos según sus códigos JEL, observamos que el porcentaje de mujeres investigando en economía está en torno

al 24 por ciento, se mantiene bastante estable a lo largo de los años analizados, 2010-2016, y con una distribución desigual por áreas: cerca de un 30 por ciento en microeconomía y en torno al 18 por ciento en macroeconomía, finanzas y econometría/matemáticas. Analizando los abstracts, temas específicos como economía de la educación, laboral, de la salud, o de género presentan cerca de un 45 por ciento de mujeres, frente a un 13-15 por ciento de mujeres en temas específicos de finanzas y macroeconomía.

En segundo lugar, y constituyendo evidencia inédita al respecto, estimamos el diferencial de notas de las mujeres frente a los hombres en sus estudios universitarios de economía por áreas. Utilizando datos de registro de la Universidad de Valencia, analizamos las calificaciones obtenidas por hombres y mujeres matriculados en economía desde 2010 a 2014. Disponemos de sus notas en todas las asignaturas cursadas durante la carrera, que clasificamos en distintos campos de estudio (finanzas, macroeconomía, microeconomía, asignaturas instrumentales, y 'otras'). Controlando por su capacidad académica (notas de entrada), características del individuo como edad, situación laboral y lugar de residencia, así como por nivel educativo y tipo de ocupación de padre y madre, obtenemos claras diferencias entre hombres y mujeres en las asignaturas de macroeconomía y microeconomía. En nuestra estimación en asignaturas optativas, por cuantiles de notas, y después de aislar el efecto que pueda tener la manera en que los estudiantes realizan su selección de asignaturas, obtenemos que las mujeres superan en notas a sus compañeros varones en microeconomía, mientras que sus notas son inferiores en las asignaturas de macroeconomía. Los resultados son más abultados en los cuantiles altos de la distribución de notas.

Por último, a partir de una encuesta pasada a nuestros estudiantes de economía durante el curso 2017-2018 analizamos la información que nos proporcionan acerca de su visión de distintas asignaturas y de la propia profesión. Los resultados más llamativos se refieren a la concepción equivocada que mantienen acerca de la profesión: preguntados acerca de ocupaciones propias de un economista (trabajar en un centro de estudios/investigación, servir de asesor a instituciones públicas/privadas, hacer carrera académica, hacer oposiciones para la administración, trabajar en el sector privado) contestan mayoritariamente que los asocian a la macroeconomía, y también, en algunos de los casos, en mayor medida a hombres. Además, en mayor proporción que los hombres, las mujeres declaran encontrar la microeconomía más intuitiva, más fácil de aprobar, más preocupada por los problemas de la sociedad, más interesante en general, y declaran obtener mejores notas. También observamos que los estudiantes que declaran haber entrado con vocación en la carrera manifiestan una mayor preferencia por la macroeconomía. Por último, del estudio de las interacciones sociales dentro del aula encontramos que las mujeres son especialmente influenciadas por sus compañeros varones en las asignaturas relacionadas con la macroeconomía, algo que no sucede con las asignaturas de corte más microeconómico. Esta pauta de influencias sociales es diferente de la que encontramos para los estudiantes varones, a los que sólo parece afectar el comportamiento y las preferencias de sus compañeros varones.

En definitiva, en nuestro estudio evidenciamos fallos de información por parte de los estudiantes sobre los temas a los que se dedica la economía y las salidas profesionales de las distintas áreas que configuran la disciplina. La información que llega a los estudiantes está sesgada justamente en contra de aquellas áreas en las que comprobamos que las mujeres tienen ventaja comparativa sobre los hombres en términos de sus resultados académicos y del interés que les despiertan ciertos temas. Por el contrario, los estudiantes confieren a la macroeconomía un protagonismo dentro de la

economía que no se corresponde con su verdadero peso en el conjunto de trabajos académicos, y observamos que los estudiantes varones tienden a superar a sus compañeras mujeres tanto en resultados como en la influencia que ejercen en las asignaturas de macroeconomía. No es de extrañar, por lo tanto, que la combinación de creencias, intereses y resultados provoque que las mujeres se sientan poco inclinadas por los estudios de economía.

Women across Subfields in Economics: Relative Performance and Beliefs

P. Beneito^{a,b}, J.E. Boscá^{a,c}, J. Ferri^{a,c} and M. García^c.

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Abstract

The relative scarcity of female students enrolling in economics has become entrenched over the last decade. We provide evidence of gender differences in performance and in preferences across subfields of the discipline and explore students' beliefs about the profession and their opinions on different subjects. The areas where women stand out relative to men are those that seem to be less well known to our students. We work on three fronts. First, using web scraping and machine learning techniques, we document the relative presence of women across subfields in recent AEA annual meetings. Macroeconomics and finance register the greatest scarcity of women. Second, using administrative records for economics students in a large public university in Spain from 2010 to 2014, we find that women outperform men in microeconomics, while men outperform women in macroeconomics, more evidently in the upper tail of the grades distribution. Finally, data gathered through a self-statement survey given to economics majors reveal that (i) they hold a macroeconomics-biased view of the economics profession; (ii) they exhibit gender differences in their perceptions of the interest and difficulty inherent in different subfields (macro vs. microeconomics); and (iii) their interests and performance are influenced differently by their male and female peers in macro and microeconomics subjects. Taken together, these three pieces of evidence provide a plausible explanation as to why women are relatively less attracted than men to economics, and suggest lines of action to redress the imbalance.

Keywords: Gender, Economics subfields, Information and Beliefs.

JEL classification: A22, J16, J82, D91.

Corresponding author: francisco.ferri@uv.es

^a University of Valencia, Spain; ^b ERI-CES; ^c Fedea.

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1 Introduction

Why are there so few women in economics? This is a question that has captured the attention of economics scholars over the last few years, and one for which the profession does not have a widely accepted answer. In this paper we look inside the discipline and explore whether women's and men's relative performance and their preferences for different subfields of economics, be they natural or socially-shaped, can help identify the areas that may be more congenial to women. Linked to this, are young students aware of the rich variety of topics covered by different subfields of economics? If the information that reaches them is skewed against fields where female students feel more comfortable, then we cannot expect women to feel particularly attracted to economics.

We provide evidence of gender differences in performance and in preferences across subfields of the discipline and explore students' beliefs about the profession and their opinions on different subjects. The areas where women relatively stand out are those that seem to be less well known to our students. We work on three fronts. First, looking at women in academia, we document their revealed preference for specific research topics as compared to men's preferences. Second, we analyze the degree to which the relative performance of women and men across subfields of economics exhibits differences even at undergraduate level. Finally, we explore students' beliefs about the profession and their opinions on different subfields, and relate them to gender interactions in the classroom.

Three complementary sources of data are used to uncover these patterns. First, using web scraping and machine learning techniques, we follow women's attendance at the annual AEA meetings in recent years. We document, first, the significant scarcity of women in the economics academic profession, and, second, the most remarkable gender differences in specific subfields. In particular, session JEL codes from 2010 to 2016 show that women account for barely 24 percent of all authors, with macroeconomics and finance being the subfields with the most severe underrepresentation, at around 18 percent on average over the period. Additionally, we dig into the abstracts to classify the papers by topics, finding sizeable differences in terms of female representation.

Second, we study if the observed differences between subfields are already being established in the early stages of the study of economics. Using administrative records for students of economics in a large public university in Spain (University of Valencia, UV henceforth), we analyze grades obtained by students from 2010 to 2014 in different courses of the economics major, which we classify into subfields (macroeconomics, microeconomics, finance, methods and other). Our econometric results from quantile regressions indicate that women outperform men in microeconomics-related courses, while men outperform women in macroeconomics-related ones; in addition, these relative differences become more noticeable in the upper tail of the grades distribution. No remarkable differences are found in the

rest of the subfields. These results are shown for both compulsory and optional courses, in the latter case after controlling for students self-selecting into certain courses, by means of semi-parametric selection controls.

Why do these differences appear? Since in our estimation we control for students' overall academic ability as well as their specific methodological ability, we can rule out possible gender-based differences in mathematical and analytical ability as a reason for the observed differences across subfields.

Finally, intrigued by these results revealing gender differences in performance in macroeconomics vs. microeconomics-related courses, we analyze information from a specifically-designed self-statement survey given to students enrolled in the economics major at UV in 2018. Both their direct answers as well as our regression results with these data reveal that: (i) students hold a macroeconomics-biased view of the economics profession, often mistakenly associating many economists' occupations with macroeconomics, and those women who view economics as a macro and male-dominated profession tend to report a worse performance in macroeconomics; (ii) self-defined vocational students (those for whom economics was their first best choice among university degrees) are more likely to report a higher relative preference for macroeconomics; (iii) performance in microeconomics is appreciably affected by how interesting students find this subfield, with more women than men reporting a greater interest in microeconomics than in macroeconomics; (iv) students exhibit gender differences in their preferences for the two subfields and in their self-reported relative performance that are in line with the observed distribution of women across areas of research and with the results obtained with the administrative data; and (v) both students' individual interests and their performance seem to be influenced by their male and female peers' interests and performance, with these influences exhibiting differences in macro and microeconomics courses; among other results we find that, in macroeconomics, women's interests respond to their female peers' interests in this subfield while, in terms of marks, only male students exert spillover effects on their peers' performance (both women and men) in macroeconomics classes.

Taken together, the three pieces of evidence provided in this paper suggest a subject-bias in terms of visibility, performance and perceived interest across subfields, which may be connected with the declining trend in female students choosing to study economics.

The rest of the paper is organized as follows. In Section 2, we frame our paper in the ongoing debate about the scarcity of women in economics and highlight its contribution to the literature. Then, in Sections 3, 4 and 5, we present the results from web scraping, administrative data, and economics students' self-reports, respectively. Finally, in Section 6, we summarize our main findings and conclude.

2 The ongoing debate and our contribution

In the last few years, a growing number of voices in both academia and the mass-media has been reflecting on the situation of women in the economics profession.¹ However, despite the recent resurgence of the issue, the underrepresentation of women in economics is not a new concern. The Committee on the Status of Women in the Economics Profession (CSWEP) of the American Economic Association (established in 1971) and the RES Women's Committee (established in 1996) have been working to promote the role of women in economics for some time now. In fact, authors such as Ferber (1995), more than two decades ago, pointed out that the low representation of women and minorities among students of economics had been noticeable for some time. The author reported that around 19 percent of PhDs in economics were earned by women in 1988-89, but ended with the optimistic prediction that " (...), *there is reason to believe that in economics, as in most other disciplines, women's progress will eventually accelerate*", (p-357).

That does not appear to have been the case. On the contrary, according to statistics on the published economists registered with the RePEc Author Service, female representation in economics academia (as of May 2018) still stands at a worldwide average of around 19 percent.² At the undergraduate level, worldwide figures indicate that around 25 to 40 percent of those opting for economics majors are women, with a declining trend over the last 10 years. For the US, as an example, Wolfers (2018)³, using data from the Census Bureau's American Community Survey, reports that women made up 35 percent of economics majors in 2016, a figure about the same as in the early 1980s. Bayer and Rouse (2016), using data from the National Center of Education Statistics in the US between 1995 and 2014,

¹In the summer of 2017, Alice Wu, caused a sort of commotion in the profession revealing the sexist comments posted on the online forum Economics Job Market Rumors (Wu, A. H., 2018, Gendered Language on the Economics Job Market Rumors Forum, in *AEA Papers and Proceedings*). The AEA President, Alvin E. Roth, charged an ad-hoc committee to evaluate various aspects of professional conduct and diversity in economics. The list of posts and articles appearing since then is becoming countless. Just to mention some examples: Justin Wolfers (University of Michigan) in *The New York Times* (<https://www.nytimes.com/2018/02/02/business/why-womens-voices-are-scarce-in-economics.html>, February 2, 2018); Sarah Smith, (University of Bristol, Chair of Royal Economic Society (RES) Women's Committee) in (<https://www.bristol.ac.uk/efm/news/2018/still-a-long-way-to-go-a-century-on.html> February 6, 2018); Anne Boring (Universiteit Rotterdam) and Soledad Zignano (Banque de France) in the *Banque de France, Eco Notepad* (<https://blocnotesdeleco.banque-france.fr/en/blog-entry/economics-where-are-women> July 3, 2018); Gemma C. Tetlow (UCL) in *Financial Times*, (<https://www.ft.com/content/0e5d27ba-2b61-11e8-9b4b-bc4b9f08f381> April 12, 2018); Soumaya Keynes' TEDx Talk ("Why Are There So Few Women In Economics?": <https://www.youtube.com/watch?v=Heiu7RPVggw>, July 27, 2018). Other experts' concerns and opinions, for example, on the BBC-Radio, (<http://www.bbc.co.uk/programmes/b01875r3/topics/Economics>, Claudia Goldin (Harvard University) May 1, 2018, Stephen Machin (CEP and LSE), May 8, 2018, Beatrice Cherrier (THEMA), May 15, 2018).

²<https://ideas.repec.org/top/female.html>, last accessed May 23, 2018.

³*The New York Times* (<https://www.nytimes.com/2018/02/02/business/why-womens-voices-are-scarce-in-economics.html>, February 2, 2018).

calculate the percentage of women with a bachelor's degree in economics in 2014 at 28.4, a lower representation than in other social sciences, business and management, and even in STEM (science, technology, engineering and math) fields. In the UK, the Universities and Colleges Admissions Service (UCAS) cites percentages below 30 percent for female undergraduate students of economics in 2013 (after a decade of decline). In the university that is the focus of this study, UV in Spain, women enrolled in the economics major in 2017 account for 36 percent of the total.

The study of Amanda Bayer and Cecilia Elena Rouse (2016) provides a complete account of the negative consequences that the under-representation of women may have in the economics profession, as well as the possible reasons for the current gender imbalance. As the authors stress, fairness, albeit highly important, is not the only reason to care about the gender balance. They survey the recent strands of research that posit diversity within a profession as a necessary factor to ensure the highest quality of knowledge. One of the strands focuses on the difference of opinions across different groups. In economics, May et al. (2014) find that male and female economists hold different views on important economic outcomes and policies. For example, female economists differ notably from male economists in terms of their preferences about the degree of desirable government regulation, income distribution issues or labor market policies. Hence, the gender imbalance may also imply a sustained bias in the prevailing range of topics and a reduction in the diversity of points of view, which may result in negative effects on research quality.

Another line of research summarized by Bayer and Rouse, mostly based on behavioral analysis through laboratory experiments, shows that diversity changes group dynamics and decision-making. These studies find that, in general, groups with mixed gender composition develop a richer interaction and a "collective intelligence" that helps them to perform better than groups lacking diversity (see, e.g., Woolley et al, 2010, or Hoogendoorn et al., 2013, and references therein).

As regards the possible reasons for the scarcity of women in economics, the authors survey both supply-side and demand-side factors alluded to in the literature. Among the former, we can cite: (i) the recurring explanation that math requirements inhibit women's entry into economics (although there is not in fact strong support for this justification - see Emerson *et al*, 2012 - especially given the fact that there has not been a corresponding decline in the percentage of women enrolling in math degrees); (ii) the role of previous exposure to economics, with more women than men reporting that they do not find economics interesting (Calkins and Welki, 2006, additionally report that perceived interest is a key factor determining degree choices); and (iii) the stereotypical view of economics as a male-dominated field.

On the demand-side, discrimination against women is seen as one of the likely explanations, even if it corresponds to implicit or unconscious bias reflecting existing stereotypes (see

e.g., Greenwald and Krieger, 2006). The fact that the profession is seen as a male-dominated one may have an effect not only on hiring practices, but even possibly on day-to-day interactions such as instructors giving advice to their students. Both female and male instructors may potentially exhibit such biases (Moss-Racusin et al., 2012).⁴

In this paper, we offer a new insight into the possible reasons for the gender imbalance in economics. The suspicion that there may be a subject bias in the profession, along with the likelihood of different gender preferences for different subjects/subfields in economics, provides a plausible explanation as to why women are relatively less attracted than men to economics. Our paper investigates the relative performance of women and men in different subfields of economics, and their different perceptions as regards these subfields and the economics profession. Our main finding is that women display relatively better performance and higher self-selection into microeconomics-related subjects from undergraduate level up, and that students hold a macro-biased (in part also a male-biased) view of the profession. Younger students at pre-university stages cannot be expected to be better informed.⁵ Hence, if young female pre-university students are not aware of the diversity of economic topics, including those in which, according to our findings, they show more interest and perform better, then it is hardly surprising that they do not feel inclined to study economics.

There may be several reasons for the lack of information and, in particular, the subject-bias of the information that reaches young students (or perhaps people in general). Topics in macroeconomics subfields are more frequently on the news and also more frequently presented to general audiences, while many other varied and probably more specific topics analyzed by economists are not so directly publicized outside academia. Added to this, during the last decade, the global financial crisis might have helped to accentuate the visibility of some specific topics over others. Over the last 10 years, we have all become accustomed to the presence of a (more often than not male) economist in the mass-media offering an analysis of causes, consequences and predicted evolution of key economic indicators. Current university students, aged from 18 to around 22 years old, were children at the outset of the Great Recession, and have probably grown up envisaging economists in this stereotypical way.

On the other hand, as we show in Section 3 below, there is a great variety of topics that

⁴In a recent study that has received great attention, Sarsons (2017) documents such a bias reflected in the higher penalty for coauthoring suffered by women economists, particularly if they coauthor with men. Hengel (2018) presents evidence that women's writing is held to higher standards in academic peer review publishing. The students themselves may be affected by the male stereotype. MacNell et al. (2015) and Boring et al. (2016) provide evidence that students rate online teachers higher when those teachers use a male name, regardless of their actual gender.

⁵Della Giusta et al. (2017), for a sample of pre-university teenage students in the UK, show how biased their perception is as regards the university majors. Also, an online survey by Economics Network administered to 1,700 UK inhabitants shows that economics is associated with aspects such as predictions, finance and business, to the exclusion of virtually everything else (<https://www.economicsnetwork.ac.uk/research/understandingecon>, last accessed March 23, 2018.)

can be classified as microeconomics. Apparently we need more 'key words' to illustrate what microeconomics is about than we would to convey a broad but approximate idea of what macroeconomics is about. This poses greater difficulty in convincing potential students as to how appealing (micro)economics can be. Hence, even if "economics is what economists do", it is also the case that "economists do not (only) do what people think they do".⁶ If we are not able to communicate the varied and appealing areas economists deal with and, moreover, if this lack of information primarily affects a particular area of economics, then potential students that would otherwise have been attracted to those 'hidden' areas of economics may not enroll in economics majors.

Why we should care about the gender imbalance may in turn depend on the underlying causes of this imbalance. If the fact that women do not feel particularly attracted to economics is caused by an information problem, then such a scarcity may be, in turn, a symptom of other problems in the discipline. Lack of information and/or misinformation for pre-university students choosing among university majors may entail an inefficient allocation of resources, as in many other markets. Talented students may be dissuaded from enrolling in majors such as economics if they misunderstand what economics is really about and the career opportunities that this discipline opens up for them.

An additional consequence of a lack of information on particular areas of analysis within economics is that the general public will also hold not only a subject-biased but also a gendered view of the profession. If the areas of research with a higher proportion of women (see Section 3 below) and where female students perform better (Section 4 below) are less well known to the public (Section 5 below), this may affect further the visibility of female economists. Given the documented effect of female role models on gender imbalances, this may constitute a factor that contributes to sustaining gender inequality.

Moreover, the lower level, and even declining trend, of female enrollment in economics, along with the fact that they seem to self-select more into microeconomics-related areas, could accentuate the gender imbalance between subfields within economics. In some cases, such as macroeconomics and finance, we might end up with an almost entire absence of professional female economists.⁷

In this paper, our aim is not to offer an exhaustive exploration of the causes that may women lead to select specific areas of research or perform relatively better in some subfields, although our survey data offer some clues in this regard. Rather, our primary goal is to document the existing differences and connect them with our students' self-reported information biases.

To our knowledge, our paper is the first to provide the sort of evidence we present be-

⁶The classic quip "Economics is what economists do" is attributed to Jacob Viner.

⁷The striking scarcity of women in some areas complicates the success of some recent initiatives such as Spanish economists and academics boycotting events without female experts. <https://sites.google.com/view/nosinmujeres/inicio>; last accessed May 31, 2018.

low, particularly in the last two parts. The information collected through web scraping adds to the scarce formal evidence provided by the literature so far as regards the areas of research where women self-select. The most similar work to this part of our paper is the study by Chari and Goldsmith-Pinkham (2017), where the authors provide information on the proportion of women in each subfield at the NBER summer meeting. We extend that information by scraping the website of the wider annual AEA meeting, and by offering detailed information on the percentage of women by research topics. As regards the results with the administrative data, to our knowledge, they represent an entirely new contribution to documenting the relative academic achievement of male and female economics students by subfields. It is particularly striking how our econometric results in this part highlight differences in the academic performance of men and women that line up with the observed worldwide trends in the choice of research areas by gender. Finally, the self-response questionnaire has been designed to find out what might be behind the econometric results with the administrative data. Since it is targeted at students in the same major and university, it uniquely complements those results.

The extent to which our results can be extrapolated to a broader scale is something we cannot categorically state. However, given that gender preferences are probably quite universal, that the curriculum of the economics major at UV is quite similar to that of other faculties and countries, and the fact that we end up observing patterns that are consistent with observations already established in the literature, we believe that our work opens up a new avenue of research that is worth exploring in other contexts.

Our results suggest reasons why women do not feel particularly attracted to economics, and point to lines of action to redress the imbalance. The main takeaway message is that economists have a communication challenge, as many voices have already expressed, and that this challenge may be particularly urgent in the case of pre-university students. Our results further support the view that this problem of information may explain part of the observed scarcity of women in economics; in addition, they point to the need to better publicize specific areas that, although they may well be highly appealing, are as yet the less well known. Our paper, then, underscores the relevance of adopting and extending projects such as CORE⁸, to help fill this information gap. The misinformation also affects our students' perceptions as regards the main occupations for economics graduates and the areas of specialization that may be open to them. Economics teachers at both pre-university and university levels need to be aware of the lack of information that affects our students, and should make a conscious effort to alleviate the problem.

⁸The Curriculum in Open-access Resources in Economics (CORE) project, supported by the Royal Economic Society, is an international initiative created in 2013 as a response to concerns that the economics curriculum was becoming disconnected from the needs of learners, economics departments and employers, and also from the lived experience of potential students. <https://www.ineteconomics.org/education/curricula-modules/core-project>

3 Women in the AEA annual meeting and the variety of topics across subfields

To throw light on the representation of women in economics across different subfields, we look at the scientific programs of the annual meetings of the American Economic Association (AEA) in recent years. First, we classify the papers presented at AEA meetings into broad areas, according to the JEL codes of their corresponding sessions⁹. Second, we dig into the paper abstracts and obtain word clouds using a machine learning approach to classify papers by topics.

3.1 JEL approach

We extract information on the programs of the annual AEA meetings from 2010 to 2016, obtaining the JEL codes of the sessions and the names of the authors. Based on the JEL codes, papers are classified into one of the following five subfields or categories: Microeconomics (including both theoretical and empirical micro-oriented topics); Macroeconomics (also covering international economics); Finance; Methods (encompassing mathematical and quantitative methods) and Other (including a set of miscellaneous categories difficult to categorize elsewhere). To calculate the share of women, we account for the total number of authors of all papers submitted in a particular category and classify them by gender according to their first name. For this purpose, we rely on three different databases. First, we use the first-names database published by the U.S. Social Security Administration, created using data from Social Security card applications. We merge this database with the list of authors from the AEA meetings. Then, we assign an author as female if the probability that the name is female is higher than 0.95, and assume an author is male if the probability that the name is female is lower than 0.05. For the non-classified names, we use the database constructed by Tang et al. (2011), who use Facebook to collect data on first names and self-reported gender, and as before we use probabilities to assign gender as female or male¹⁰. Lastly, for the names that remain non-classified after these two iterations, we use the names database developed by Bagues and Campa (2018), who assign gender to the different names with a probability of one. Any authors who either fall within the $[0.05, 0.95]$ interval or cannot be found in any of the databases are excluded.¹¹ Our observational unit is typically an author-paper-field-year match (author to simplify). We register 22,609 authors over the

⁹The complete list of these JEL codes and their correspondence with the different areas is available in Table 6 in Appendix A.

¹⁰This database is also used by Chari and Goldsmith-Pinkham (2017).

¹¹After using the three database, the average of non-classified names across all years and areas is 13.8 percent. We assume that the gender distribution by economic subfield of excluded authors is not significantly different from that of gender-identified authors. Results that include a non-classified gender category are qualitatively similar to the ones offered in the paper.

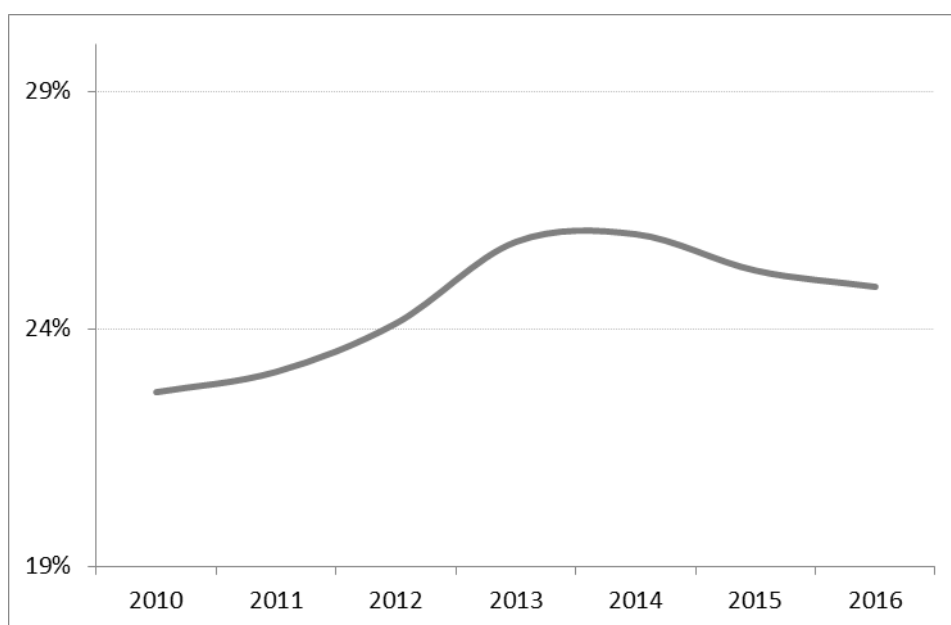


Figure 1 : *Share of women: all research areas (2010-2016)*

whole period, of which 5,611 (24.82 percent) are female. Of course, the same author may appear more than once in the roster.

Figure 1 shows a fairly stagnant evolution of the share of women around the average, with a minimum of 22.7 percent in 2010 and a maximum of 26 percent in 2014. Additionally, Figure 2 represents the evolution of the share of women across areas, where we uncover a clear gap between two research clubs: one related with Macro, Finance and Methods, which has a very low participation of female economists; and another more gender-balanced club made up of Micro & Other fields.¹² Actually, the share of women in the AEA program displays a virtually constant difference of about 10 percentage points between these two broader research areas, which constitutes a considerable difference if we take into account the fact that the average female participation is less than 25 percent. Depending on the year, female authors represent between 16 and 20 percent of all authors in 'Macro, Finance and Methods', and between 27 and 30 percent of total authors in 'Micro & Other'.

In a recent paper, Chari and Goldsmith-Pinkham (2017) extract information from the NBER Summer Institute sessions, over the period 2001-2016, to calculate the share of women in finance, macro & international, and micro subfields. They also find a persistent gap between subfields, with figures that are closely aligned with those we offer here for those years.

¹²Methods is the smallest categories by number of authors, accounting for an average of 2.6 percent of total authors over the whole period.

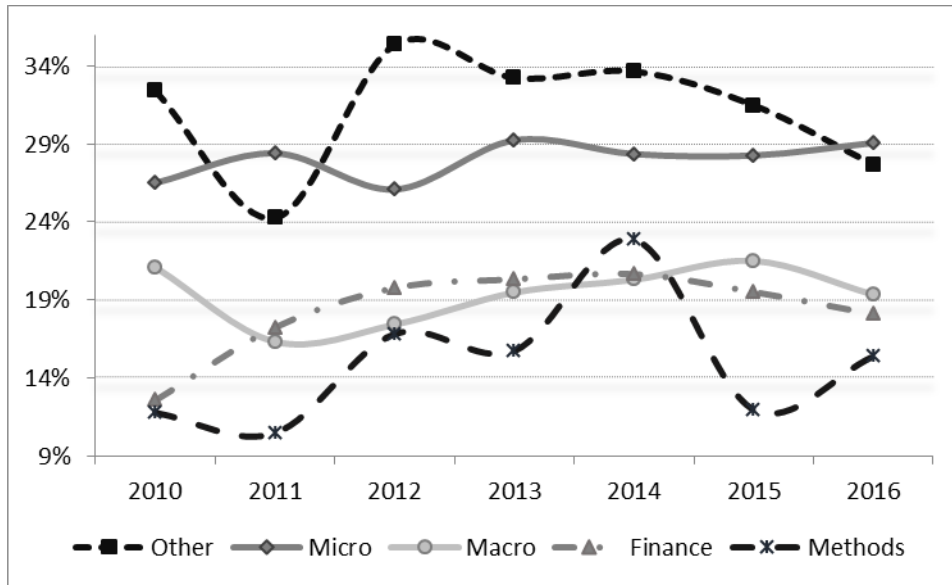


Figure 2 : *Share of women: research subfields (2010-2016)*

3.2 Abstract approach

Session JEL codes are quite general and may be imprecise indicators of what a paper is about; thus, the JEL approach might not be sufficiently fine-grained to capture the actual research topics covered in the meetings. To overcome this limitation, we dig into the paper abstracts and extract information using a machine learning technique. The website of the AEA meeting offers abstracts for the years 2014, 2015 and 2016. Using the Latent Dirichlet Allocation (LDA) algorithm for text analysis developed by Blei et al. (2003), we have classified the AEA abstracts by topics. The LDA algorithm offers a simple way of classifying large amounts of text (more than 5000 abstracts in this case)¹³. After some testing, we set a number of 21 topics with which to classify abstracts. We consider that the choice of 21 clouds satisfies a balance between the identification of underlying themes and the principle of parsimony.

For a more reader-friendly presentation of the words composing each of the themes obtained, we have constructed a word cloud for each theme. Figure 3 shows the three clouds with the highest and the three with the lowest share of women, averaging the three years for which we have information. The complete set of clouds, ordered according to the average share of women, can be found in Table 7 in Appendix A.

Topics related to gender, education and health appear as the most attractive to women, with the share of female authors ranging from 47.7 to 32.2 percent of the total. Conversely, at the bottom of the distribution of choices, we find themes linked with theoretical econo-

¹³Examples of the use of this algorithm in the economics literature can be found, for example in Hansen et al. (2017) and Muller et al (2017).

metrics, finance and macroeconomics, where women represent less than 16 percent of the authors. These results reinforce and complement our findings with the JEL approach. In both cases, they are fairly closely aligned with those obtained by Dolado et al. (2012) using a different methodology. These authors collected data from the personal websites of faculty members of the top-50 economics departments in 2005 as listed on Econphd.net. Using Econphd.net codes to classify research into different fields, they observed that topics such as wages and gender inequality, education, health and demographics were among the top female choices, with mathematical economics, fluctuations and business cycles at the other extreme.

Interestingly, our results indicate that themes conventionally aligned with macroeconomics are actually in the minority. In Table 7 (in Appendix A), we clearly identify only three out of the twenty-one clouds with macroeconomics (those assigned ranks 12, 16 and 21), to which we could add two finance-related clouds (ranks 11 and 19) plus one international economics cloud (rank 10) and one econometrics cloud (rank 20). Apart from three additional clouds that we find difficult to classify (ranks 6, 7 and 14), the remaining eleven could be classified as conventional microeconomic topics. This evidence suggests at least three ideas regarding the communication challenge that we described in the introduction. First, a fairly ample range of topics is covered by microeconomics, in contrast with the apparently prevalent idea among outsiders that economists essentially deal with macroeconomic issues and finance. Second, the fact that microeconomic topics are highly varied and correspond to a wide set of words complicates the task of conveying in a simple and straightforward way to those outside the academia that these topics are an essential part of economics. Finally, economics faces two main challenges when it comes to enhancing the visibility of female economists, namely, raising the profile of the first clouds in Figure 3 and boosting the proportion of women in the last clouds. It would be great if young students had a good understanding of these word clouds, their true contents, the human and social problems they deal with, and, most importantly from the perspective of this paper, were aware of the presence of women in these areas of research.

Having shown that there is considerable gender bias in the choice of research areas, which leads to an uneven gender composition across different economics subfields, we provide evidence in the following section that this gender-based inclination towards specific subfields appears earlier, at the undergraduate level.

4 Relative performance across fields: results with administrative data from the University of Valencia

In this section we use UV administrative records for the period 2010-2014, to estimate the relative academic performance of male and female students across subfields. First, we present

the data, then we estimate quantile regression (QR henceforth) for the students' grades in all courses classified into subfields (macroeconomics, microeconomics, finance, methods and other), and finally we estimate QR regressions using the data on optional courses correcting for selection into these courses by means of a semi-parametric selection model.

4.1 Data and quantile regression estimation.

The University of Valencia, with more than 50,000 students in 2017, is one of the largest public universities in Spain. Following a formal request for information, UV provided us with data for all students enrolled in economics at UV from 2010 to 2014. For all these students we received anonymized administrative records containing information on each student's entrance grade, the educational level and employment status of their father and mother, the student's employment status, courses that the student is or has been enrolled in over the sample years, exams taken each year (per course) and the grades achieved, as well as certain demographic characteristics such as gender and age.

In our data sample, each observation refers to one student in a given course and degree year. Each student contributes the same number of observations to our estimation sample as courses that the student is or has been enrolled in over the sample years. That is, we have not only summary information of a student's performance in a given academic year, but also their performance in all the courses they have taken over the sample period.

Figure 4 displays the trends in the percentage of students enrolled in the economics degree from 2005 to 2017 (though our estimation sample stops at 2014). The figure shows that, although the relative percentages of men and women were fairly well balanced in the years 2005 to 2007, the share of women has remained below that for men in the years since. Furthermore, and in line with what seems to be the general trend worldwide, in recent years the share of women has started to fall further and further below that of men. In the last year female students account for only 36 percent of the total.



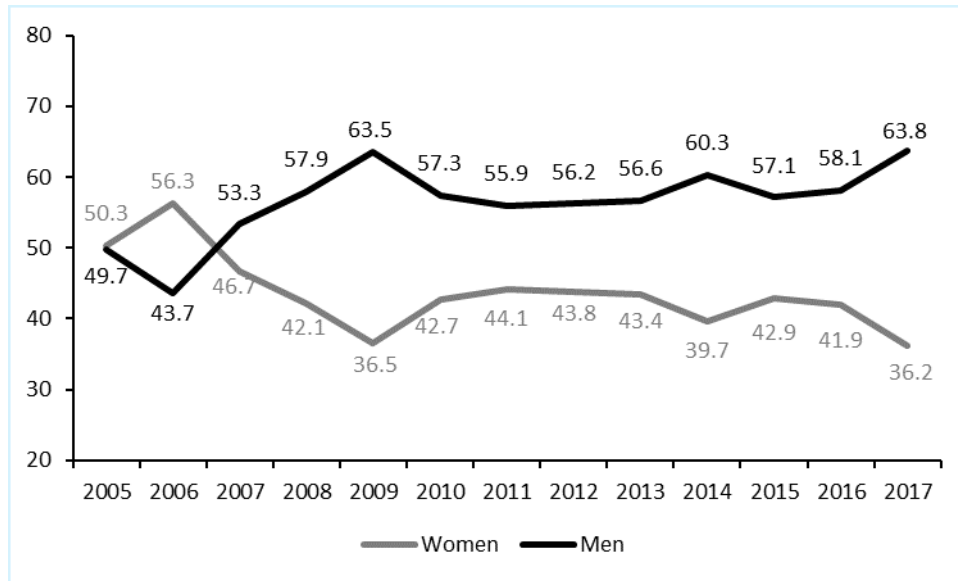


Figure 4 : *Percentages of male and female students in Economics (UV).*

The economics major at UV is organized around both compulsory and optional courses. Our sample data comprises both students entering under the Bologna Program launched in 2009 and students who had entered before that year and were still studying in years 2010 to 2014. Under the Bologna Program, students need to pass 240 ECTS credits over four academic years, with an average load of 60 credits per year. Courses can have different credit loads, with the most typical being 4.5, 6 or 9 credits per course. Courses are classified as core, compulsory or optional, and are spread out over the different years of the degrees. Optional courses are taken in the last year of the degree and represent 20 percent of the total amount of credits in economics. Under the former program, the 2000 Program, students had to pass 300 credits over five years organized in a three-year first cycle (180 credits) and a two-year second cycle (120 credits). Out of the total number of credits, 30 credits corresponded to optional courses taken over the three years of the first cycle, and 54 credits over the two years of the second cycle.

Similarly to what we did in the previous section, we classify all the courses into five sub-fields: macroeconomics, microeconomics, finance, methods and other. The courses included in each subfield are listed in Table 8 in Appendix B. Each student enters the estimation regression as many times as courses they have taken in the corresponding subfield, and we only consider the final grade when the exam was passed, that is, only one observation per student and course is used.

For each subfield we estimate a quantile regression to allow the results to differ along the grades distribution. The QR, introduced by Koenker and Bassett (1978), estimates the quantiles of the conditional distribution of the response variable as functions of observed

covariates. Our QR regression for each subfield can be written as follows:

$$Q_q(G_{imt}) = \alpha(q) + \beta(q)W_i + \gamma(q)\mathbf{x}_{it} + m_t(q) + \tau(q) + Q_q(u_{imt}) \quad (1)$$

where Q_q denotes the conditional q th quantile; subscripts i , m and t denote the student, the course, and the year, respectively; W_i is a gender dummy that takes the value 1 if the student is a women and 0 if he is a man; G_{imt} denotes the grade obtained by student i in each course m and in a given year t , the course belonging to the corresponding subfield for which we estimate the equation; $\mathbf{x}_{it}$ denotes a vector of characteristics of the student and other socio-economic controls relating to their parents, some of which may vary over time. We pool all the individual observations corresponding to courses within a same subfield across our sample years and include a set of year dummies to control for the year effects $\tau(q)$. The term $m_t(q)$ refers to course-effects that we allow to vary over years: specificities of a given course in a given year, such as a change in the teacher or the difficulty of the final exam (such course-year effects are captured in the form of the average grade of all students in the course in the year). Finally, u_{imt} is the error term of the equation.

Among the variables included in $\mathbf{x}_{it}$ that refer to the student, we pay special attention to the score obtained by the student in the official examinations taken to gain entrance to the university (we call this the AU-score throughout the rest of the paper).¹⁴ The AU-score is considered as a measure of the initial or innate academic ability of the student, and acts as a student-specific effect in the estimation. Other student-level controls included in $\mathbf{x}_i$, some of which may vary over time, refer to age, whether they are full-time students, whether they live in the family home during the academic year and whether students come to the university from standard high schools (current high school programs), from vocational (or professional) high schools, from older high school programs or by transferring from previous university degrees. The rest of the socio-economic controls refer to the educational and economic situation of the student's parents. These are binary variables taking the value 1 whenever the parents have a given level of formal education or have a given employment status, and 0 otherwise. The information is given for the student's father and mother separately.

The QR quantiles considered are the 0.25, 0.50 and 0.75 quantiles.¹⁵ The interpretation of coefficient estimates is essentially the same as in the median regression with the following

¹⁴The AU-score is obtained by averaging the student's grades achieved at high school and the grade obtained in a specific examination compulsory for enrollment in public universities in Spain. Every year, faculties establish the minimum AU-score for enrollment in a given degree.

¹⁵In particular, we have estimated simultaneous quantile regression using the command *sqreg* in *Stata*. It produces the same coefficients as standard quantile regression for each quantile but *sqreg* obtains an estimate of the VCE via bootstrapping. QR offers two advantages over the option of splitting the sample: i) it uses the entire sample information and thus does not involve a loss of degrees of freedom; and ii) it avoids the sample truncation problem which arises by splitting the data according to observed values of grades.

difference: in the median regression the constant is the median of the sample, while in the QR the constant is, say, the 0.25 quantile is the 0.25th percentile for the sample.

4.2 Results.

Compulsory Courses

We distinguish in our estimation between compulsory and optional courses. First, Table 1 displays the results of the QR for grades obtained by students in the compulsory courses of the different subfields. The introduction of the AU-score is important in our setting, since, if the composition of the sample was biased towards, say, women having higher/lower ability than men, the observed advantage/disadvantage of women could be attributed to their different ability. In Table 1 the following results stand out. In macroeconomics and finance, the differential in women's grades in macroeconomics is negative although the estimates are not, in general, statistically significant (an exception is the case of the 0.50 quantile for finance, where the effect is significant at the 10 percent level). However, in microeconomics, female students exhibit a positive differential with respect to their male coursemates that becomes larger and significant in the 0.50 and 0.75 quantiles. Likewise, in methods, women clearly show positive differentials in all three quantiles, particularly in the 0.50 and 0.75 quantiles.

Notice that, in these upper quantiles, a difference of 0.2 points (microeconomics) or 0.15 points (methods) in the final grade may determine which students get a final Distinction in the course; thus, for top students, such a difference may matter quite a lot.¹⁶

Optional Courses

Next, we focus on optional courses in the different subfields. In these courses, the academic content is more specific than in compulsory or core courses, the groups are smaller and the teachers are more specialized in the course. Also, in optional courses, students are more likely to self-select according to their preferences. It may well be the case that the differences in women's and men's relative performance are more clearly revealed in these courses.

In this case, we offer our QR results with and without control for selection. We consider the convenience of accounting for selection in this case for a number of reasons. On the one hand, students may prefer some subfields over others just because they find them easier to understand or simply more interesting. In turn, a variety of factors may influence why

¹⁶According to the rules of the Faculty of Economics at UV, only 1 in every 20 students enrolled in a group can be awarded a Distinction. Students who are awarded a Distinction are then exempted from paying for one of the courses in the following academic year.

Table 1 : QUANTILE REGRESSION OF WOMEN AND MEN GRADES
ACROSS SUBFIELDS (COMPULSORY COURSES)

	(1) MACRO	(2) MICRO	(3) FINANCE	(4) METHODS	(5) OTHER
<i>quantile 25</i>					
Women	-0.010 (0.024)	0.014 (0.018)	-0.020 (0.014)	0.057** (0.024)	0.026 (0.016)
AU-score	0.138*** (0.014)	0.143*** (0.011)	0.109*** (0.016)	0.137*** (0.011)	0.150*** (0.006)
Constant	4.456*** (0.206)	4.410*** (0.128)	4.851*** (0.141)	4.642*** (0.197)	4.017*** (0.089)
<i>quantile 50</i>					
Women	-0.023 (0.051)	0.104* (0.055)	-0.089* (0.050)	0.186*** (0.049)	0.037 (0.028)
AU-score	0.259*** (0.016)	0.232*** (0.020)	0.263*** (0.020)	0.260*** (0.020)	0.231*** (0.009)
Constant	4.744*** (0.308)	4.938*** (0.229)	4.476*** (0.407)	5.187*** (0.302)	4.617*** (0.145)
<i>quantile 75</i>					
Women	-0.088 (0.066)	0.224*** (0.058)	-0.080 (0.073)	0.154*** (0.058)	0.069** (0.034)
AU-score	0.325*** (0.021)	0.277*** (0.020)	0.322*** (0.028)	0.347*** (0.019)	0.256*** (0.010)
Constant	5.556*** (0.433)	6.781*** (0.424)	5.219*** (0.465)	6.746*** (0.269)	6.047*** (0.183)
N Obs.	4313	5469	3459	6135	16125

Bootstrapped errors in parentheses (500 replications). * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. All regressions include course-year effects, year dummies and the following set of socio-economic controls: student's age, full-time student, living at home, father with primary education, mother with primary education, father with university education and mother with university education. AU-score: student's score to access university (averaged grades from high school and the university access exam).

a student finds a given subfield more or less interesting. For example, students' attention may be drawn to a subfield because it deals with topics that seem particularly appealing, or just because it is perceived as an area of study that will facilitate their future job search. Students may also choose optional courses on the basis of their previous results in the most closely related compulsory courses. Of course, since there is a limited number of optional courses on offer within a degree, they may also choose some courses through a process of elimination.

On the other hand, the above-mentioned considerations may differ among subfields or by gender. In fact, it is often argued that women tend to make choices more based on their performance.¹⁷ If this were the case, the way women and men self-select could prevent us from observing their underlying capacity or tendency to obtain different grades. If women dislike, say, finance and only choose it when they believe they may well get good marks in it, whereas men tend to select into finance regardless of their prospective performance, then the composition of the groups in finance could result in very similar grades even if men were, say, naturally better at this subject. What we are in fact aiming to capture is the extent to which women and men exhibit different relative performance that goes beyond such determinants of self-selection into specific subfields.

We apply Buchinsky's (1998) method to correct for the effect of selection in QR. Basically, the method extends Heckman's (1979) classic model to allow for non-normality. In QR, since we aim to correct selection in various quantiles, we cannot restrict the analysis to a symmetric normal distribution. The Buchinsky method consists in first estimating a univariate binary-choice model through a semi- or non-parametric estimator; in a second stage, the QR for grades is estimated adding a correction term derived from the first stage. We leave for Appendix C the detailed description of the method, and the particular way in which we apply the selection correction.¹⁸

Table 2 presents the QR results for grades in the optional courses across subfields, with and without correction for selection.¹⁹ First, the results confirm the previous finding that

¹⁷Rask and Tiefenthaler (2008) provide evidence suggesting that women demonstrate higher sensitivity to previous grades in selecting further economics courses.

¹⁸Our semi non-parametric estimator, SNP henceforth, is that proposed by Gallant and Nychka (1987), which has the advantage over other semi-parametric estimators that it does not involve kernel smoothing. This SNP estimation reveals some interesting findings (displayed in Appendix C). i) Past performance in micro seems to affect the choice of micro subjects differently in men and women; in particular, women with good marks in micro are far less likely to choose macro courses than men while they are much more prone than men to choose micro-related optional courses in that case. ii) It seems that men are not driven by their past marks in finance to enroll in finance-related courses, whereas women are more likely to enroll in finance courses if they previously achieved good grades in finance. iii) Higher ability students, as proxied by the AU-score, tend to choose macro and methods to a greater extent, while they seem to be less attracted by finance. iv) Women have lower total estimated probabilities of entering macro, and finance, as compared to micro and other courses.

¹⁹The correction for selection is statistically significant in all subfields, and the choice of the order of the polynomial on the index ($X'_i\beta_s$) is made on the basis of how many powers are significant in the OLS

women perform better than men in micro while performing relatively worse in macro-related courses. The correction for selection has two effects on these results: the magnitude of the estimated coefficient for the women dummy is larger in both the micro and the macro equations, and the significance of the estimates increases, at least in the 0.50 and 0.75 quantiles. In microeconomics, women outperform men in all three quantiles, while the differentials are somewhat greater in the upper quantile, where the difference is near 0.4 points. In macroeconomics, women (when the covariates have a value of 0) obtain average grades that are more than 0.5 points below the grades obtained by men in the upper quantiles, while the estimates in the 0.25 and 0.50 quantiles, although also negative, are not statistically significant. It is important to emphasize here that these are not differences that teachers could easily observe in their lists of grades. Instead, these are the differences that would show up if the groups of students were composed of students that are broadly comparable with respect to a list of characteristics, including their innate ability and the reasons why they enroll in these subfields.

The fact that the differences are more evident in the upper part of the grades distribution makes the obtained results even more relevant. The upper tail of the distribution of grades is where the level of competitiveness between students is expected to be the highest, and thus, where the natural differences, in terms of ability and preferences between men and women, if they exist, will show up more clearly. In addition, a positive/negative difference in this upper tail gives the individual the self-confidence that he or she is notably better at some courses than at others, what may condition male and female graduates' choices of future occupations. It can also be the case that employers seek to hire or select graduates drawing from this upper part of the distribution. By way of example, students planning to follow a postgraduate course or to undertake a PhD may be selected by supervisors on the basis of their marks in specific subjects. The observation that there are more men in macro-related occupations and more women in micro-related ones could then be a consequence of these results.

Preferences or ability?

Faced with these results, the question that naturally arises is what might be behind these differences. Is it a matter of preferences? Or, alternatively, is it a matter of ability, some element not totally captured by the AU-score? Given that macro- and microeconomics-related courses at the degree level may imply different degrees of analytical skills, and given that the results in Table 1 suggest that women perform relatively better in methods, we repeat our main QR results partialling out the effect of the student's average grade in these instrumental courses.²⁰

regression on the median (see Appendix C).

²⁰Ideally, we would like to use some variable to account for students' innate or initial mathematical ability

In Table 3 we repeat the QR results for macro, micro and finance, both for compulsory and optional courses, after controlling for the student’s average performance in methods. All grades obtained by the student in compulsory and optional methods-related courses are averaged as a proxy for the ‘technical’ ability of the student. A first observation is that the higher the average performance in methods, the higher the grade in all courses; moreover, the effects are greater in macro and micro than in finance. As compared with previous results displayed in Tables 1 and 2, we observe that the magnitude of the coefficient for the women dummy is, in general, adjusted downwards, thus suggesting that part of the previously estimated effect might be positively correlated with the students’ analytical ability. Accordingly, the positive differential in favor of women in micro is slightly attenuated, while the negative results for macroeconomics are reinforced quantitatively, at least for compulsory courses and for optional ones in the 0.50 quantile.

We conclude from these results that even if differences in analytical ability might play some role, they do not suffice to explain the estimated differences in grades. Hence, preferences arise as the most satisfactory explanation of the observed differences in performance across subfields. In the next section we examine what students’ self-statements about macro- and micro-related courses reveal as regards their preferences and interests in these two categories.

5 Survey given to economics students: opinions and beliefs, and their impact on performance.

In this section, we present the results from the self-statement questionnaire given to students of economics enrolled at UV in February of academic year 2017-2018. First we describe the survey design and present the main information at a descriptive level, and then we conduct OLS and IV estimation of the determinants of students’ self-reported interests and performance in macro and microeconomics courses. In this latter case, we also conduct an estimation of peer effects to highlight the social interaction of male and female students in macro and microeconomics classes.

5.1 Survey design and self-reported statements about subfields and the economics profession.

Intrigued by our results revealing the different relative performance of male and female students in macro and micro courses, we surveyed students of economics to inquire into their opinions about the two subfields of macro and microeconomics and to gather information on their beliefs about the economics profession. An anonymous questionnaire was given to

before entering the university. Unfortunately, the AU-scores do not allow us to separate mathematics marks from marks in other subjects such as languages or history.

Table 2 : QUANTILE REGRESSION FOR GRADES IN OPTIONAL COURSES ACROSS SUBFIELDS (WITHOUT AND WITH SELECTION CORRECTION)

	(1) MACRO No corr.	(2) MACRO Select. corr.	(3) MICRO No corr.	(4) MICRO Select. corr.	(5) FINANCE No corr.	(6) FINANCE Select. corr.	(7) METHODS No corr.	(8) METHODS Select. corr.	(9) OTHER No corr.	(10) OTHER Select. corr.
<i>quantile 25</i>										
Women	-0.347 (0.338)	-0.277 (0.284)	0.196** (0.097)	0.258** (0.107)	0.162 (0.157)	0.186 (0.168)	0.050 (0.116)	0.005 (0.125)	0.000 (0.000)	-0.001 (0.002)
AU-score	0.151 (0.197)	-0.024 (0.191)	0.162*** (0.036)	0.069** (0.034)	0.186*** (0.043)	0.203*** (0.045)	0.141*** (0.048)	0.158*** (0.053)	-0.000 (0.000)	0.003 (0.004)
Constant	5.034*** (1.716)	5.754*** (1.699)	3.708*** (0.525)	4.319*** (0.475)	5.025*** (0.879)	5.071*** (0.944)	3.179*** (0.739)	3.655*** (0.814)	4.747*** (0.017)	4.596*** (0.073)
<i>quantile 50</i>										
Women	-0.454 (0.296)	-0.534 (0.329)	0.210* (0.118)	0.251** (0.110)	0.033 (0.144)	0.064 (0.140)	0.071 (0.141)	-0.128 (0.154)	-0.030* (0.016)	-0.020*** (0.007)
AU-score	0.218* (0.132)	0.125 (0.171)	0.329*** (0.032)	0.216*** (0.043)	0.222*** (0.038)	0.228*** (0.033)	0.226*** (0.066)	0.220*** (0.062)	0.185*** (0.012)	0.062*** (0.015)
Constant	7.063*** (1.445)	6.557*** (1.742)	4.671*** (0.644)	4.781*** (0.687)	5.711*** (0.810)	5.267*** (0.717)	4.299*** (0.924)	5.069*** (0.866)	4.372*** (0.207)	4.800*** (0.108)
<i>quantile 75</i>										
Women	-0.508* (0.302)	-0.547** (0.270)	0.274** (0.114)	0.376*** (0.111)	0.165 (0.166)	0.063 (0.147)	0.057 (0.159)	-0.251 (0.178)	-0.065 (0.045)	-0.021 (0.014)
AU-score	0.232** (0.101)	0.063 (0.119)	0.351*** (0.032)	0.260*** (0.039)	0.144*** (0.049)	0.135*** (0.045)	0.218*** (0.055)	0.253*** (0.060)	0.206*** (0.012)	0.120*** (0.014)
Constant	8.474*** (1.484)	7.630*** (1.351)	5.610*** (0.610)	5.970*** (0.597)	6.992*** (0.965)	6.628*** (0.928)	6.738*** (1.005)	6.474*** (0.884)	4.739*** (0.264)	5.876*** (0.162)
N Obs.	256	256	1624	1624	755	755	1062	1062	12734	12734

Bootstrapped errors in parentheses (500 replications). * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. All regressions include course-year effects, year dummies and the following set of socio-economic controls: student's age, full-time student, living at home, father with primary education, mother with primary education, father with university education and mother with university education. AU-score: student's score to access university (averaged grades from high school and the university access exam).

Table 3 : QR FOR GRADES ACROSS SUBFIELDS: ROBUSTNESS TO STUDENT'S GRADES IN METHODS

	COMPULSORY COURSES			OPTIONAL COURSES (Sel. corr.)		
	(1) MACRO	(2) MICRO	(3) FINANCE	(4) MACRO	(5) MICRO	(6) FINANCE
<i>quantile 25</i>						
Women	-0.018 (0.030)	0.012 (0.021)	-0.023 (0.022)	-0.359 (0.237)	0.229** (0.092)	0.212 (0.151)
AU-score	0.065*** (0.014)	0.076*** (0.010)	0.058*** (0.012)	-0.050 (0.141)	0.030 (0.033)	0.161*** (0.051)
Methods' grade	0.718*** (0.068)	0.674*** (0.044)	0.466*** (0.060)	1.786*** (0.473)	1.090*** (0.228)	0.537*** (0.206)
Constant	4.444*** (0.194)	4.292*** (0.117)	4.737*** (0.189)	4.512*** (1.389)	4.173*** (0.548)	3.653*** (0.912)
<i>quantile 50</i>						
Women	-0.008 (0.049)	0.035 (0.053)	-0.073 (0.055)	-0.594** (0.300)	0.267** (0.108)	0.059 (0.115)
AU-score	0.134*** (0.019)	0.102*** (0.021)	0.159*** (0.024)	-0.060 (0.134)	0.086** (0.039)	0.206*** (0.033)
Methods' grade	1.113*** (0.091)	1.141*** (0.081)	0.994*** (0.107)	1.428*** (0.471)	1.501*** (0.234)	0.545** (0.212)
Constant	5.345*** (0.271)	5.335*** (0.263)	4.550*** (0.354)	6.372*** (1.299)	4.410*** (0.638)	5.096*** (0.697)
<i>quantile 75</i>						
Women	-0.147** (0.070)	0.185*** (0.062)	-0.168** (0.079)	-0.424** (0.210)	0.208** (0.106)	0.048 (0.135)
AU-score	0.171*** (0.025)	0.133*** (0.026)	0.194*** (0.031)	-0.095 (0.138)	0.209*** (0.042)	0.118*** (0.041)
Methods' grade	1.212*** (0.111)	1.237*** (0.090)	1.162*** (0.119)	1.357** (0.551)	1.320*** (0.202)	0.367 (0.284)
Constant	5.919*** (0.526)	6.469*** (0.391)	5.374*** (0.538)	8.186*** (1.412)	6.025*** (0.624)	6.122*** (0.893)
N Obs.	4313	5469	3459	256	1624	755

Bootstrapped errors in parentheses (500 replications). * p<0.10 ** p<0.05 *** p<0.01. All regressions include course-year effects, year dummies and the following set of socio-economic controls: student's age, full-time student, living at home, father with primary education, mother with primary education, father with university education and mother with university education. AU-score: student's score to access university (averaged grades from high school and the university access exam).

students in class time with the collaboration of the teachers of the compulsory courses of the first, second and third year of the economics degree. The response rate is the number of students attending classes the day the survey, which was not announced in advance, was given out (N=307).²¹ Besides their opinions about macro, micro and the profession, they were also asked questions concerning themselves and their parents' education and jobs. More concretely, a first group of these questions relate to the students' gender, AU-scores, whether or not they had considered other alternatives to the economics major before entering the university, the type of high school they come from, as well as questions about their parents' socio-economic characteristics, coinciding with the categories in the administrative data we used in Section 4.

Students' opinions about macro vs. microeconomics.

To gather the students' opinions about macroeconomics and microeconomics, we asked them to declare which of these two subfields they found to be more intuitive, more aligned with social problems (we call this indicator *social concern*), technically more complex and more difficult to pass. Two additional questions in this group were of particular interest to us: first, whether students find either macro or micro a more interesting subfield than the other; and second, in which subfield they obtain better grades. They could also take a neutral position and answer 'both equally'.

In Table 4 we show the students responses. First, we present OLS results for several dependent variables constructed as binary indicators taking the value 1 if the student rates a given subfield (macro or micro) as more clearly intuitive, technically complex, difficult to pass, etc. The estimated constant in each case measures the percentage of male students that choose the characteristic denoted at the top (intuitive, complex, and so on) as more connected to macro or micro, while the estimated women difference adds to the constant to determine the percentage of women that choose that answer (those who take a neutral position make up the difference to 100 percent).

We can sum up our results as follows. The percentage of men that find macroeconomics more intuitive, more technically complex and more difficult to pass and the percentage of men that believe these characteristics to be more closely linked to micro are fairly similar (roughly 30 percent for both macro and micro). However, women significantly find macroeconomics more technically complex and more difficult to pass than men, while women are more likely than men to answer that micro is more intuitive than macroeconomics (around 32 percent of men as compared to nearly 46 percent of women). As regards which subfield is more closely aligned with important problems in society around 60 percent of our stu-

²¹The response rate is around 70 percent, a total of 9 groups were surveyed and the share of women is around 46 percent, somewhat greater than the actual percentage of enrolled women, suggesting that absenteeism among women might be lower.

dents rate macroeconomics clearly above microeconomics, and women do not differ from men in this statement (although the estimated differential is negative, it is not statistically significant in our regressions). In the case of the more general question of which subfield is found to be more interesting, it also seems that macro is preferred by both men and women, although in this case women exhibit a differential positive answer in micro and negative in macro with respect to men that is statistically significant. Finally, as regards their performance in the two subfields, a much higher percentage of men respond that they obtain better grades in macroeconomics (nearly 41 percent as compared to the 14 percent that claim to obtain better grades in micro). The percentages of women stating better grades in either micro or macro are quite similar (a total of 26 percent in macro and around 22 percent in micro) but relative to men, their self- stated performance is statistically worse in macro and better in micro.

This first set of results, thus, reveals that women are more likely than men to choose micro as a more interesting subfield, and the opposite holds for macro. This does not mean that women find macroeconomics less interesting than microeconomics; it is just that they find it less so than men do. For reasons we are not able to identify, women find micro less difficult and more intuitive than macro, but, interestingly enough and in spite of this, they report similar performance in micro and macroeconomics. Unlike women, men exhibit more skewed answers towards a relatively better performance in macro. Thus, according to their own statements, women do not exhibit a particular preference or an absolute advantage in microeconomics as compared to macro but, instead, they clearly hold a comparative advantage/disadvantage in micro/macro as compared to men.

In the second half of the table, we repeat these OLS results controlling for students' ability (AU-score) and the rest of the controls. We also include the academic year in which the student is currently studying. This conditional estimation basically confirms the differential effects exhibited by women with respect to men outlined above.²²

Students' beliefs about the economics profession.

Next, to assess the students' beliefs about the economics profession, we presented them with a list of seven possible occupations of an economist. For each one, we asked students to report their opinion concerning two aspects: first, whether they personally associate more clearly each of these occupations either with macroeconomics or with microeconomics (or both equally); and second, whether each of these occupations is perceived as a male or a female job (or, alternatively, no gender bias). The seven occupations listed refer to jobs in: 1. A research center in Spain. 2. A research center abroad. 3. Banking and/ or Finance

²²Here the constants no longer admit the same interpretation as in the upper half of the table. They are now the proportion of men that chose that option when all the rest of the covariates have a value of 0 (including age, for example, which cannot be zero).

Table 4 : STUDENTS' SELF-STATEMENTS ABOUT SUBJECTS IN MACRO AND MICRO
 "I FIND SUBJECTS IN THIS SUBFIELD MORE..."

	Intuitive	Technically complex	Difficult to pass	Better grades	Socially concerned	Interesting
<i>MACRO</i>						
Woman (difference)	0.003 (0.053)	0.163*** (0.055)	0.168*** (0.054)	-0.142*** (0.053)	-0.0229 (0.056)	-0.112** (0.037)
Constant (avg. men)	0.307*** (0.035)	0.337*** (0.036)	0.283*** (0.035)	0.410*** (0.038)	0.614*** (0.037)	0.626*** (0.038)
<i>MICRO</i>						
Woman (difference)	0.132** (0.055)	-0.115** (0.049)	-0.118*** (0.045)	0.073* (0.044)	0.059 (0.043)	0.065* (0.035)
Constant (avg. men)	0.325*** (0.036)	0.319*** (0.036)	0.259*** (0.034)	0.145*** (0.027)	0.145*** (0.027)	0.090** (0.027)
<i>MACRO</i>						
Woman (difference)	0.026 (0.052)	0.135** (0.056)	0.130** (0.055)	-0.111** (0.050)	-0.034 (0.057)	-0.114** (0.056)
Constant	0.301 (0.240)	0.767** (0.300)	0.627** (0.245)	0.067 (0.264)	0.556* (0.312)	0.548* (0.303)
AU-score	0.002 (0.016)	-0.008 (0.020)	0.004 (0.018)	0.0113 (0.016)	0.008 (0.020)	0.017 (0.019)
Age	-0.007 (0.006)	-0.011 (0.007)	-0.013** (0.005)	-0.001 (0.007)	-0.001 (0.009)	-0.011 (0.009)
Year 2	0.331*** (0.069)	-0.256*** (0.069)	-0.318*** (0.060)	0.517*** (0.064)	-0.007 (0.074)	0.298*** (0.067)
Year 3	0.117* (0.061)	-0.099 (0.067)	-0.038 (0.069)	0.285*** (0.059)	0.042 (0.071)	0.187*** (0.070)
F-test controls ^a	yes	yes	yes	yes	yes	yes
p-values	0.708	0.590	0.250	0.865	0.504	0.927
<i>MICRO</i>						
Woman	0.116** (0.055)	-0.110** (0.049)	-0.075* (0.042)	0.068* (0.035)	0.067 (0.044)	0.061* (0.035)
Constant	0.903*** (0.299)	-0.139 (0.250)	-0.038 (0.263)	0.745*** (0.239)	0.162 (0.237)	0.316 (0.220)
AU-score	-0.034* (0.017)	0.033** (0.015)	-0.001 (0.013)	-0.038** (0.018)	-0.008 (0.015)	-0.008 (0.017)
Age	-0.004 (0.009)	-0.001 (0.007)	0.00774 (0.009)	-0.008* (0.004)	0.00477 (0.007)	-0.004 (0.003)
Year 2	-0.323*** (0.066)	0.257*** (0.066)	0.424*** (0.064)	-0.102* (0.052)	-0.0397 (0.057)	-0.122*** (0.041)
Year 3	-0.170** (0.071)	0.206*** (0.057)	0.068 (0.046)	-0.034 (0.057)	-0.087* (0.052)	-0.058 (0.048)
F-test controls ^a	yes	yes	yes	yes	yes	yes
p-values	0.064	0.398	0.309	0.563	0.296	0.955
N Obs	307	307	307	307	307	307

Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. ^a Controls: student's age, full-time student, living at home, father with primary education, mother with primary education, father with university education and mother with university education. AU-score: student's score to access university (averaged grades from high school and the university access exam).

sector. 4. PhD to become an academic. 5. Advisor in institutions (public or private). 6. Private sector. 7. Civil servant (through official examinations). Students were also allowed to specify any 'other' job they might contemplate. We believe that most would agree that the list itself is neither field-biased nor gender-biased.

The students' answers as regards their perception of the listed occupations reveal that their beliefs about the economics profession are affected by subfield and gender biases. These answers are shown in Figures 5 and 6. The first figure illustrates the percentage of students that associate each of the listed jobs either with macro or with microeconomics (or neutral). The data reveal, in our view, some clear mistaken beliefs held by students in this regard. For example, they associate jobs in research centers more with macro than with micro, and even more with macro than with 'both': around 52 percent and 64 percent, respectively, make such an association, against 10 percent and 3.6 percent that regard these two occupations as more connected with microeconomics. Becoming an advisor in institutions, no matter if they are public or private, is also prominently associated with macroeconomics (65 percent of students believe this, against 24 percent that associate it with both subfields, and 7.8 percent that link it to micro). The banking and finance sector is again more strongly associated with macroeconomics. The private sector is the only case where microeconomics clearly outnumbers macroeconomics (78 percent of respondents connect it more clearly to micro). Finally, micro is approximately equal to macroeconomics as a subfield that is specific to civil servant, that is, jobs in the public sector obtained by sitting official examinations, and finally, curiously enough too, microeconomics is somewhat more associated with following a PhD and becoming academics (18 percent for micro as compared to 12.7 percent for macro).²³

At least three concerns arise from this information. First, the economics profession is viewed as dominated by macroeconomics in most of economists' more natural occupations. The many interesting fields where microeconomists work and their relevance in providing advice to public and private institutions do not seem to reach our students. Second, this imperfect information is predictably much more pronounced among young students before their choice of major. Those not particularly attracted by macroeconomics are very unlikely to feel attracted by economics, in part due to the lack of appropriate information as regards the many topics that microeconomics deals with. And, third, if microeconomics is particularly associated with only the private sector (probably viewed as merely dealing with firms' and consumers' decisions) it then follows that business majors offer a natural alternative for

²³In general, no significant differences between women and men emerge in these answers, so we do not offer them separately by gender. The only statistically significant differences are that 4 percent (p-value=0.072) and 6 percent more women (p-value=0.027) find jobs in research centers abroad and jobs in finance and banking, respectively, to be more associated with women, and 12 percent more women (p-value=0.038) regard jobs in research centers abroad as more associated with macroeconomics.

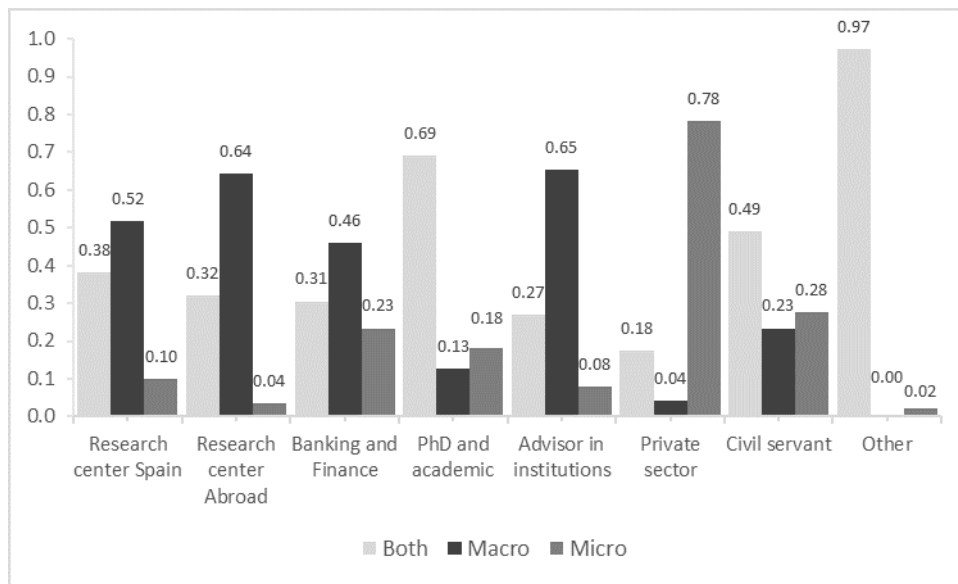


Figure 5 : *Students' association of jobs with MACRO vs MICRO*

those who think they will enjoy microeconomics more.²⁴

Moving to Figure 6 we can observe the students' beliefs about the gender bias of the different types of occupations. A first observation to note here is that, in all cases, the highest percentage corresponds to students that find the job equally associated with women and men. In any case, when students side with any gender, it is more often a man than a woman in most of the occupations: in two out of the seven cases (finance and advisor to institutions) more than 40 percent of students find the job to be particularly associated with a male figure (vs. 6.5 percent associating it with women), and in three out of the remaining five jobs, around 20 percent of students provide the same answer (no more than 6 percent associate them with women in any case). In only two out of the seven occupations, women are slightly more salient: following a PhD and becoming an academic, and sitting official examinations to work in the public sector. These are the two jobs in the list that probably entail a lower perceived risk and greater stability, namely, an academic and a civil servant. We find it quite curious that the two occupations less clearly associated with macro are precisely those that are more closely associated with women.²⁵

Thus, for many of our students, their overall perception of the profession seems to be

²⁴At UV the percentage of women in business majors is slightly above 50 percent. Since we do not have information on students before they choose their majors nor on students that have decided not to enter economics, we cannot ascertain the extent to which these misperceptions about the profession may affect such decisions. Very likely, though, their understanding of the economics field is even worse in such cases.

²⁵Social psychologists point out that individuals' assertions when asked about specific biases tend to hide the true ones. To overcome this recognized problem, psychologists carry out *Implicit Association Tests*, IAT, designed to detect the strength of a person's automatic association between objects or ideas (Greenwald et al., 1998).

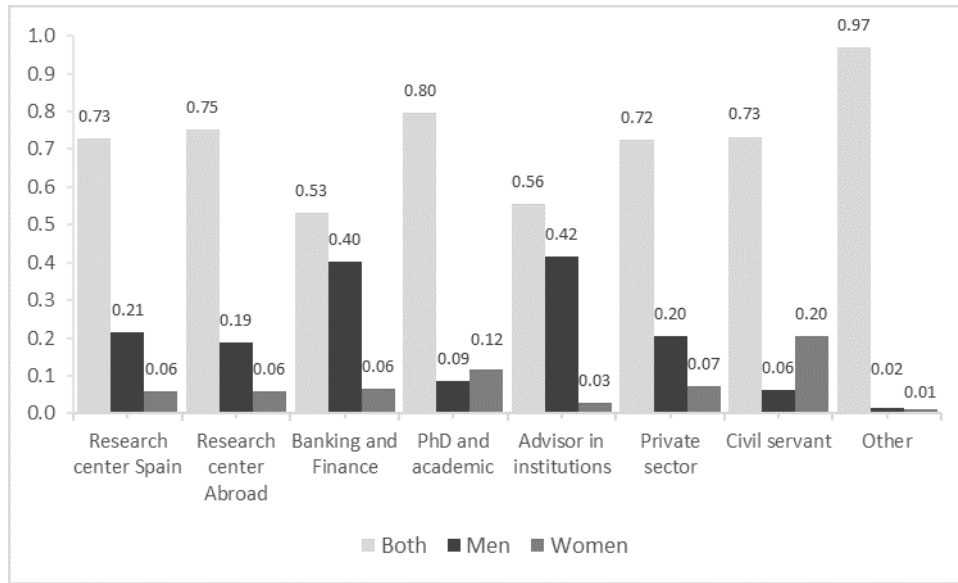


Figure 6 : *Students' association of jobs with MEN vs WOMEN*

one that offers greater opportunities for macroeconomists, particularly if they are men. It is difficult to see how such an environment could be congenial to women. Not only they do not belong to the dominant gender in some of the most visible occupations of the profession, but nor do they have a relative advantage in or preference for the dominant subfield, macroeconomics. The most disturbing fact, however, is that some of these established stereotypes respond to mistaken beliefs about the profession. It seems, for example, that the important role of microeconomics in providing advice to policymakers in the areas of education, health, energy, industry or labor is not clearly understood by our students. Policy advice in these areas is viewed as a task carried out by macroeconomists. The data also reveal a considerable misunderstanding of the job opportunities offered by the profession, as well as how the subfields they study in the degree translate into specific occupations in the labor market.

5.2 Students' perceptions and contagion effects on interests and grades.

5.2.1 Empirical equations and estimation procedure.

We now extend some of the baseline regressions offered in Table 4 by incorporating a full set of covariates. In particular, we focus on the indicator variables revealing which subfield students find more interesting and in which one they claim to obtain better grades. Our goal here is to find out, on the one hand, whether students' preferences for a particular subfield may affect performance, and, on the other hand, how interests and grades correlate with other students' statements regarding themselves as well as their beliefs about the profession.

In this section we also pay special attention to the likely contagion effects among students, both in their interests for the two subfields of macro and microeconomics and in the form of learning externalities in the classrooms.

We proceed as follows. For each one of the two subfields, we estimate a linear probability model (LPM henceforth) for the dependent binary indicator I_{if} equal to 1 if the i -th student states "*I find subfield f more interesting (f =macro, micro)*" and 0 if the student reports that the other subfield is more interesting or takes a neutral position. The estimation equation for each subfield takes the form:

$$\begin{aligned}
I_i = & \alpha + \beta W_i + \delta \mathbf{z}_i^I + \gamma \mathbf{x}_i + \tau_t + \\
& + \phi_W^{I^w} W_i \times PI_{j-i}^W + \phi_M^{I^w} M_i \times PI_{j-i}^W + \\
& + \phi_W^{I^m} W_i \times PI_{j-i}^M + \phi_M^{I^m} M_i \times PI_{j-i}^M + u_i^I
\end{aligned} \tag{2}$$

where W_i is the women dummy variable. The vector $\mathbf{z}_i^I$ contains the student's answers to other questions of the survey that we consider may correlate with the perceived interest in the subfield: a dummy variable that equals 1 for those who declare the subfield to be more closely linked to social problems; a dummy variable identifying those for whom economics was their first best option among all the university degrees (*initial vocation*); a quantitative variable counting how many jobs the student perceives as macro-oriented (we call this the "*Jobs-macro*" belief); a quantitative variable counting how many jobs the student perceives as macro-and-male-oriented (we call this the '*Jobs-macro-men*' belief); $\mathbf{x}_i$ denotes a vector of other characteristics of the student and family socio-economic controls, and τ_t stands for academic-year fixed effects (a set of dummy variables to account for the academic year the surveyed student is currently undertaking - first, second or third year of the degree). The rest of variables in equation 2 refer to our measures of male and female peers' interests that we construct as follows. For each student in each group we define the percentage of their female and male classmates who claim to find that particular subfield more interesting than the other (we label these peer measures PI_{j-i}^W and PI_{j-i}^M , respectively), and we cross them with the dummy variables for women and men, W_i and M_i , to allow the responses to peers to differ by gender. Finally, u_i^I is the error term of the equation. We estimate an equation like 2 separately for macro and for microeconomics.

We also define a similar model for the students' self-reported statements regarding their relative performance, where we consider, in turn, that the interest in that field may be among the explanatory factors. The estimation equation in this case can be written as:

$$\begin{aligned}
G_i = & \alpha + \beta W_i + \lambda I_i + \delta \mathbf{z}_i^G + \gamma \mathbf{x}_i + \tau_t + \\
& + \phi_W^{G^w} W_i \times PG_{j-i}^W + \phi_M^{G^w} M_i \times PG_{j-i}^W + \\
& + \phi_W^{G^m} W_i \times PG_{j-i}^M + \phi_M^{G^m} M_i \times PG_{j-i}^M + u_i^G
\end{aligned} \tag{3}$$

where G_i stands for the binary indicator taking the value 1 if the student states that their grades in macroeconomics (microeconomics) are better than in microeconomics (macroeconomics) or are the same. The equation for grades incorporates on the right-hand side the indicator of interest, I_i , among its explanatory factors. $\mathbf{z}_i^G$ denotes a vector containing the student's answers to other survey questions that we consider may correlate with their relative grades in the subfield, containing the same variables as $\mathbf{z}_i^I$ except for *initial vocation* and *social concern*.²⁶ Similarly to equation 2, we construct here the percentage of a student's female and male classmates who claim to obtain better grades in that subfield (PG_{j-i}^W and PG_{j-i}^M , respectively), and cross them with the gender dummies. We estimate an equation like 3 separately for macro and for microeconomics.

Identification of the causal effect of peers entails certain difficulties, endogeneity being a clear concern in this case. Among other reasons, the peer effect is endogenous because of an inherent reason: if peers' outcomes affect individual outcomes, individual outcomes will affect peers' outcomes, leading to simultaneity bias.²⁷ Here we follow the most widely-used approach to overcome the endogeneity problem, which consists in instrumenting the peer measures (e.g., Goux et al., 2007). In particular, we use as instruments two variables that are predetermined before students enter their respective groups and before their interaction in the classroom starts: the AU-scores and their self-reported statements about initial vocation. Following the standard practice, we aggregate the individual responses to these two variables,

²⁶In exploratory work, initial vocation and social concern did not yield statistical significance in the grades equation, which indicates that, beyond their impact through interest, they do not directly affect relative grades. This means that these variables are naturally excluded from the equation for grades, which they only impact through their effect on the interest in the subfield. Hence, the two equations, interest and grades, can be thought of as the first and second stages, respectively, of an instrumental variables setting where the covariates excluded in the equation for grades can be used as instruments for interest to assess its exogeneity in the second stage. This allowed us to test for exogeneity and validity of instruments using initial vocation and social concern as instruments for interest in the equation for grades. These results allowed us to rule out such endogeneity concerns. These results are available upon request.

²⁷Selection bias and other unobserved influences are two additional sources of endogeneity. The so-called *reflection problem* is one of the main sources of such endogeneity. It refers to the endogenous self-selection of individuals into their groups of influence, that is, individuals approach those whose unobservable characteristics are systematically related to theirs. An additional problem for the estimation of peer effects is that, in many educational empirical studies, data do not include class identifiers, which impedes the selection of a student's relevant peers. Our survey data allows us to identify the class, which permits the construction of the peer measures for each group of students spending class time together at university. The administrative data used in Section 4, for example, do not allow us to identify the class groups.

which then serve as IVs. Appendix D details the 2SLS procedure followed.²⁸

5.2.2 Estimation results.

Relative interests.

Table 5 reports the estimation results for the determinants of interests and grades on the two subfields. In all cases, we interact the explanatory variables with the women dummy variable to allow the effects to differ by gender.

A first interesting result is that students entering economics with an initial vocation are around 25 percent more likely to answer that they find macroeconomics more interesting than micro. In micro, this variable correlates negatively with students' opinion that this subfield is more interesting, with the estimate being statistically significant at the 10 percent only in the case of women. We find this unequal correlation between initial vocation and interest in the two subfields very relevant because of the likely implications. On the one hand, the fact that both entry into economics as a vocation and interest in the subfield correlate positively with macro but negatively with micro may reflect the idea that students have a serious misunderstanding of what economics is about. On the other hand, these mistaken beliefs are biased against microeconomics and, thus, they may dissuade from enrolling those that could be more naturally interested in topics addressed by microeconomic theories and empirics, were they aware of them. In gender relative terms, as a higher proportion of women seem to be interested in micro, this could help explain the lower percentage of women that opt for economics as a vocation.²⁹

The results also support the idea that, if a student views a given subfield as more aligned with social problems, this correlates positively with their statement that this subfield is more interesting than the other. However, while in macroeconomics the effect is common to both men and women (an estimated coefficient of 0.161), in the case of microeconomics the effect is appreciably higher (around 0.227) and significant only in the case of women. This indicates that, for women, the preference for microeconomics is fairly closely related to the degree to which this subfield is perceived to be connected to social problems.

²⁸The use of LS to estimate in the second stage our binary variables of interests and grades yield average partial effects, APE, that prove to be virtually the same as the marginal effects on the average from an alternative Probit estimation. Given its greater flexibility and ease of interpretation, we apply LS to the mentioned two binary indicators.

²⁹In a regression of the variable *initial vocation* on the indicator of macro as a more interesting subfield and on the number of occupations associated with macroeconomics (plus socio-economic controls), we found significant positive correlations in the first case (coefficient of 0.077 with p-value=0.031) and in the second case only for men (coefficient 0.158 with p-value=0.045). Thus, entering economics as a vocation is correlated with the interest in macroeconomics, and, in the case of men, also with the number of occupations associated with macro. The women dummy variable is negative in the regression, although not statistically significant. These results correspond to the sample of students in the first year, and are available on request.

An additional finding in Table 5 is the fact that, for women, believing a larger number of occupations to be linked to macroeconomics seems to convey the idea that macro is more interesting than micro, while this variable does not render statistical significance in the case of men. This latter finding highlights that female students tend to find macroeconomics more interesting as the number of occupations perceived as being held by macroeconomists rises; a practical view.

At the bottom part of columns 1 and 2 in Table 5 we display the results for the peers' variables.³⁰ These have been standardized for ease of interpretation. Thus, the estimated coefficients measure marginal probabilities of one standard deviation from the mean of the corresponding peer measure. In the case of macroeconomics, the results suggest that the larger the percentage of women in the classroom who show a clear interest in that subfield, the higher the probability that a female student in that classroom will claim to find it interesting too. The estimated coefficient suggests that if the percentage of women in a classroom with a marked interest in macroeconomics (as compared to micro or being neutral) increased by one standard deviation above its mean, the likelihood of a female student declaring that macroeconomics is more interesting than micro would increase by nearly 20 percent. Unlike women, men do not seem to be affected by their peers' interests in macroeconomics. The coefficient, albeit positive, is comparatively low and not significantly estimated. In microeconomics, however, the results suggest that men are positively influenced by their male peers (coefficient of 0.042 with p-value=0.019), and women by their female classmates (coefficient of 0.074 with p-value=0.040). Thus, in microeconomics the estimated effects are lower than in macro, and also lower for men than for women.³¹

These results for the effects of peers' interests in one student's own interests admit the following interpretations. First, the responsiveness of students to their peers' interests, when they exist, is linked to peers of the same gender. Women do not respond to the percentage of men that declare a greater interest in a given subfield, and nor do men to their female peers' interests.³² Second, men are less responsive than women to their peers' interests. In macro, they are not significantly affected at all, and in microeconomics, though

³⁰A priori, the signs of these peer or contagion effects are unknown to us. In principle, students will be more strongly influenced by those classmates with whom they most often spend time, exchange opinions or share information, who tend to be of the same gender. Conversely, students may be more influenced by those who are perceived as the best at a given subfield, regardless of gender. Perceptions, whether or not they are right, that men or women are relatively better at one subfield than the other may also condition which individuals play a leading role in a classroom and are more capable of generating contagion effects. Furthermore, the reaction to these effects may also be gender and subfield specific depending, for example, on the student's own independent interests or abilities. We are not aware of any previous work that deals with peer effects formulated in this way.

³¹At the bottom of the table, the F-statistics for joint significance of IVs in the first stage take considerably large values, thus ruling out concerns about the weakness of instruments. A full set of group dummies is also included in the estimation to control for other possible group-specific unobservables.

³²The principle of *homophily* states that individuals prefer other people who are similar to them (McPherson et al., 2001), gender being one of the main aspects of such similarity.

the estimated effect is positive and statistically significant, its magnitude is the lowest among all the estimated impacts. The fact that men do not react to their peers' interest in macroeconomics may be due to their greater individual interest in macroeconomics, which probably exists independently of feedback from others. In micro, a subfield in which they are not on average particularly interested, a higher proportion of interested male classmates may attract their attention to this subfield. In other words, it seems that the lower the initial individual interest, the higher the potential for peers' influence to make a difference. This could also help explain the fact that the peer effect for women in macroeconomics is appreciably larger than in microeconomics.³³

Summing up, vocational students tend to find macroeconomics more interesting than micro, the perception of a larger number of occupations for macro leads to a greater interest in macro on the part of women, and there seem to exist contagion or *social multiplier effects* (Glaeser et al., 2003) in the interests of female students towards macroeconomics. It is worth noting that, after discounting the observable factors, the women dummy variable still points out a lower relative interest of women in macro than men.

In the case of microeconomics nothing is left in the women dummy that indicates a greater preference for microeconomics on the part of women, beyond those who find it more socially concerned. This indicates that the higher preference of women for microeconomics as compared to men comes basically from those women who find microeconomics more socially concerned than macro. Interestingly enough, contagion effects are much less pronounced than in macro, even if also here women seem to be more sensitive to their mates than men are.

Relative performance.

Next we comment on the results for the estimation of students' self-reported statement that they perform relatively better in one of the two subfields. Now we add the variable that captures whether students assess a given subfield as the most interesting one, which we further interact with the women dummy.

Women tend to declare better grades in macroeconomics when they also declare to find it more interesting than micro (only when the women dummy is interacted with "finding macro more interesting" the effect is positive and significant). For the case of microeconomics, the variable indicating a higher interest in this subfield has a large and statistically significant effect, both for men and for women. Although the effect is not significantly different for women, since women report a higher interest in micro relative to men, this could help explain

³³Our findings here line up, for example, with Huntington-Klein and Rose (2018), who find that women's preferences and decisions are affected by greater exposure to women peers, while peer gender has little effect on men. The authors argue that the results may depend on the context, with more potential for peer effects to have an impact when there are fewer women.

why women tend to outperform their male classmates in microeconomics. That is, more women than men show interest in micro, and this turns out to be a significant explanation of their better grades in this subfield.

An interesting result refers to the relationship between the AU-score of the student and their reported relative performance. For macroeconomics in column 3, results show that men are more likely to report a better performance in macroeconomics the higher their AU-score is. Nevertheless, the interacted term of the AU-score with the women dummy is negative, significant and clearly larger than for men, which for women would yield a (smaller but) comparable effect in quantitative terms but with the opposite sign. This result shows that, unlike men, the higher women's AU-score is, the much less likely they are to claim a relatively better performance in macroeconomics. As a result, the relative negative performance of women captured by the isolated women dummy vanishes (the sign is reversed and it is not statistically significant).

Hence, female students of higher ability tend to report worse grades in macroeconomics. This result adds further support to our main finding in Section 4 using the administrative data, which reveals that the largest differences between men and women correspond to the upper tail of the grades distribution.

Finally, our results in column 3 indicate that the belief that the profession is male- and macro-dominated has a significant and appreciable impact on the probability of a woman declaring that she obtains worse grades in macro than in micro, while it does not influence in any way the statements offered by men. The coefficient estimate for women suggests that for each additional job perceived by a female student as male- and -macro- dominated, she is more than 10 percent more likely to claim that her best grades are not achieved in macroeconomics than a woman who does not hold such a view of the profession.

It is hard to make a categorical judgement as to the reasons why this might happen. The most straightforward explanation for such an effect could be that, as the perception of the economics profession being macro- and male-dominated increases, women's discomfort in the degree increases, and this becomes particularly noticeable in their performance in macroeconomics. It could be thought of as a response explained by some degree of stereotype threat: the more convinced a woman is that the profession is dominated by male macroeconomists, the greater her conviction that men outperform women in macroeconomics and, thus, the worse the performance of women in macroeconomics.³⁴ Alternatively, a relatively worse

³⁴Stereotype threat refers to a situation where a person is concerned with a negative stereotype about their social group (Steele and Aronson, 1995). This concern may cause the person to perform worse when competitors are thought to be better than her/himself. Spencer et al. (1999) found that, unlike men, women's performance in math is negatively affected by the risk of being judged according to the negative stereotype that women have weaker math ability. They hypothesized that the apprehension it causes may disrupt women's math performance. In a recent paper, Iribarry and Rey-Biel (2017) find that women underperform men when the task in which they compete is perceived as favoring men and they are explicitly informed of the presence of a strong rival.

performance of women in macroeconomics as compared to micro caused by the macro/male-dominated profession belief could be reflected in women's self-selection into given subfields. That is, women might react by focusing their attention and academic effort on the subjects they find more congenial to them and where they expect lower competition with men, a type of female reaction with broad support in the literature (see, e.g., Geenezy and Rustichini, 2004, -and references therein- where the authors provide experimental evidence that women dislike competition when it is against men).

Finally, we wonder to what extent the gendered differences found in performance may condition the ambient lived by students in classes, and whether this might act as a mechanism that reinforces the differences. Peer effects in grades may come from two main sources. The first is through joint study and accomplishment of tasks by sharing doubts and engaging in discussion, as well as other forms of learning spillovers. The second comes from competition among classmates' peers, which may turn out to have positive or negative effects, depending on each individual's reaction to competitive settings.

Our estimation results for peer effects do not show negative effects in any case. On the contrary, all significant estimates are positive, and they exhibit a gender and subject bias different to those obtained for interests. In particular, statistically significant peer effects in macroeconomics originate only from male students, but affect both male and female classmates (with similar estimated coefficients of 0.156 and 0.149, respectively). Neither men nor women seem to be affected by their female peers' performance in macroeconomics. Quite interestingly, though, in microeconomics the patterns differ. In this case, a male student is more likely to indicate a better relative performance in microeconomics as the percentage of male classmates with better grades in micro increases. The same applies to women with respect to their female peers.

These results for peer effects on grades might appear puzzling at first sight. In brief, men seem to collaborate/compete only with their male peers, in both subfields, while women collaborate/compete with classmates of different genders depending on the subfield, namely, male peers in macro and female peers in micro. An initial interpretation of these results could be that both men and women may hold their own ideas as regards which students are the top performers in the classrooms. In this sense, we might argue that men hold gender-biased opinions as regards performance; more specifically, male-biased perceptions of the classmates to look up to. Conversely, for women, the *a priori* could be based on precisely what our results in Section 4 have indicated, that is, men tend to outperform women in macro, while women outperform men in microeconomics. To the extent that women perceive a different relative performance of their male and female peers in their classes, they may become convinced that men are the leaders in macro while women are so in microeconomics. Thus, women would have what we could refer to as a performance-based

or statistical bias.³⁵ This first interpretation would line up with the results in Grunspan et al. (2016). The authors, using classroom data from an introductory undergraduate biology class at a large American university, find a strong male bias among males when assessing their perceptions about the performance of their female classmates, whom they clearly underrate. In contrast, females seem to rate their peers on the basis of their performance, regardless of gender.

There may be alternative explanations for these contagion effects on grades. Studies have shown that men tend to participate more actively in the classroom than women (Lundeberg and Punócohaí, 1994), and it would be expected that more so the greater their interest in the subject matter. According to this view, if men contribute with more comments, questions and opinions in macroeconomics classes, in which they tend to be more interested, they probably gain greater recognition from both their male and female classmates. This, in turn, generates a situation whereby students in the classroom, no matter if they are men or women, are more likely to share tasks, ask for help or even compete with men. In microeconomics, the argument would follow that women fail to convey such an image, and each student collaborates then with peers of the same gender.

Summing up, our results with the survey data confirm that women underperformance in macroeconomics as compared to men occurs mainly in the upper part of the academic ability distribution, that finding macroeconomics interesting is a necessary condition for women to report better grades in this subfield, and that the fact of observing a larger amount of jobs associated to men and macro may impact negatively the performance of women in this subfield. In microeconomics, after discounting the effect of interest, the women dummy still points out that female students are more likely than men to state that micro is the subfield where they relatively obtain better grades.

Finally, and as a likely reflection of the outstanding role of men in macroeconomics, they are the only ones to influence the performance of their mates in macroeconomics classes. Women reporting relatively better grades in macro do not have any influential effect on the grades of their peers, and in microeconomics they only influence their female classmates.

6 Summary and conclusions

Academics in economics have long observed that, at the research level, women tend to self-select differently across subfields in our discipline. In particular, women are relatively more present in some of the research topics that we would classify under microeconomics. In this paper, we have provided new evidence of this fact using web scraping and machine learning techniques to gather information from the papers presented at the annual AEA meeting

³⁵Statistical bias or inference (Phelps, 1972) refers to the case whereby people use group statistics as a proxy of the unknown, or imperfect, information about individuals.

Table 5 : STUDENT'S SELF-STATEMENTS:
 "I FIND SUBJECTS IN THIS SUBFIELD MORE INTERESTING" (INTEREST)
 "I OBTAIN BETTER GRADES IN SUBJECTS OF THIS SUBFIELD" (GRADES)

	INTEREST		GRADES	
	MACRO (1)	MICRO (2)	MACRO (3)	MICRO (4)
Women	-0.993** (0.446)	-0.243 (0.595)	0.114 (0.728)	0.992* (0.599)
Interesting			0.055 (0.076)	0.284* (0.153)
W*Interesting			0.180* (0.098)	-0.116 (0.181)
AU-score	0.021 (0.025)	-0.025 (0.021)	0.045* (0.023)	-0.015 (0.025)
W*AU-score	0.029 (0.040)	0.041 (0.031)	-0.079** (0.036)	-0.036 (0.037)
Initial Vocation	0.249** (0.091)	-0.011 (0.053)		
W*Initial Vocation	-0.034 (0.143)	-0.132* (0.075)		
Social concern	0.161** (0.077)	0.025 (0.065)		
W*Social concern	-0.090 (0.115)	0.227* (0.121)		
Jobs Men	0.018 (0.038)	0.026 (0.026)	-0.001 (0.040)	0.025 (0.026)
W*Jobs Men	-0.011 (0.042)	0.005 (0.044)	0.018 (0.036)	-0.020 (0.034)
Jobs Macro	-0.004 (0.031)	0.024 (0.016)	0.033 (0.029)	-0.017 (0.014)
W*Jobs Macro	0.080** (0.032)	-0.016 (0.029)	0.028 (0.033)	0.008 (0.035)
Jobs Macro-Men	0.021 (0.063)	-0.033 (0.044)	-0.073 (0.061)	0.053 (0.049)
W*Jobs Macro-Men	0.024 (0.073)	0.003 (0.073)	-0.118* (0.066)	0.014 (0.065)
<i>Peers' Effects</i>				
Men*Male Peers'	0.057 (0.087)	0.042** (0.019)	0.156*** (0.057)	0.063* (0.033)
Women*Male Peers'	0.037 (0.069)	0.011 (0.020)	0.149** (0.073)	0.010 (0.044)
Men*Female Peers'	0.037 (0.064)	0.021 (0.031)	-0.010 (0.069)	-0.027 (0.039)
Women*Female Peers'	0.198*** (0.070)	0.074* (0.040)	-0.009 (0.090)	0.088** (0.045)
Constant	0.278 (0.587)	0.109 (0.231)	-0.302 (0.370)	0.130 (0.332)
IVs for Peers	Peers' Vocation Peers' AU-scores	Peers' Vocation Peers' AU-scores	Peers' Vocation Peers' AU-scores	Peers' Vocation Peers' AU-scores
First stage F-test (IVs for male peers)	1336.57	319.18	321.17	441.49
First stage F-test (IVs for female peers)	613.58	363.09	103.27	195.71
N Obs	307	307	307	307
Adj. R ²	0.143	0.063	0.244	0.085

Bootstrapped standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. Controls tested and excluded because of lack of joint statistical significance: student's age, full-time student, living at home, father with primary education, mother with primary education, father with university education and mother with university education, plus year dummies. AU-score: student's score to access university (averaged grades from high school and the university access exam).

from 2010 to 2016.

However, to our knowledge, thus far there has been no evidence as to when these differences might arise. In this paper we have shown that they seem to start as early as at the undergraduate level, if not sooner. Using administrative data for economics students at a large public university in Spain we find that, relative to one other, male and female students perform differently in macroeconomics and microeconomics-related courses, more appreciably in the upper quantiles of the grades distribution.

The observed different performance of students by gender and subfield could be broadly attributed, in principle, to two potential factors. The first is possible differences in mathematical and analytical ability by gender. Our results after controlling for the students' overall academic ability and their specific methodological ability rule out this possibility. The second is different preferences for subfields by gender. To gather some information as regards this latter possibility, we surveyed students of economics enrolled at UV in the academic year 2017-2018. Some of their responses are striking, though do in fact confirm the idea that subfields of economics reach women and men in different ways. As an example, the survey data reveals that women are more likely than men to report that they find micro a more interesting subfield than macroeconomics, as well as less difficult and more intuitive.

In terms of the most natural occupations for economics graduates, our surveyed students view the economics profession as dominated by macroeconomics, and students entering economics with higher initial vocation also show a greater interest in macroeconomics. Further, the belief that the profession is male- and macro-dominated has a significant and appreciable impact on the probability of a woman declaring that she obtains worse grades in macro than in micro, while it does not influence the statements offered by men at all. As an additional piece of evidence that male students are viewed as the ones playing an influential role in macroeconomics, our peer effects analysis highlights that men are the only ones to influence their peers' performance in macroeconomics classes.

Taken together, the three pieces of evidence provided in this paper convey the idea that there is a gender imbalance across subfields in the profession that is not only evident at the research level but that starts as early as the undergraduate level. Different abilities do not seem to be the reason, while gender-based differences in interests and perceptions about the economics profession and the different subfields of our discipline might play an explanatory role.

In this paper we have not fully entered on the reasons why these preferences across subfields in economics differ by gender. These differences being natural or socially shaped remain a riddle to us. However, our observations suffice to conclude that the gender imbalance across subfields may be connected with the gender imbalance in economics as a whole: there are areas where women seem to feel relatively more comfortable, because of preferences or relative performance (or both), and these coincide with those that seem to be less well

known to our students. Our paper suggests that many microeconomics-related topics are not being effectively conveyed to young students - nor perhaps to the general public - and that correcting this misinformation might be one way to make economics a more appealing discipline for women.

Appendix A: JEL Approach

Table 6 : CORRESPONDENCE BETWEEN JEL CODES AND SUBFIELDS

JEL code	Name	Area
A	General Economics and Teaching	Others
A0	General Economics and Teaching	Others
A1	General Economics	Others
A2	Economic Education and Teaching of Economics	Micro
A3	Collective Works	Others
B	History of Economic Thought, Methodology, and Heterodox Approaches	Others
B0	History of Economic Thought, Methodology, and Heterodox Approaches	Others
B1	History of Economic Thought through 1925	Others
B2	History of Economic Thought since 1925	Others
B3	History of Economic Thought: Individuals	Others
B4	Economic Methodology	Others
B5	Current Heterodox Approaches	Others
C	Mathematical and Quantitative Methods	Methods
C0	Mathematical and Quantitative Methods	Methods
C1	Econometric and Statistical Methods and Methodology: General	Methods
C2	Single Equation Models. Single Variables	Methods
C3	Multiple or Simultaneous Equation Models. Multiple Variables	Methods
C4	Econometric and Statistical Methods: Special Topics	Methods
C5	Econometric Modeling	Methods
C6	Mathematical Methods. Programming Models. Mathematical and Simulation Modeling	Methods
C7	Game Theory and Bargaining Theory	Micro
C8	Data Collection and Data Estimation Methodology. Computer Programs	Methods
C9	Design of Experiments	Micro
D	Microeconomics	Micro
D0	Microeconomics	Micro
D1	Household Behavior and Family Economics	Micro
D2	Production and Organizations	Micro
D3	Distribution	Micro
D4	Market Structure, Pricing, and Design	Micro
D5	General Equilibrium and Disequilibrium	Micro
D6	Welfare Economics	Micro
D7	Analysis of Collective Decision-Making	Micro
D8	Information, Knowledge, and Uncertainty	Micro
D9	Micro-Based Behavioral Economics	Micro
E	Macroeconomics and Monetary Economics	Macro
E0	Macroeconomics and Monetary Economics	Macro
E1	General Aggregative Models	Macro
E2	Consumption, Saving, Production, Investment, Labor Markets, and Informal Economy	Macro
E3	Prices, Business Fluctuations, and Cycles	Macro
E4	Money and Interest Rates	Macro
E5	Monetary Policy, Central Banking, and the Supply of Money and Credit	Macro
E6	Macroeconomic Policy, Macroeconomic Aspects of Public Finance, and General Outlook	Macro
E7	Macro-Based Behavioral Economics	Macro

JEL code	Name	Area
F	International Economics	Macro
F0	International Economics	Macro
F1	Trade	Macro
F2	International Factor Movements and International Business	Macro
F3	International Finance	Finance
F4	Macroeconomic Aspects of International Trade and Finance	Macro
F5	International Relations, National Security, and International Political Economy	Macro
F6	Economic Impacts of Globalization	Macro
G	Financial Economics	Finance
G0	Financial Economics	Finance
G1	General Financial Markets	Finance
G2	Financial Institutions and Services	Finance
G3	Corporate Finance and Governance	Finance
G4	Behavioral Finance	Micro
H	Public Economics	Micro
H0	Public Economics	Micro
H1	Structure and Scope of Government	Micro
H2	Taxation, Subsidies, and Revenue	Micro
H3	Fiscal Policies and Behavior of Economic Agents	Micro
H4	Publicly Provided Goods	Micro
H5	National Government Expenditures and Related Policies	Micro
H6	National Budget, Deficit, and Debt	Others
H7	State and Local Government. Intergovernmental Relations	Micro
H8	Miscellaneous Issues	Others
I	Health, Education, and Welfare	Micro
I0	Health, Education, and Welfare	Micro
I1	Health	Micro
I2	Education and Research Institutions	Micro
I3	Welfare, Well-Being, and Poverty	Micro
J	Labor and Demographic Economics	Micro
J0	Labor and Demographic Economics	Macro
J1	Demographic Economics	Others
J2	Demand and Supply of Labor	Micro
J3	Wages, Compensation, and Labor Costs	Micro
J4	Particular Labor Markets	Micro
J5	Labor-Management Relations, Trade Unions, and Collective Bargaining	Micro
J6	Mobility, Unemployment, Vacancies, and Immigrant Workers	Micro
J7	Labor Discrimination	Micro
J8	Labor Standards: National and International	Micro
K	Law and Economics	Micro
K0	Law and Economics	Others
K1	Basic Areas of Law	Micro
K2	Regulation and Business Law	Micro
K3	Other Substantive Areas of Law	Micro
K4	Legal Procedure, the Legal System, and Illegal Behavior	Micro

JEL code	Name	Area
L	Industrial Organization	Micro
L0	Industrial Organization	Micro
L1	Market Structure, Firm Strategy, and Market Performance	Micro
L2	Firm Objectives, Organization, and Behavior	Micro
L3	Nonprofit Organizations and Public Enterprise	Micro
L4	Antitrust Issues and Policies	Micro
L5	Regulation and Industrial Policy	Micro
L6	Industry Studies: Manufacturing	Micro
L7	Industry Studies: Primary Products and Construction	Micro
L8	Industry Studies: Services	Micro
L9	Industry Studies: Transportation and Utilities	Micro
M	Business Administration and Business Economics. Marketing. Accounting. Personnel Economics	Others
M0	Business Administration and Business Economics. Marketing. Accounting. Personnel Economics	Micro
M1	Business Administration	Others
M2	Business Economics	Others
M3	Marketing and Advertising	Others
M4	Accounting and Auditing	Others
M5	Personnel Economics	Others
N	Economic History	Others
N0	Economic History	Others
N1	Macroeconomics and Monetary Economics. Industrial Structure. Growth. Fluctuations	Macro
N2	Financial Markets and Institutions	Finance
N3	Labor and Consumers, Demography, Education, Health, Welfare, Income, Wealth, Religion, and Philanthropy	Micro
N4	Government, War, Law, International Relations, and Regulation	Others
N5	Agriculture, Natural Resources, Environment, and Extractive Industries	Others
N6	Manufacturing and Construction	Others
N7	Transport, Trade, Energy, Technology, and Other Services	Others
N8	Micro-Business History	Micro
N9	Regional and Urban History	Micro
O	Economic Development, Innovation, Technological Change, and Growth	Macro
O0	Economic Development, Innovation, Technological Change, and Growth	Macro
O1	Economic Development	Micro
O2	Development Planning and Policy	Micro
O3	Innovation. Research and Development. Technological Change. Intellectual Property Rights	Micro
O4	Economic Growth and Aggregate Productivity	Macro
O5	Economywide Country Studies	Macro
P	Economic Systems	Others
P0	Economic Systems	Macro
P1	Capitalist Systems	Others
P2	Socialist Systems and Transitional Economies	Others
P3	Socialist Institutions and Their Transitions	Others
P4	Other Economic Systems	Others
P5	Comparative Economic Systems	Others
Q	Agricultural and Natural Resource Economics. Environmental and Ecological Economics	Micro
Q0	Agricultural and Natural Resource Economics. Environmental and Ecological Economics	Micro
Q1	Agriculture	Others
Q2	Renewable Resources and Conservation	Micro
Q3	Nonrenewable Resources and Conservation	Micro
Q4	Energy	Micro
Q5	Environmental Economics	Micro
R	Urban, Rural, Regional, Real Estate, and Transportation Economics	Micro
R0	Urban, Rural, Regional, Real Estate, and Transportation Economics	Micro
R1	General Regional Economics	Others
R2	Household Analysis	Micro
R3	Real Estate Markets, Spatial Production Analysis, and Firm Location	Micro
R4	Transportation Economics	Micro
R5	Regional Government Analysis	Others

JEL code	Name	Area
Y	Miscellaneous Categories	Others
Y0	Miscellaneous Categories	Others
Y1	Data: Tables and Charts	Methods
Y2	Introductory Material	Others
Y3	Book Reviews (unclassified)	Others
Y4	Dissertations (unclassified)	Others
Y5	Further Reading (unclassified)	Others
Y6	Excerpts	Others
Y7	No Author General Discussions	Others
Y8	Related Disciplines	Others
Y9	Other	Others
Z	Other Special Topics	Others
Z0	Other Special Topics	Others
Z1	Cultural Economics. Economic Sociology. Economic Anthropology	Others
Z2	Sports Economics	Others
Z3	Tourism Economics	Others

Table 7 : CLASSIFICATION BY THEMES OF AEA PAPERS

Cloud (main stems)	Rank	Share of Women			Number of authors (average)
		2014	2015	2016	
women, educ, gender, famili, children, age, gap, evid, parent, femal	1	48.40%	47.89%	46.75%	197
program, student, school, educ, learn, score, colleg, univers, effort	2	41.38%	32.26%	31.74%	155
health, insur, use, servic, provid, improv, examin, patient, impact, medic	3	31.63%	30.81%	34.13%	169
labor, employ, worker, wage, job, earn, skill, union, occup	4	28.25%	31.01%	29.65%	168
behavior, individu, experi, social, decis, choic, prefer, contribut, influenc	5	30.85%	24.24%	26.75%	170
econom, institut, will, social, theory, research, approach, understand, discuss	6	21.74%	28.49%	30.30%	169
effect, find, increas, result, impact, signific, suggest, decreas, variat, causal	7	36.11%	20.37%	22.78%	56
firm, competit, product, manag, ceo, busi, corpor, patent, innov, profit	8	25.00%	24.55%	27.39%	223
incom, tax, household, data, measur, wealth, consumpt, poverti, individu, level	9	29.82%	20.20%	19.90%	157
trade, countri, develop, import, product, export, global, foreign, china, region	10	20.39%	25.93%	21.77%	145

CLASSIFICATION BY THEMES OF AEA PAPERS (CONTINUED)

Cloud (main stems)	Rank	Share of Women			Number of authors (average)
		2014	2015	2016	
financi, bank, credit, debt, market, risk, loan, mortgag, borrow	11	25.91%	21.55%	19.49%	308
growth, chang, declin, period, recess, year, rise, sever, trend, document	12	21.01%	30.86%	13.76%	103
state, govern, public, system, privat, legal, conflict, law, reform, polit	13	22.22%	20.00%	21.33%	86
capit, invest, cost, show, constraint, human, extern, rais, incent, lead	14	26.47%	12.50%	23.88%	69
use, local, chang, land, energi, citi, area, locat, environment, geograph	15	21.39%	15.17%	22.89%	205
polici, rate, shock, interest, monetary, exchang, real, chang, inflat, fiscal	16	23.64%	20.56%	15.24%	127
price, market, hous, demand, consum, use, valu, elast, real, properti	17	13.13%	20.63%	16.25%	160
inform, mechan, network, contract, agent, auction, result, strateg, signal, incent	18	18.69%	16.13%	14.47%	130
risk, return, fund, asset, stock, investor, volatil, hold, premium, equit	19	15.45%	16.17%	15.73%	249
estim, use, test, variabl, bias, identifi, distribut, error, result, data	20	12.96%	15.15%	15.50%	123
model, dynam, optim, welfar, heterogen, equilibrium, predict, general, endogen	21	7.34%	15.46%	11.00%	102

Appendix B: complementary material and tables.

Table 8 : CLASSIFICATION OF COURSES AT UV INTO SUBFIELDS

	Core and Compulsory	Optional
Macroeconomics	Macroeconomics (principles) Macroeconomics (intermediate) Advanced Macroeconomics Dynamic Macroeconomics	International Macroeconomics. Topics in Applied Macroeconomics. Growth Theory.
Microeconomics	Microeconomics (principles) Microeconomics (intermediate) Advanced Microeconomics Games and Strategic Behaviour.	Industrial Organization. Applied Industrial Economics. Labour Economics. Topics in Applied Microeconomics. Game Theory. Natural Resources Theory. Microeconomics: Markets and Contracts.
Finance	Financial Accounting Financial Maths Principles of Financial Management Financial Information Analysis	Management in Banking and Finance. Business Finance. Theory of Banking and Finance. Financial and Monetary Policy. Financial Markets and Bank Operations.
Methods	Statistics Maths Mathematical Programming Econometrics (principles) Econometrics (intermediate)	Data Analysis in Economics. Introduction to Maths for Business. Econometric Applications. Maths for Dynamic Models.
Other	Basics of Law European Union Economy Economic History Foundations of Business Management Accounting Economic Policy (principles) Economic Policy (advanced) International Economics Public Economics	Regional Economics. International Trade. Competitiveness and R&D Policies. Growth and Development in Ec. History. Agricultural Economics. Social Economics. Public Economics Evaluation. Economic Policy in the UE. Public Regulation. Tax System in Spain. Regional and Local Development Policies. Monetary Integration. Business Strategies. Federal Taxation. Contemporary Economic Thinking .

Courses difficult to categorize by their subject matter have been classified according to the fields of the departments that are in charge of the course.

Appendix C: Two-steps Semi-parametric selection model.

To account for selection bias into optional courses we start defining a dummy variable s_i which takes the value 1 if the student has chosen any optional course in the f field for which we estimate the equation. The QR equation for grades can be written as follows:

$$Q_q(G_{imt}/s_i = 1) = \alpha(q) + \beta(q)W_i + \gamma(q)\mathbf{x}_{it} + m_t(q) + \tau(q) + Q_q(u1_{imt}/s_i = 1) \quad (4)$$

where now the quantiles are conditional on selection. The selection equation follows a semi-parametric single index regression model as:

$$s_i = g(X_i'\beta_s) + u2_i \quad (5)$$

where the function g is of unknown form and $(X_i'\beta_s)$ is a single linear combination of parameters and covariates thought to explain the selection. A student may choose none, one or more than one course in a given subfield. Students in two courses of a given subfield will contribute twice to the QR regression of this subfield, and will also appear twice in the selection equation in that subfield. This yields an estimation which is somewhat equivalent to applying frequency weights, that is, weighting individuals' observations according to their frequency in the sample.

The conditional quantile of observed grades depends on the quantile-specific selection bias term of unknown form $g(X_i'\beta_s)$ which cannot be corrected using the traditional parametric estimation *à la* Heckman.³⁶ Instead, we use the two-step procedure suggested by Buchinsky (1998) as follows. In the first step, the parameters in the selection equation (5) are estimated using any semi non-parametric estimator. As in Sharma et al. (2013), we use the SNP estimator proposed by Gallant and Nychka (1987), which has the advantage over other semi-parametric estimators that it does not involve kernel smoothing.³⁷ In the second step, the QR is run on all the second stage covariates and on a polynomial expansion on the estimated linear index $(X_{if}'\beta_s)$ of the first stage. The degree of the polynomial in our QR estimation has been chosen according to the statistical significance obtained for the different

³⁶Parametric estimators are consistent and asymptotically efficient only if the distributional assumptions are correctly specified. Since in QR the selection bias term is of unknown form, its parametric estimation would lead to inconsistent estimates.

³⁷Kernel-based Methods require the choice of bandwidth, are computationally intensive and often have convergence difficulty (Stewart, 2004). The SNP is a pseudo-ML estimator where the unknown likelihood is approximated using a Hermite polynomial expansion. Identification of an SNP estimator requires fixing the value of the intercept and having at least one continuous variable in the vector of covariates. Following Melenberg and Soest (1996) the value of intercept is set to its probit estimate. Also, continuous variables are included in the estimation. See De Luca (2008) for details on the command SNP in Stata.

powers of the index.

The linear index estimated in our SNP model comprises all the covariates already included in the QR tables, including the women dummy variable. We also add as determinants of the choice of optional courses the average grades students obtained previously in the different compulsory courses. This reflects the plausible idea that students may choose optional courses on the basis of how good they are at the different subfields.³⁸ All covariates that refer to the students themselves (age, full-time study, high school type, etc.) as well as the grades previously obtained in the compulsory courses are interacted with the women dummy to allow us to observe whether women make their choices differently to men.

Parents' educational and employment status are not crossed with the women dummy, after having checked that no differences between men and women arose in any case in the estimated effect of these variables. These variables are not presented in the table for the sake of simplicity (and, in general, do not show significant effects in most of the cases).³⁹

We apply the two-step procedure to each of the subfields. That is, for macro, micro, finance, Methods and other, we estimate the non-linear selection equation and, then, the corresponding QR regression with the selection correction terms. Table 9 displays the results for the SNP estimation, while Table 10 presents the result for the QR of grades. In Table 9 a double column has been constructed that shows the baseline effect of each covariate, plus the differential effect for women. That is, the second column, labeled women (difference), in each subfield reports the coefficient of the interaction term although there is only one estimated equation in each pair of columns.

One of the most interesting findings from the SNP estimation is the different impact of past grades in macro and micro on the students' choice of the corresponding optional courses. On the one hand, the better the past grades in macro, the higher the likelihood of a student choosing courses in the macro, micro and finance subfields. No differences arise between men and women in this regard. However, past performance in micro seems to affect the choice of micro courses differently in men and women. In particular, women with good marks in micro are far less likely to choose macro courses than men: the negative coefficient for the interaction with the women dummy in the second column for macro (-1.196) almost cancels out the positive baseline effect (1.582). In microeconomics, good grades in the past make women much more prone than men to choose micro-related optional courses: the estimated

³⁸Performance in previous economic courses by high school students is found to be a positive predictor of persistence in the discipline (Chizmar, 2000; Jensen and Owen, 2001; Calkins and Welki, 2006).

³⁹It could be argued that the decisions to enroll in different fields may be interconnected. Then, the selection model could be thought of as a simultaneous equation system where the choice of one subfield depends on the previous results in that field and on the choice made about the rest of the subfields, plus additional covariates. By running separate equations, each of them can be considered as the reduced form equation from such a joint system, where the past grades in all courses enter into each of the equations. The efficiency gain from the joint estimation of the reduced form equations is not a primary goal since our first step SNP is basically aimed at estimating the index to correct for selection in the second step.

effect for men is 1.253 while for women an additional 0.950 is significantly estimated.

The selection into finance also shows some differences between men and women. In particular, it seems that men are not driven by their past marks in finance to enroll in finance-related courses, whereas women are more likely to enroll in finance courses if they previously achieved good grades in finance. Another notable result is the negative association between good marks in macro and micro and the likelihood of enrolling in the subfields of Methods or other. Women with previous good grades in micro are much less likely than men to enroll in Methods, while they pay much more attention than men to their past marks in Methods when selecting courses in this subfield.

Additional results in Table 9 refer to the association between the AU-score and the choice of courses. Higher ability students, as proxied by the AU-score, tend to choose macro and Methods to a greater extent, while they seem to be less attracted by finance. In the rest of the subfields, no significant effects are estimated, either for men or for women.

The women dummy variable coefficient is positive in macro and Methods, which accounts for the part of the probability that remains unexplained for women as compared to men after partialing out the impact of the rest of covariates. The estimated total probability, on average, that women enter a given subfield as compared to men is not, however, uniquely defined by this dummy coefficient. To offer some results in this regard, at the bottom of Table 9 we show the average value of the estimated index ($X_i'\beta_s$) for men and the differential value for women (in particular, we run an OLS regression of the index on a constant and the women dummy). The obtained estimates indicate that the index is significantly lower for women in macro, finance and Methods while the difference is positive in micro and other. As the probability increases with the index, these results indicate that women have lower estimated probabilities of entering macro, finance and Methods, as compared to micro and other courses.

Table 9 : SEMI-NON-PARAMETRIC (SNP) ESTIMATION OF OPTIONAL COURSES CHOICES

	Macro		Micro		Finance		Methods		Other	
	men	women (difference)	men	women (difference)	men	women (difference)	men	women (difference)	men	women (difference)
Women		1.636*** (0.533)		0.282 (0.793)		0.194 (0.277)		2.346*** (0.376)		-0.220 (0.356)
AU-score	0.0654** (0.0295)	-0.0494 (0.0411)	0.0742 (0.110)	-0.0229 (0.116)	-0.0893*** (0.0239)	0.0745* (0.0389)	0.185*** (0.0381)	-0.208*** (0.0530)	0.00983 (0.0241)	0.0123 (0.0665)
Past grades macro	2.570*** (0.158)	0.241 (0.278)	2.627*** (0.419)	0.0410 (0.540)	2.839*** (0.195)	0.0461 (0.313)	-1.689*** (0.527)	-0.203 (0.724)	-1.536*** (0.306)	-0.0496 (0.497)
Past grades micro	1.582*** (0.162)	-1.196*** (0.397)	1.253*** (0.382)	0.950* (0.501)	1.665*** (0.144)	0.0998 (0.356)	-2.893*** (0.451)	-2.595*** (0.606)	0.0929 (0.256)	0.0413 (0.381)
Past grades finance	-0.224 (0.369)	0.488 (0.489)	2.515*** (0.434)	-2.055*** (0.554)	0.100 (0.228)	0.736* (0.406)	-0.770 (0.513)	0.877 (0.623)	-0.175 (0.396)	0.893* (0.491)
Past grades Methods	0.0639 (0.370)	-0.824 (0.519)	1.501*** (0.285)	-0.748 (0.805)	-0.371 (0.228)	-0.156 (0.313)	1.500*** (0.0876)	1.168*** (0.283)	-1.276*** (0.252)	-0.432 (0.316)
Past grades other	0.00936 (0.127)	0.368* (0.196)	0.0720 (0.268)	0.374 (0.393)	0.229** (0.108)	-0.0425 (0.156)	0.367*** (0.140)	-0.583*** (0.198)	-0.172* (0.101)	0.0262 (0.149)
Age	0.0213*** (0.00531)	-0.0766*** (0.0203)	-0.0344*** (0.0129)	-0.0421* (0.0241)	0.0101** (0.00407)	-0.0236*** (0.00907)	-0.0190*** (0.00613)	-0.0410** (0.0165)	0.0126 (0.0226)	0.0189 (0.0123)
Living at home	-0.0544 (0.0938)	0.0295 (0.128)	-0.399 (0.367)	0.239 (0.448)	-0.00370 (0.0644)	0.0260 (0.0950)	0.0982 (0.0920)	-0.0259 (0.126)	0.0767 (0.0600)	-0.0823 (0.0790)
Standard high school	0.175 (0.131)	0.164 (0.175)	-0.135 (0.425)	0.320 (0.552)	-0.377*** (0.0946)	0.175 (0.152)	1.192*** (0.194)	-1.195*** (0.245)	0.104 (0.0917)	-0.112 (0.151)
Vocational high school	0.0818 (0.178)	0.569** (0.235)	-0.807 (0.516)	0.489 (0.639)	-0.0445 (0.130)	0.193 (0.187)	0.0552 (0.248)	-0.476 (0.343)	0.0202 (0.140)	-0.295* (0.168)
full-time student	0.166* (0.0966)	-0.118 (0.154)	0.146 (0.359)	0.157 (0.409)	0.0717 (0.0681)	-0.150 (0.106)	-0.0337 (0.0933)	0.0282 (0.148)	0.0244 (0.0637)	0.0185 (0.111)
Constant (fixed)	-3.218		-1.311		-2.099		-1.560		1.138	
Likelihood Ratio Test for probit vs. SNP [p-values in brackets]	37.93 [0.000]		4.61 [0.032]		106.31 [0.000]		186.82 [0.000]		13.24 [0.000]	
Log pseudolikelihood	-1199.92		-5076.24		-2716.64		-3579.03		-8101.24	
Estimated linear index	1.154*** (0.004)	-0.021*** (0.006)	0.002 (0.008)	0.018* (0.010)	0.394*** (0.005)	-0.122*** (0.007)	0.843*** (0.007)	-0.188*** (0.011)	0.012*** (0.003)	0.046*** (0.005)

Robust errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01.

Table 10 : QR OF GRADES IN OPTIONAL COURSES BY SUBFIELD (WITH AND WITHOUT SELECTION CORRECTION)

	Macro		Micro		Finance		Methods		Other	
	No corr.	Select corr.	No corr.	Select corr.	No corr.	Select corr.	No corr.	Select corr.	No corr.	Select corr.
Women	-0.521 (0.333)	-0.584* (0.332)	0.364*** (0.087)	0.352*** (0.106)	0.102 (0.166)	0.180 (0.168)	0.078 (0.138)	0.014 (0.143)	-0.028 (0.032)	-0.019 (0.031)
AU-score	0.049 (0.136)	-0.091 (0.139)	0.226*** (0.048)	0.092** (0.040)	0.177*** (0.056)	0.184*** (0.052)	0.208*** (0.054)	0.279*** (0.056)	0.119*** (0.013)	0.094*** (0.014)
W*AU-score	0.129 (0.189)	0.155 (0.175)	-0.098** (0.041)	-0.074 (0.050)	-0.007 (0.083)	-0.028 (0.072)	-0.030 (0.067)	-0.067 (0.068)	-0.004 (0.019)	-0.001 (0.017)
Age	-0.042** (0.016)	-0.057*** (0.017)	-0.014** (0.007)	0.004 (0.011)	-0.012 (0.013)	-0.011 (0.012)	0.001 (0.014)	-0.008 (0.012)	-0.009*** (0.003)	-0.002 (0.003)
Standard high school	0.322 (0.693)	-0.015 (0.702)	0.326 (0.198)	0.074 (0.155)	0.175 (0.183)	0.335* (0.192)	0.132 (0.263)	0.623** (0.246)	0.233*** (0.051)	0.175*** (0.055)
Vocational high school	-0.396 (0.772)	-0.521 (0.720)	0.298 (0.233)	0.416** (0.198)	0.325 (0.223)	0.284 (0.224)	0.164 (0.289)	0.185 (0.279)	0.165*** (0.063)	0.106* (0.059)
full-time student	0.432 (0.273)	0.208 (0.282)	0.289* (0.168)	0.180 (0.116)	0.017 (0.172)	0.015 (0.169)	0.246* (0.136)	0.216 (0.144)	0.125*** (0.030)	0.127*** (0.031)
Living at home	-0.117 (0.243)	-0.052 (0.213)	0.018 (0.064)	0.151 (0.097)	0.127 (0.134)	0.124 (0.129)	-0.006 (0.115)	0.005 (0.113)	-0.014 (0.024)	0.006 (0.024)
SNP index		1.330*** (0.280)		0.645*** (0.087)		0.946*** (0.256)		-0.567*** (0.134)		-0.550*** (0.050)
SNP index ²				0.293*** (0.065)				0.213*** (0.048)		0.456*** (0.066)
SNP index ³				-0.096*** (0.025)						0.215*** (0.042)
Constant	9.477*** (1.363)	8.626*** (1.359)	5.702*** (0.630)	5.579*** (0.408)	6.422*** (0.799)	5.694*** (0.762)	5.699*** (0.565)	5.710*** (0.577)	5.061*** (0.176)	4.994*** (0.160)
N Obs	256	256	1624	1624	755	755	1062	1062	12734	12734
Adj. R ²	0.176	0.256	0.051	0.115	0.071	0.128	0.069	0.091	0.426	0.437

Bootstrapped errors in parentheses (500 replications). * p<0.10 ** p<0.05 *** p<0.01. All regressions include course-year effects, year dummies and the complete set of socio-economic controls included in Table 1. AU-score: student's score to access university (averaged grades from high school and the university access exam).

Appendix D: IVs estimation of contagion or peer effects.

To overcome the problem of endogeneity of the peer effects measures in equations 4 and 5 we follow the most widely-used approach, which consists in using instrumental variables (e.g., Goux et al., 2007). These instruments may be constructed from individual measures affecting the individual responses about interests and grades which are exogenous to the error term of the equation. We choose two variables that are predetermined before students enter their respective groups and before their interaction in the classroom starts: the AU-scores and their self-reported statements about initial vocation. With the individual responses to these two variables, we construct the IVs.

More specifically, we define for each student the percentages of males and female peers in the class expressing an initial vocation PV_{j-i} and their respective average AU-scores PAU_{j-i} . In a first stage, we estimate the reduced forms of the male peers' interest and the female peers' interest on the IVs and the rest of the covariates of the main equation. As an example, for the female peer measure in equation 2 the first stage regression takes the general form:

$$PI_i^W = \beta_0 + \beta_1 PAU_{j-i}^W + \beta_2 PAU_{j-i}^M + \beta_3 PV_{j-i}^W + \beta_4 PV_{j-i}^M + \beta_5 \mathbf{w}_i + e_i^I \quad (6)$$

where $\mathbf{w}_{is}$ stands for all the covariates and controls other than the peer measures appearing in the main equation (equation 2 in this case). An equation like 6 is run for each of the four peer measures appearing in equations 2 and 3 above. In the second stage, we plug the first-stage predictions for the peer measures into the right-hand side of the corresponding main equation of interest. To account for the extra variance introduced in the second stage when a first-stage estimated variable is included, we bootstrap the standard errors.

The application of IV to estimate peer effects present a fundamental difference with respect to the IV estimation in the standard setting. Here, the individual variable used to construct the IV does not fulfill an exclusion restriction in the main equation. On the contrary, if an individual covariate is not explanatory of the individual responses its aggregation will probably not correlate with the peer measure. Moreover, the individual variable may enter the main equation together with their peer construction. An example of an application of this approach can be found in Carrell et al. (2008) for the estimation of peer effects in academic cheating.

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Variation in Women’s Success across PhD Programs in Economics

Leah Boustan and Andrew Langan

In 2017, women made up 32 percent of entering PhD students in economics. The share of women in economics is below many other fields including science, technology, engineering, and mathematics and has not increased since the 1990s (as discussed in this journal by Bayer and Rouse 2016). This paper adds new data—both quantitative and qualitative—on graduate programs in economics to understand the wide and persistent variation in women’s success across departments. We then use these insights to suggest “best practices” for department chairs, PhD admissions committees, and others hoping to increase the number of women in economics.

Our quantitative data come from two sources: newly available annual surveys of graduate departments conducted by the Committee on the Status of Women in the Economics Profession (CSWEP), and our own hand-collected faculty rosters from PhD-granting economics departments in the United States from 1994 to 2017. The CSWEP survey contains information on the number of men and women graduating from each program by year, and the number of job market placements by job type and gender.¹ We organize our roster data to associate each faculty member with their graduation cohort and alma mater to examine other early career outcomes, such as placement rank, publications, and promotion.

¹ CSWEP’s data are now posted on ICPSR (Study Number 37118); we received an early copy of the data for this paper. We thank Shelley Lundberg and Margaret Levenstein for access to the data. By agreement with CSWEP, names of the institutions are suppressed.

■ *Leah Boustan is a Professor of Economics and Andrew Langan is a PhD student, both at Princeton University, Princeton, New Jersey. Boustan is also a Research Associate, National Bureau of Economic Research, Cambridge, Massachusetts. Boustan is the corresponding author at lboustan@princeton.edu.*

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The opening four sections of this paper document a number of facts. First, there was wide variation in the average share of women in the graduating classes of economics PhD programs during the past 30 years, ranging from 10 percent to more than 50 percent of the class. This variation is primarily explained by differences in initial admission, rather than differential attrition from the program. Many programs, particularly the largest ones, increased the share of women on the student body from the 1990s to the 2010s. Yet the share of women in a PhD program tends to be a persistent attribute of a department, with a strong correlation in the gender composition of graduating classes over time.

Second, we show that departments with a greater share of women on their faculty also have more women in their student body: a 10 percentage point increase in faculty share is associated with a 2.5 percentage point increase in student share. This relationship could be causal if, for example, women on the faculty serve as role models for women students, or it could reflect other departmental attributes that are attractive to both women faculty members and graduate students.

Third, we document that, on average, men and women who graduated from the same program between 1994 and 2017 are no different in their propensity to be offered and accept a faculty position at a US PhD-granting department or to be promoted to associate professor within ten years of graduation. But conditional on taking a job in a US PhD-granting economics department, men land placements at higher-ranked departments and publish more in the top journals in the first seven years after obtaining their degree.

Fourth, we rank 22 large (anonymized) programs on the gender gap in these early career outcomes. We focus on programs with sufficient data for both men and women; these 22 programs train two-thirds of the faculty at PhD programs in the United States. Our ranking identifies large variation in relative success for women across graduate programs in outcomes like job placement, publication, and promotion. For example, women graduating from departments with better relative outcomes have 9 percent higher placement rates than men, while women graduating from departments with worse relative outcomes have 8 percent lower placement rates than men. Yet in all cases, men are more likely than women to publish in top journals, suggesting that women face a common set of impediments in their early careers regardless of their graduate institution.

This ranking across departments guided our selection of departments for a set of structured qualitative interviews designed to learn more about variation in the mechanics and culture of graduate instruction in economics. We conducted 31 interviews with faculty members and former students at five programs—two that achieved good relative outcomes for women, two that achieved poor relative outcomes for women, and one in the middle of the pack. All interviews were conducted and transcribed by Leyla Mocan, a Master in Public Policy student at the Woodrow Wilson School at Princeton. Our interviews confirm that having women on the faculty inspires women in the student body to succeed. The interviews also uncover several features of graduate programs that are associated with good relative outcomes for women: structuring the graduate program to formalize

key aspects of advisor–student contact; creating a collegial atmosphere in research seminars; and developing awareness of gender issues, especially by senior male faculty. We see many of these ideas as “gender neutral,” in the sense that they would likely improve the climate of graduate instruction for all students regardless of gender. However, our interviews suggest that these reforms would likely have a disparate impact on women.

The Share of Women Graduating from Economics PhD Programs

This section presents new facts about variation in the share of women in graduating classes from economics PhD programs. We limit our analysis to the 88 out of 127 economics departments with a large enough number of entering and graduating PhD students who responded to the CSWEP survey.² We aggregate the annual data into two broader graduation cohorts: students graduating between 1994 and 2005 and between 2006 and 2017. These periods divide our data in half.

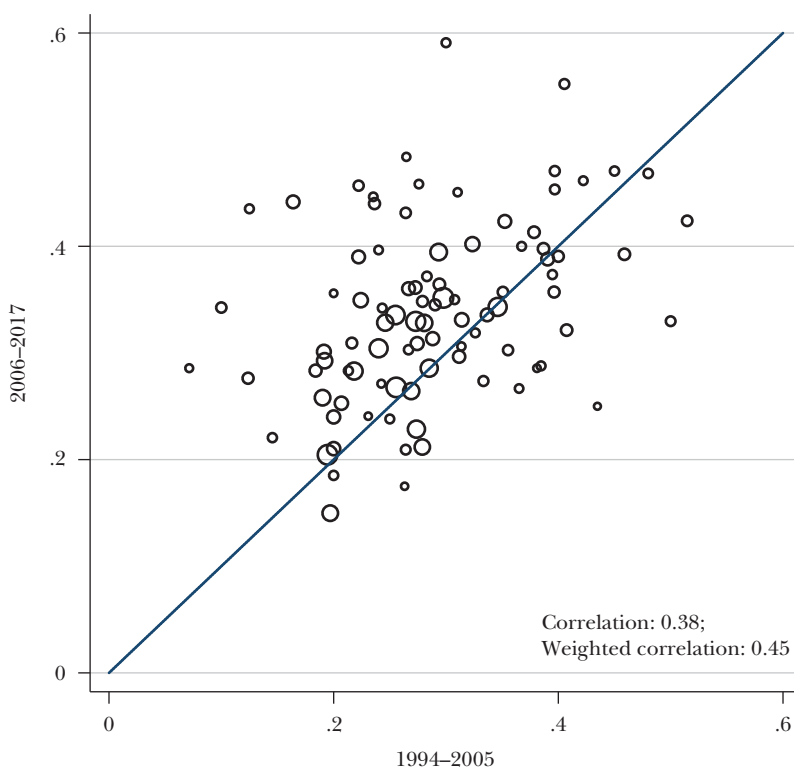
Figure 1 illustrates that the share of women in the graduate student body ranges from 10 percent to more than 50 percent. The share of women in a program is a persistent attribute, with a correlation between the two time periods of 0.38 (0.45 if weighting by size of the program, and 0.53 when focusing on programs above the median size). Figure 2 shows a strong relationship between the share of women in entering first-year cohorts (1994–2012) and in graduating cohorts (1999–2017). The coefficient from regressing share of women in the graduating class on share of women in the entering class cannot be statistically distinguished from one, suggesting that variation in share of women across programs is not driven by differential attrition, such as gender differences in the probability of leaving the program after failing general exams. The year groupings in this figure are selected to match entering first-year cohorts at least approximately with corresponding graduating classes. We assume that students take around five years to graduate, but the result is robust to alternative assumptions.

Correlations with Observable Departmental Attributes

Differences in the share of women graduating from PhD departments in economics are correlated with some observable characteristics of these programs. Table 1 considers the association between share of women in the graduating class and six attributes of a PhD program: its *US News & World Report* department ranking; the share of women on its faculty; the field mix of its faculty; the average

²We focus on departments that were above the 25th percentile in the number of entering first-year students (123) and the number of graduates (68) reported to CSWEP during the full period, and for which we have faculty rosters, to permit other analyses.

Figure 1

Share Women PhD Recipients by Department: 1994–2005 versus 2006–2017

Source: CSWEP department survey.

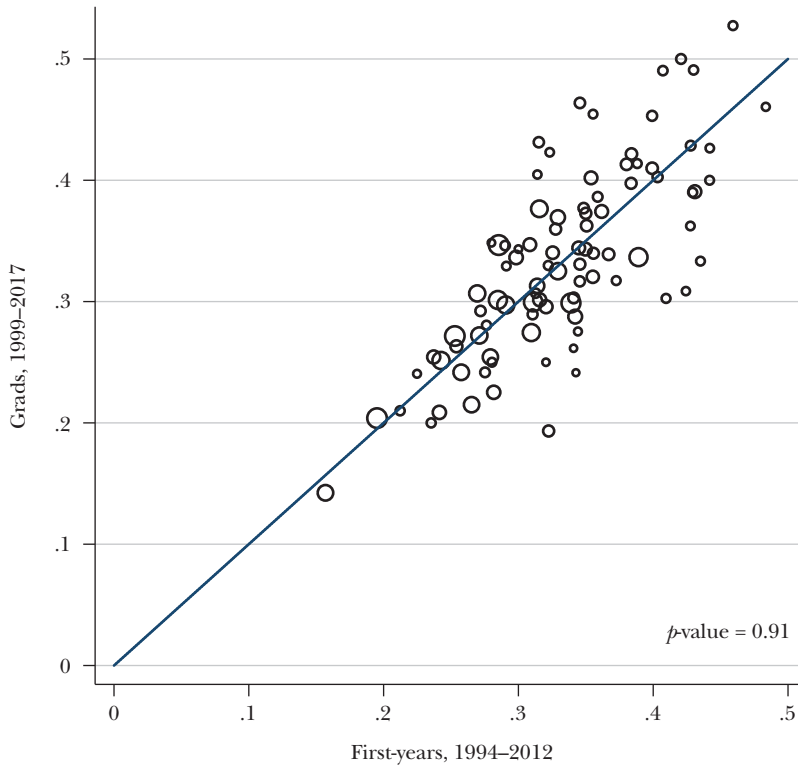
Note: This figure plots women's share of economics PhD recipients from 2006 to 2017 against their share from 1994 to 2005, by department. Points are weighted by the total number of graduates over the entire period per department. We exclude years with imputed counts of PhD graduates and large outliers from department totals.

size of its entering class; the share of non-US-citizen entering students, and the institution's location in a small, medium, or large city.

The first six columns enter each attribute separately and the last column includes all control variables that were individually statistically significant. With 88 observations, we have limited power to detect relationships. Yet we find that the share of women in the graduating class rises in a clear way with the share of women on the faculty. The final column suggests that a 10 percentage point increase in the share of women on the faculty (roughly equivalent to the interquartile range) is associated with a 2.5 percentage point increase in the share of women in the graduating class. This positive association is consistent with Hale and Regev (2014), which uses retirements of men to consider exogenous changes in share of women on the faculty.

A few other departmental characteristics influence the gender composition of the student body. Programs located in the country's 15 largest metro areas have

Figure 2

Share Women, PhD Recipients versus First-Years, by Department, Entering Classes of 1994–2012

Source: CSWEP department survey.

Note: This figure plots women's share of economics PhD recipients from 1999 to 2017 against their share of first-year students from 1994 to 2012, by department. The p -value shown is taken from a t -test of the null hypothesis that the share of women is equal in the two groups within department. Points are weighted by the total number of graduates over the entire period per department. We exclude years with imputed counts of PhD graduates or first-years and large outliers from department totals.

more women in the student body, as do departments further down the 2017 *US News* ranking. Faculty research field mix, program size, and the share of non-US students, as measured by the National Science Foundation's *Survey of Graduate Students and Postdoctorates in Science and Engineering*, do not seem to affect gender balance. In other calculations not shown here, we also see no association between any of these department attributes and the relative placement rates of women.³

To measure gender and field composition of faculty, we compile data on academic rosters across economics departments from three sources: the *Prentice*

³Neumark and Gardecki (1998) and Hilmer and Hilmer (2007) likewise find no positive association in the late 1970s through early 1990s between the share of women on the faculty and students' early career outcomes.

Table 1

Effect of Department Characteristics on Share Women in Graduating Class, Economics PhDs

Department characteristics	Mean	Share women graduates						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rank 11–20	0.102	0.024 (0.034)						0.035 (0.034)
Rank 21–30	0.159	0.049 (0.031)						0.060* (0.032)
Rank 31+	0.625	0.080*** (0.025)						0.079** (0.036)
Faculty Share Women	0.156		0.409*** (0.127)					0.245* (0.130)
Faculty Share Applied Micro	0.389			0.231 (0.257)				
Faculty Share Theory	0.228			–0.090 (0.254)				
Faculty Share Macro	0.252			0.007 (0.258)				
Average Cohort Size	15.961				–0.003** (0.001)			0.000 (0.002)
Share Foreign Entrant	0.472					–0.006 (0.061)		
Medium City	0.375						0.032 (0.020)	0.023 (0.019)
Large City	0.330						0.037* (0.021)	0.050** (0.021)
Constant		0.272*** 0.023	0.268*** 0.021	0.261 0.191	0.383*** 0.021	0.335*** 0.030	0.308*** 0.015	0.214** 0.056
Observations		88	88	88	88	88	88	88
R ²		0.136	0.108	0.027	0.073	0.000	0.042	0.243

Source: The sample includes 88 departments that responded to the CSWEP survey, exceeded the 25th percentile of both the number of entering and graduating students among respondents, and for which we have departmental rosters available from Langan (2018). Economics department rank comes from the 2017 edition of *US News and World Report*. Faculty share women and average cohort size come from 1994–2016 CSWEP responses. Field composition is obtained from our academic roster (Langan 2018) by counting total person-years in the department by individuals' stated fields, using JEL codes from the 1997 AEA members survey, the *Prentice Hall Guide to Economics Faculty*, 1994–2006, and keyword matching from statements on individual and department websites. Share of foreign first-year students comes from 1994–2017 department responses to the National Science Foundation's *Survey of Graduate Students and Postdoctorates in Science and Engineering*.

Note: This table reports the results of regressing women's share of PhD recipients from economics departments on various department characteristics: its *US News & World Report* department ranking; the share of women on its faculty; the field mix of its faculty; the average size of its entering class; the share of non-US-citizen entering students; and the institution's location in a small, medium, or large city. Column 6 regresses share women on the size of the city in which the department is located: the top 15 metro areas are considered "large" and smaller areas with more than 150,000 population are considered "medium." When calculating women's share of graduates from each department in the CSWEP survey data, we drop department-year observations with imputed values for graduates or academic placements at PhD granting institutions and large outlier values.

***, **, and * represents statistical significance at the 1, 5, and 10 percent levels, respectively.

Hall Guide to Economics Faculty, published in seven editions between 1994 and 2006; departmental and faculty web pages accessed using the Wayback Machine (www.archive.org); and the 1989 and 1993 biographical surveys of members by the American Economic Association. More details on construction of the faculty roster are available in Langan (2018).

Early Career Outcomes by Gender

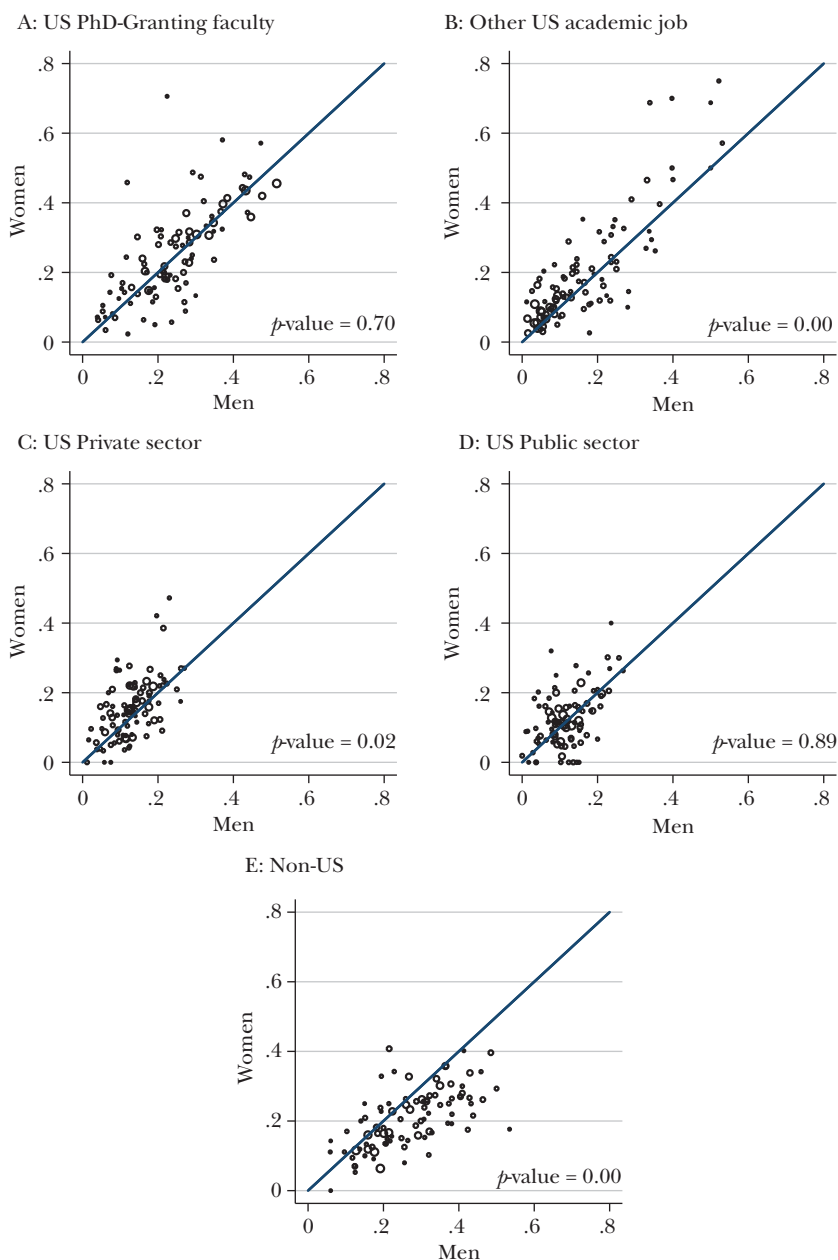
We now turn to examining differences in early career outcomes of recent economics PhDs by gender. We calculate a set of relative ratios for men and women graduating from the same programs for outcomes like academic placement, placement rank, and so on. We then ask in the next section how those ratios vary across departments. Here, we start by identifying two average tendencies: 1) women and men who graduated from the same department are equally likely to place into US doctoral departments; and 2) conditional on receiving an academic placement, women place into lower-ranked departments and publish fewer papers in the first seven years of their career.

Figure 3 graphs the job placement rate by gender for graduates of the 88 PhD programs in our core sample from 1994 to 2017. We consider five placement categories: faculty jobs in US PhD-granting departments, other US academic jobs, US private sector jobs, US public sector jobs, and jobs outside of the United States. The p -values under each panel refer to the null hypothesis that rates of placement are equal for men and women (a small p -value indicates strong evidence against the null hypothesis). We find *no* statistically significant difference in the average placement rate of men and women graduates from the same department into faculty jobs in US PhD-granting institutions, as shown in the first panel. In contrast, women are more likely to accept other US academic jobs, and men are more likely to take jobs outside of the United States.

To develop more detailed early career outcome measures, we move from CSWEP's job placement data to our faculty rosters. We create ratios of men and women who graduated from each department by associating each faculty member in our roster with their department of graduate instruction. For example, we observe one of our coauthors, Leah Boustan, in her first job placement in the UCLA Department of Economics in 2006, but we associate her outcomes (including her placement at UCLA) to her graduation cohort at Harvard University. We use the reshaped roster to define additional outcomes for 22 departments with at least ten women placed into PhD-granting economics departments in order to calculate reasonable averages. Because our rosters include only academic economics departments and not, for instance, business, public policy, or resource economics programs, they constitute only a subset of the CSWEP placements, but the two placement rates are highly correlated overall, and by gender (correlation = 0.75).

Figure 4 compares a set of early career outcomes for men and women who graduated from each of the 22 departments. Men place at departments ranked higher

Figure 3

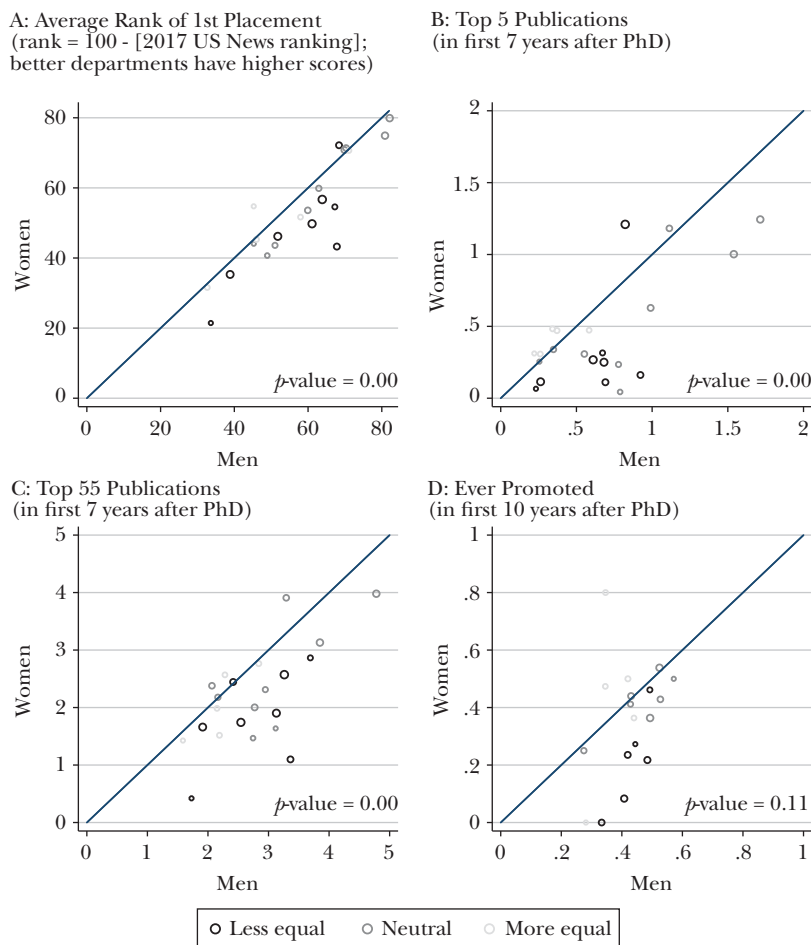
Job Placement Rates by Gender and Department, Five Sectors

Source: CSWEP department survey.

Note: This figure plots women's versus men's rate of placement into various types of job, for economics PhD recipients in 1994–2017, by department (indicated by circles). The p -values shown refer to a test of the null hypothesis that placement rates for a given job type are equal for men and women (a small p -value indicates strong evidence against the null hypothesis.) "US PhD-Granting Faculty" refers to tenure-track faculty jobs in a department that awards doctoral degrees. Points are weighted by the total number of graduates over the entire period per department. We exclude years with imputed counts of PhD graduates or academic placements at PhD granting institutions and large outliers from department totals.

Figure 4

Post-Graduation Outcomes for Men and Women, PhD Economists by Graduate Department



Source: Source: Faculty rosters, Langan (2018).

Note: This Figure plots, for various graduate departments, women's average outcome against men's for four early-career outcomes. We focus on PhD graduates from 22 large US economics departments for which we can identify at least 10 women placed from the 1987 through 2017 graduating cohorts into US economics departments with doctoral programs (or for Figure 4D, 18 graduate departments with 10 women placed between 1987 and 2010). In Figure 4A, we plot the average rank for the first economics department where individuals place after graduation. (Departments not ranked by US News are assigned a *US News* rank of 100). In Figure 4B, for each graduate department, we plot the average number of publications for men versus women graduates in a Top 5 journal (*American Economic Review* (excluding *Papers and Proceedings*), *Quarterly Journal of Economics*, *Econometrica*, *Journal of Political Economy*, and *Review of Economic Studies*) in the first 7 years after PhD. In Figure 4C, for each graduate department, we plot number of publications for men and women in journals ranked 55 or better in the RePEc aggregate journal rankings in the first 7 years after a PhD. For post-2010 graduates, both top 5 and top 55 total publications are predicted for those with at least one publication. In Figure 4D, for each graduate department, we plot the share of men and women, graduating ever observed as an associate or full professor in our faculty rosters within 10 years after receiving their PhD. The p -values are taken from a t -test of the null hypothesis that men and women's average outcomes are equal within department (a small p -value indicates strong evidence against the null hypothesis). Points are weighted by the total number of graduates over the entire period per department. Dots shaded lighter indicate graduate departments that are more equal in terms of having better relative outcomes for women, as summarized in Table 2.

by *US News* and have more publications within their first seven years of graduation. The average gap in placement rank between men and women graduates of the same program is 4.8 rank points, as shown in Figure 4A. Figures 4B and 4C show that men publish more papers in Top 5 or Top 55 economics journals within seven years of graduation; publications are culled from the table of contents data provided by journals to *RePEc*. The average gap in Top 55 publications between men and women graduates of the same program is 0.58.⁴ Figure 4D shows that women are marginally less likely to be promoted to associate or full professor at a PhD-granting economics department within ten years of graduation, relative to men from their alma mater.⁵ Balanced promotion rates by gender could arise if men publish more than women but also face a higher publication bar for tenure, given their higher-ranked first placement.

Documenting Differences in Relative Outcomes for Women across Departments

We are particularly interested in documenting the variation across departments in relative outcomes for women, including graduation rates, placement into an academic job, and later research performance. In Table 2, we rank 22 anonymized graduate programs from “A,” the department with the best outcomes for women graduate students, relative to men in their programs, to “V,” the department with the worst relative outcomes. The ranking is derived by converting each of the outcomes into a z-score and then calculating the mean z-score across outcomes for each department; details are presented in Appendix A.

Average outcomes for three ranked categories (better & best; neutral; worse & worst) are reported in the last three rows of the table. Across these three categories, women make up a similar share of the student body (28 to 30 percent) and first-year students are equally likely to graduate from the program (column labeled “Retention”) regardless of gender. Differences arise at the job placement and assistant professor stages. At programs that are relatively better for women, women have 9 percent higher academic placement rates than men, placement ranks that are nearly identical to men in their program, and marginally lower numbers of top 55 publications. At programs that are relatively worse for women, women have 8 percent lower academic placement rates than men, place into substantially lower-ranked departments, and publish approximately 30 percent fewer papers in a top 55 journal.

⁴The relative publication records of men and women in our sample is consistent with Antecol, Bedard, and Stearns (2018) and Sarsons (2017) for economics, and with broader results across fields summarized in Ceci, Ginther, Kahn, and Williams (2014). For additional work on gender and publication in economics, see Blank (1991), McDowell, Singell, and Stater (2006), Abrevaya and Hamermesh (2012), Bransch and Kvasnicka (2017), and Hengel (2017).

⁵Ginther and Kahn (2004, 2015) find that men are more likely than women to receive tenure in economics, controlling for year of graduation and institutional quality of alma mater.

Table 2

Comparative Success of Women by Graduate Department

(icons represent a department's position in the distribution of each statistic: ✓✓ = top 10%; ✓ = top 25%; × = bottom 25%; ×× = bottom 10%).

Group	ID	Share women	Change in share women	Retention	Rates of placement at PhD	Placement rank	Top 55	Top 5	Promotion
Best relative outcomes for women	A	✓		×	✓✓		✓	✓✓	
	B		✓	✓	×			✓	✓✓
	C		✓✓			✓✓		✓	×
Better relative outcomes	D				✓			✓	✓
	E		✓	✓✓		✓			✓
Neutral	F		×				✓		
	G			✓✓					
	H	✓				✓	×		
	I								
	J			××	✓		✓✓		
	K	×	×		×	✓	✓✓		
	L			✓	✓	×	×	××	
	M	×							✓
Worse relative outcomes	N		✓		✓✓			×	
	O	××						✓✓	×
	P						×		
	Q	✓✓	✓✓	✓	××	××	××	×	
	R	✓		×		×			×
Worst relative outcomes	S	✓✓	×	×	×				×
	T	××	××			××	✓	××	
	U	×			××	×			
	V		××	××		✓✓	××	×	
Better & Best	(A-E)	0.30	1.28	1.02	1.09	1.01	0.92	1.21	1.14
Neutral	(F-N)	0.28	1.13	1.01	1.08	0.94	0.84	0.66	0.91
Worse & Worst	(O-V)	0.28	1.14	0.99	0.92	0.83	0.66	0.47	0.46

Note: This table ranks 22 graduate departments for which we can identify at least 10 women graduates who placed into an economics department with a doctoral program from 1987 to 2017. The ranking is conducted according to relative student outcomes for women versus men. Details for the ranking procedure are in Appendix A. Icons represent a department's position in the distribution of each statistic (✓✓ = top 10%; ✓ = top 25%; × = bottom 25%; ×× = bottom 10%). Averages for the statistics by group are shown in the lowest three rows. Share women is the fraction of first-year women over all first-year students for the whole period. For other statistics, graduate departments are ranked on relative rates, where a value greater than 1 reflects women outperforming men (or positive growth in the case of change in share women). Change in share women reports share women graduates (women graduates divided by total graduates) from 2006–2017 divided by share women graduates from 1993–2005 (see Figure 1). Retention is the share women graduates from 1999–2017 divided by share women first-year students from 1994–2012. This statistic compares the gender ratio at entrance and graduation, allowing 5 years for matriculation. Rates of placement at PhD is from CSWEP and is defined as for Figure 3. Placement rank, Top 55, Top 5, and Promotion are defined as for Figure 4.

Checkmarks in Table 2 indicate the departments that were in the top 10 percent (two checkmarks) or top 25 percent (one checkmark) of any given outcome (out of 22 departments), and ×'s indicate the departments that were in the bottom 10 percent (two ×'s) or bottom 25 percent (one ×). Departments that have better

relative outcomes for women on average are not *necessarily* better across the board. Even the best departments by our rankings have some poor relative outcomes for women (for example, Department C has low promotion rates), and even the worst departments have some good relative outcomes for women (Department T places women at highly-ranked departments relative to men).

Interviews about Why Some Departments Have Better Relative Outcomes for Women

Why are relative outcomes for women graduate students better at some departments than at others? One natural approach to answering this question for us, as empirical economists, might have been to gather systematic data about each department (perhaps by conducting a survey) and then performing a quantitative analysis to determine which attributes of a program predict success for women. However, we only have complete outcome variables for 22 programs, and we do not have a clear *a priori* sense of which explanatory variables may matter, nor how to measure them.

Instead, we conducted a series of exploratory interviews. We selected six departments to include in our interview sample: two departments with better than average outcomes (Departments B and C), two departments with worse than average outcomes for women (Departments O and T), and two departments in the middle of the group (Departments F and K). For each of these departments, we started by contacting the current department chair for a short interview. From there, we developed a snowball sample, asking the chair for a few names of faculty members and former students to reach out to next. In the end, we spoke with six or seven graduates or faculty from five departments, primarily in June and July 2018. Due to idiosyncratic scheduling difficulties we dropped one department (Department F) from the sample. Otherwise, we had a 91 percent response rate for all interview subjects contacted. Our interview subjects were 55 percent women and 45 percent men. Interviews ranged from 8 to 45 minutes, with the typical conversation lasting 15 minutes.

Each interview consisted of nine questions. We asked respondents to describe student contact with advisors, seminar culture and job market preparation, and also included open-ended questions about women in economics; we report the standard interview script in Appendix B. All interview subjects were told that their answers would be confidential. In our discussion of qualitative patterns, we suppress all names of individuals and of institutions, and we redact a few details to prevent department or subject identification.

From the interview responses, we observe a series of differences between departments with better and worse relative outcomes for women graduate students that are worth keeping in mind for departments interested in improving gender diversity or balance in outcomes for their members. The departments with the best relative outcomes tended to have a commitment to hiring women onto the faculty; regular and transparent processes for student–advisor contact; a more collegial seminar culture; and a stronger general awareness of gender issues among senior faculty.

Many of these departmental policies would be helpful for all students, but our interviews suggest that they may also help to narrow gender gaps. In the remainder of this section, we have organized a series of representative quotations from our interviews, emphasizing points of difference along these dimensions between departments with better and worse relative outcomes for women graduate students.

Women on the Faculty

One obvious difference between departments with better and worse relative outcomes for women graduate students is their commitment to and success in hiring women on the faculty. Students trained at Departments B and C talked about how valuable it was to have been taught by women faculty, and to have informal interaction with women faculty outside of the classroom. A former student from Department C said: “Every semester we always had one female teaching us in the core first year classes. Starting with that introduction to the graduate department made me feel like ‘I can do this and be a woman.’”⁶ A faculty member at Department C agreed, touting the value of the “women in economics group, female faculty who have lunches and dinners and coffees with female graduate students, a group that has been around as long as I can remember.” One faculty member from Department B described how the program was able to build up a group of women faculty, emphasizing that “our dean puts a lot of emphasis on diversity. It could even amount to an extra position if we come up with an additional excellent female candidate.”

In contrast, interviewees from departments with worse outcomes for women graduate students noted—and often lamented—their historical lack of representation of women on their faculties. These departments were only recently beginning to prioritize hiring women or had limited plans to do so. At our median Department K, the faculty were concerned about how their historical lack of women faculty affected their graduate students. One faculty member said, “[W]ell it starts with hiring. I’ve seen over the years that role models are incredibly important. I know that in our [redacted] field, for example, we currently have five faculty members who are all male. And I think we are all nice guys and inviting and encouraging and try to be gender neutral, yet whenever we have a female [visitor or speaker], women graduate students flock to her much more readily, there’s a comfort level and a role model that’s very important.” A faculty member at Department T concurs, relaying: “I have a student who is a woman who graduated maybe ten years ago ... she thinks her experience would have been better if there were more senior female faculty, that she would have felt more comfortable. ... So we’re working on that, we make offers, but like everyone else in the senior market it’s really tough. ... [I]t’s hard to get acceptances.” Unlike Departments B and C (and even Department K), Department T has not made an intentional effort to hire women. Instead, the chair simply tries to ensure that women are not overlooked on the job market, saying: “I look at

⁶Throughout the paper, we use the terms “men and women” instead of “male and female” when discussing gender in order to emphasize that gender identity is a social phenomenon. However, we leave the quotations from our interview subjects as stated.

the women we didn't fly out and I want to make sure that they're not better than the worst men that we fly out. ... [We] pay attention to see if we're gender neutral, at least in our junior hiring."

Hiring women on the faculty strikes us as a concrete and low-cost approach to creating a productive learning environment that might encourage women to enroll in the graduate program. Our interview subjects also articulated clear mechanisms whereby women on the faculty might benefit graduate students by serving as role models and mentors.

Advisor Contact

In many other disciplines in the sciences and the humanities, prospective PhD students apply to work with a particular faculty member before admission. In economics, it is typical for prospective students to apply to the department as a whole without specifying an intended field. All of the programs in our interview set have a decentralized process for second- or third-year students to select dissertation advisors. Many students reported approaching faculty with whom they took a course in the first-year core or in second-year field courses. This student's experience at Department O is typical of the haphazard search process: "I got [Faculty Member X as my advisor] just by talking a lot in class and by doing reasonably well ... that distinguished me and made me seen as a relatively attractive person to work with."

Students and faculty speculated that the current *laissez faire* approach can be intimidating for many students. It may be particularly hard for students who are in the minority in economics departments (including women) who may fear the actual or perceived skepticism of faculty. One student at Department C reported: "I think there was some implicit bias. I remember in the first year of the PhD program, I got [a high score on a core exam]... and my husband did not do particularly well in the course. But I remember the professor who was teaching the course reached out to my husband and tried to encourage him to go into [the field] and didn't say anything to me."

One feature that distinguished departments with better relative outcomes for women was the mandatory and regular nature of student works-in-progress seminars—that is, public venues for fourth- and fifth-year students to present new research and gather comments from a group of committed faculty. According to a student from Department C, "you would actually enroll in a course that was your lunchtime workshop; you were required to attend and present at least once a quarter. The faculty were really good about going to those things. They came regularly, and they would give you comments."

In contrast, at the departments with worse relative outcomes for women in our sample, works-in-progress seminars are offered for student research presentations, but students are not required to attend. As one faculty member describes the process, "[Department T] doesn't have ... a centralized policy around making sure everyone presented once or twice a year. ... There are certainly students who aren't going to any lunch, or if they are going they are not presenting. We don't do record keeping." Another faculty member agrees, saying that "one or two students get almost

completely lost, they don't make appointments with advisors, and their advisors don't reach out. ... There are some students who are not into getting advice very much. Unless they're a genius and come up with some fantastic thing, they tend to get lost."

Offering regular public venues for student feedback may be especially important for women, who mentioned off-campus advising settings in which they felt uncomfortable or to which they were not invited. This concern arose at departments of all levels on our ranking. One student from Department B described how "one senior male faculty was known for having these weekly 'salons.' He would take a bunch of students out to a bar. A bunch of students would go, it routinely felt like an old boys' club. ... I know one woman who went, but I wouldn't have felt comfortable." A student from Department C reported that she missed advising opportunities because of her gender: "[My advisor] would often take graduate students for beers, and he would take the men one on one. When I was first working with him, he said 'we should just meet in the office, we shouldn't get a beer, it could be misconstrued or you might feel I'm taking advantage of you.' So, either my husband would have to tag along, which was really boring for him, or another male graduate student would have to come, but I wouldn't get as much one-on-one attention."

Given the highly decentralized nature of the advising process in economics, we think that all departments have some room to experiment with developing more formalized points of student-advisor contact. One of our interview departments recently established a procedure to match incoming first-year students with a faculty mentor to address the unique challenges of the first-year program. Another department is experimenting with third-year research advising groups, wherein students are paired with field-specific faculty members. The chair of this department acknowledges that "before, it was all decentralized, students just had to reach out" and expressed hope for the new structure. Other departments have instituted regular faculty meetings to assess student progress and ensure that no students are falling between the cracks. One model for how to regularize the various steps of graduate training is the recent and widespread efforts to formalize the process of preparation for the job market—including holding information sessions, conducting mock interviews, designating a faculty member to be placement coordinator, and so on.

Seminar Culture

Another theme that emerged from our interviews is that departments with better relative outcomes for women are reported to have a less aggressive and more constructive climate in their research seminars. A faculty member at Department B portrayed seminars as "not enormously aggressive ... we don't take someone apart for the sake of taking them apart." A student from Department C had a similar impression. "Like most economics departments, [the seminar] was aggressive, but it wasn't as aggressive as some I've been to. You would get through your first few slides without being asked 'why did you choose this title? This is stupid.' Especially with the graduate students. They would ask questions more gently like 'don't you think that this would be a problem with identification?' Compared to 'this is not how to identify it.' But they wouldn't sit and let you make mistakes."

Two of the three departments with worse outcomes for women were noted for having aggressive seminar styles. A faculty member from Department K said that “the word that comes to mind is combative, perhaps aggressive. People start to talk about their work and much of their audience seems to think it’s their job to find the faults and tear it all down.” A student trained at Department O recalled that seminars were “fiercely competitive.” On the other hand, Department T was described as having seminars that are “pretty polite.”

Unlike new hiring or a reorganization of the graduate program, working toward a more supportive seminar culture is an action that individual faculty members can take on their own, without the need to create consensus at the departmental level. One idea is to save some comments on student work for a short private meeting held after the public seminar. Meeting one-on-one after the seminar can help students take stock of the various suggestions and prioritize which next steps are most important without the immediate pressures of a presentation.

We are agnostic about why some of the specific policies described here, including developing a more supportive seminar culture, might be particularly helpful for women students. Interview subjects mentioned the possibility that women are more averse to competitive environments, more likely to take harsh feedback personally, more likely to be left out of informal (“old boy”) networks, and so on. There is observational and experimental evidence for some of these channels (for example, see Goldin 2015 on differential response by gender to receiving low grades as undergraduates), and others channels would be interesting subjects for future study.

Awareness of Gender Bias

A final difference that we noticed between departments with better and worse relative outcomes for women was an awareness of gender bias, particularly in its more subtle and implicit forms, among the senior male faculty who often make up the majority of leadership positions in a department. Awareness of gender bias may influence how these senior faculty interact with women in their classes and in their advisory roles on a day-to-day basis. Moreover, we noticed that senior faculty with more cognizance of gender bias react differently to incidents of harassment (which, although rare, were mentioned at three of our five interview departments). One woman made this point quite succinctly, saying “my personal view is that a lot of it has to come from the men, [the field is] still very male dominated, so until the men are comfortable, nothing much good is going to happen for the women.”

Differences in awareness of gender bias were most obvious in responses to the interview question “do you see any difference in the [graduate department] environment for men and women?” Faculty at departments with better relative outcomes for women responded to the question in more observant and thoughtful ways. A senior faculty member at Department K was typical of this view in saying: “I’m confident that there is no explicit discrimination, but perhaps what is happening is more subtle or subconscious ... The same behaviors in a man say he’s forceful and defends his ideas; he’s aggressive in a good way. Those same behaviors when taken by women tend to get a different reaction in a subtle kind of way.”

In contrast, faculty members at Departments O and T focused exclusively on the lack of *overt* discrimination against women students and did not seem aware of (or to put much credence in) the subtle differences in the way men and women experience the culture of the field. A professor at Department O said “I’m not aware of people explicitly treating anyone different in one way or another [by gender], at least from faculty perspective. I can’t—I’m not aware of any specific instances to that effect. As far as I can tell, nothing that I can think of comes to mind.” A male faculty member from Department T answered similarly, reporting that he talked to graduate students and never heard complaints about poor treatment of women students. “I’m still a little perplexed about this,” he said. “I ask graduate students what the atmosphere is like for them, and I never hear about any problem of them being harassed in the kind of extreme form, but even in more subtle ways. My sense, and I acknowledge that I might be misreading, is that women in the department are treated well. That’s my sense, but I’m suspicious about if I’m gathering information correctly.”

Differences in awareness of gender issues can have important consequences in how department leadership respond to instances of harassment in a learning environment, which were mentioned at three of the five departments that we profiled. By harassment, we do not mean individual cases of unwanted sexual attention, although this may also happen. Instead, we heard about intentional attempts on the part of one or more men in the student body to make women graduate students feel unwelcome. These instances of harassment, while certainly not the norm, did occur across the board. We also noticed clear differences in how the faculty at each department responded to such events. In each case, administrators condemned the harassment and sought to punish the individuals responsible, but the responses differed in whether further action was taken to change the underlying culture or institutions that contributed to the problem.

At Department C, the faculty considered the event to be outside of the norm and immediately searched for an underlying cause, which they then acted to remedy. A faculty member at Department C tells this story: “We actually had an incident [recently] that I think was unusual, [details redacted]. One thing we realized is that we had [a new admissions director] for the last couple of years, and [...] we had ended up with a couple of classes with way too few women students. Maybe only 20 percent, rather than [our usual] much higher figure. And so, the chair basically leaned on the person in charge of admissions that we had to have a lot more women, and our entering class this year is 50–50, which is the first time it’s been so high. We’re hoping that means it won’t happen again, if you have more women even guys who think like that will feel pressured not to act. That was the first time that we had anything like that in all the years I’ve been here, and I was really pleased that the Chair really got on it and pressured the admissions chair rather than ignoring it.”

At Departments K and T, instead, the harassing behavior itself was condemned but there was no further action to assess and perhaps adjust the culture. A faculty member at Department T described an instance of harassment and the departmental response: “We’ve had problems in the past. For example, there were some men [engaging in redacted activities], which is an extreme form of harassment ... In

those cases, the chair went nuts. No one could figure out who was doing it, but they warned that they would be thrown out of the university if this happened again. I believe it has not happened anymore.” According to a student trained at Department K, a similar reaction occurred there in response to one individual’s harassing actions. “The Chair tried to make some statement the next year, held a meeting at the beginning of the year for all PhD students, and said that there had been [harassing behavior], people saying things about women that you shouldn’t say because you could hurt someone’s feelings.”

We acknowledge that improving awareness of gender bias—in oneself and one’s environment—is an amorphous recommendation, and hard to convert into direct action. Self-reflection, questioning one’s assumptions, and striving to learn more about the experiences of others are habits worth cultivating for any individual and especially academics. Empathy is a human virtue, and a scholarly one too. On an organizational level, attention and sensitivity to diverse perspectives in a department should be considered when making departmental leadership decisions.

Conclusions

We document substantial variation in the representation of women and in the early career success of women across economics PhD programs. We provide suggestive evidence, based on a set of structured interviews, that there are large differences in culture and practices across graduate programs in economics; these differences are associated with better and worse relative outcomes for women. Important differences across departments include the number of women on the faculty, regularized opportunities for contact between advisors and students, and collegial research seminars.

Of course, such qualitative observations are only the beginning of establishing hypotheses about “what works” in increasing the representation of women in economics. We encourage other scholars to test the hypotheses suggested by this paper in more detail. In addition, it would be interesting to know whether prospective graduate students consider the types of factors underlying these rankings when selecting departments. If so, the association between share of women in the graduate program and positive early career outcomes could be, in part, due to students’ choices in where to matriculate.

Typical studies of the underrepresentation of women in scientific and technical fields focus on early educational experiences (like differential treatment in high school courses by gender) or on the job market and in academic workplaces (for example, see Ceci, Ginther, Kahn, and Williams 2014). These emphases, while certainly important, overlook the potentially central role of the learning environment in graduate school itself. To the extent that the culture and policies of a graduate program matter, there may be meaningful steps that we can all take to encourage and support women in economics. We hope that our findings will help to inform ongoing discussions—or to initiate new ones—in departments seeking to ensure the best opportunities and outcomes for all their graduates.

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Gender Representation in Economics Across Topics and Time: Evidence from the NBER Summer Institute *

Anusha Chari [†]

Paul Goldsmith-Pinkham[‡]

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Abstract

We document the representation of female economists on the conference programs at the NBER Summer Institute from 2001-2018. Over the period from 2016-2018, women made up slightly over 21 percent of all authors on scheduled papers. However, there was large dispersion in the female author share across programs. While the average share of women has slightly risen from 18 percent since 2001-2003, a persistent gap between finance, macroeconomics and microeconomics subfields remains. We examine several channels potentially affecting female representation including gender differences in acceptance and submissions rates, institutional rank, NBER affiliation, faculty seniority and the role of organizers.

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[†]Professor of Economics, Department of Economics & Professor of Finance, Kenan-Flagler Business School, University of North Carolina at Chapel Hill & NBER. Email: achari@unc.edu

[‡]Assistant Professor, Yale School of Management. Email: paul.goldsmith-pinkham@yale.edu

1 Introduction

A persistent and stable gender gap exists between graduating economics Ph.D.s and assistant professors since the early 2000s. The gap compounds the cascading decline in the numbers of women graduating as economics majors to those entering economics Ph.D. programs-labeled as “the leaky pipeline” (CSWEP, 2016). Labor demand and supply factors may drive the observed leakage. However, institutional characteristics and implicit biases may also play a role (Wu, 2017; Hengel, 2017; Sarsons, 2017; Bayer and Rouse, 2016).

Substantial recent evidence suggests that women face systematic barriers in the economics profession.¹ Collectively, these papers find that female economists face significant disadvantages to advancing in the profession (Wu, 2017; Hengel, 2017; Sarsons, 2017; Antecol, Bedard and Stearns, 2018; Ceci et al., 2014; Thomas Cunningham and Zavodny, 2008). For example, Ceci et al. (2014) suggest that there exists “a persistent sex gap in promotion that cannot readily be explained by productivity differences.” Many factors reinforce this gap, but a pervasive feature of academic life that may contribute is conferences. While an important source of networking and feedback, conferences will have disparate benefits if there are differences in participation by gender. This gap could be affected by either differences in acceptance or submission rates, which could both be influenced by (predominantly male) conference organizers.

This paper examines the conference representation of female economists using a new panel dataset measuring the share of female authors on the program at the National Bureau of Economic Research (NBER) Summer Institute conference between 2001 and 2018. We use these data to measure female representation across both time and subfields. We then decompose the rate of female economists onto the program into the rate of acceptance, conditional on submission, and the rate of submission. We find no differences in acceptance rates across genders, but find evidence that the probability of submission is likely influenced by institutional factors related to the NBER, including NBER membership and then the gender of the program organizer.

We focus on conference representation for two reasons. First, opportunities to present at major conferences are valuable in academia; they increase the visibility of new work, provide an efficient means to receive feedback from audiences of peers and facilitate collaborative networking (Kalejta and Palmenberg, 2017; Casadevall and Handelsman, 2014; Casadevall, 2015). For younger scholars,

¹See Justin Wolfers in the New York Times, <https://www.nytimes.com/2018/02/02/business/why-womens-voices-are-scarce-in-economics.html>

presentations at conferences constitute prestige and enhanced visibility and may be critical to professional advancement. Promotion and tenure committees often use conference presentations as metrics of external recognition. Measuring the prominence of women at conferences can, therefore, provide insight into the representation of female economists in this vital component of the academic process. Second, data from a large conference like the NBER Summer Institute also provide a novel look at gender balances across subfields of economics.

The Summer Institute is an annual three-week conference hosted by the NBER. The conference is a highly visible forum that showcases the latest research advances across many sub-disciplines in economics. According to data from the NBER, the most recent meetings attracted 2,763 registered participants from 440 academic and policy institutions around the world. The conference hosts many different programs under the broad themes of finance, macroeconomics, and microeconomics. Each program is organized by a set of NBER-affiliated economists who select papers that appear on the agenda.²

We construct a rich panel dataset of these conference programs from 2001 to 2018 that contains information on the selected papers, their authors, and the organizers of the program. In addition, for sessions with discussants, the data include discussant names. We then identify the gender of the authors, discussants and the organizers.³ With these data, we first present basic summary statistics about the share of female authors in the time series and across fields. An important caveat to our work is we are not able to identify which of the authors presented, nor who necessarily attended the conference. Our measures will reflect the share of women as authors on papers.⁴ We find that the share of female authors ticks upwards slightly over the full sample period, from roughly 18 percent in 2001-2003 to slightly over 21 percent in 2016-2018. The Committee on the Status of Women in the Economics Profession (CSWEP) has done similar work to survey the overall representation of women in economics departments, and we can compare our numbers to CSWEP's annual reports to compare the NBER to the overall economics profession. On average, the share of female authors at the Summer Institute falls below the share of female assistant professors relative to all assistant professors but is generally above the overall share of women in all tenure-track positions.

²While broad, the NBER Summer Institute does not represent all subfields of economics or the distribution of economists across subfields equally.

³We assign gender as either male or female either statistically based on first name or perceived preferred gender. Our measure will mismeasure and fail to capture any non-binary gender economists.

⁴This is an important limitation since female coauthors could be rising over time, but not female participation as presenters at the NBER. Also, differences in female authorship across subfields may not entirely translate to presenting at the NBER. With better data, understanding these dynamics may highlight how gender differences regarding the visibility of female economists manifest themselves and where the potential issues lie.

In contrast to CSWEP statistics, our data allow us to move beyond the time series and examine the representation of women across subfields of economics. While there may be anecdotal observations about the share of female representation across subfields, our paper is the first to our knowledge that systemically documents the differences in gender across subfields in economics. Indeed, a striking feature of previous work on gender and economics is that it presents economic research as a monolith. Far from being homogenous, we find that in the first week of the Summer Institute in 2016, a week dominated by finance and macroeconomics programs, 17.5 percent of the authors on papers presented were women. In contrast, the third week of papers, a week focused on labor and public economics, had almost twice as many women on the program; 30.5 percent of the authors were women.

We disaggregate the data into three broad categories: applied micro, finance, and macro & international, and find that the representation of women across the subfields varies substantially. In the most recent period, 2016-2018, the share of women was roughly 14.6 percent in finance; in macro & international, it was slightly higher, around 16.1 percent; and in micro, the share was highest, with 26.5 percent female authors. Moreover, we find that the growth rates across these subfields are roughly the same over the sixteen-year period. This suggests that despite overall growth in the share of women in economics, the aggregate statistics mask significant underlying heterogeneity across sub-disciplines over the past sixteen years.

These differences across subfields prompt us to examine three channels that could potentially affect female representation. First, using anonymized data on submissions in 2016 and 2017, we find that the rate of acceptance for women who submit papers to the NBER Summer Institute is statistically indistinguishable from that of men. Across the three subfields of finance, micro, and macro & international, we find that while micro and macro & international have statistically indistinguishable rates between men and women, women in finance have a 2 percentage point lower probability of a paper acceptance when compared to men in finance ($t\text{-stat} = -1.63$). We estimate relative rates of submission by gender using CSWEP data and find that despite no difference in acceptance rates by gender, there are gender differences in submission rates, which drive overall representation. Second, we study the correlation between the gender of the program organizer and the share of women on the program. We find that the share of female economists on a given program is higher when a woman is an organizer. However, we cannot entirely rule out reverse causality, namely that as the share of women increases, more women are organizers and featured on the program.

Lastly, we focus on the program discussants selected directly by the organizers. We find that in

sessions with discussions, the share of female discussants is similar to the share of female authors. Across sub-fields, differences in female representation on the discussant dimension are also similar to cross-sectional differences in patterns of female authors on programs. Organizers have sole discretion to select discussants based on the papers chosen for the program. While the underlying pool of submissions determines the subset of papers selected for the program, discussant selection is not subject to the same constraint. Hence, the selection likely reflects the organizers' information set of appropriate discussants. Here too we find that female organizers are also more likely to select female discussants.

The share of women in the profession and on the program at the Summer Institute could vary for a variety of reasons. For instance, women could submit at different rates to the Summer Institute; or women could submit papers of differential quality, or there could be differences in acceptance rates by gender. While we can only approximate the submission rates of women to the NBER, we do find that conditional on submissions, there are no systematic differences between the acceptance rates across gender (and across subfields).⁵ This suggests that women are not systematically submitting lower quality papers, nor are there differences in acceptance rates across subfields.^{6,7}

Our results tie into a large literature that studies the representation of women in economics. Much of this work focuses on the representation of women among faculty and the differential rates of tenure across genders ([Ginther and Kahn, 2004](#); [Kahn, 1995](#); [Bayer and Rouse, 2016](#)). [Hamermesh \(2013\)](#) also shows the share of female economists published in top economics journals. Fewer papers study the representation of minorities as a whole: [Bayer and Rouse \(2016\)](#) and [Price \(2009\)](#) are a few exceptions. Focusing on the representation of African-American economists, [Price \(2009\)](#) argues that departments in fact systematically hire fewer new African American Ph.D.s and lack of representation of African Americans amongst faculty is, in fact, a demand, not supply, problem. In 2015, to address the clear differences in gender representation in finance, the American Finance Association (AFA) founded the Academic Female Finance Committee (AFFECT) to study the causes of low female representation in finance, following the lead of CSWEP. Their results suggest that similar to the results found by CSWEP, a "leaky pipeline" occurs in advancing from Ph.D. programs to the highest levels. The report argues

⁵This finding is consistent with [Donald and Hamermesh \(2006\)](#) who shows that conditional on being on the ballot, women are more likely to win AEA elections. Some may interpret this finding as, once in elite ranks, women do well.

⁶The fact that the acceptance rates across genders are statistically similar could be consistent with two hypotheses of organizers favoring either male or female authors "just enough," regardless of the quality of the submissions. While the data do not allow us to distinguish between these two competing hypotheses, Occam's razor suggests that it is more likely that the quality across gender of submitted papers is similar.

⁷We are extremely grateful to the Jim Poterba and Alex Aminoff for merging gender identifiers to the NBER submissions data and preparing summary tabulations relating to the 2016 and 2017 meetings for us. Data for more years are not available.

that in fact “there are many qualified women who are less recognized for potential high-level roles.”⁸

Our work is new in two ways: first, we focus on a well-known and large conference over a long time series, which provides an alternative perspective on the visibility of women in the profession.⁹ Second, using the large scale of the conference, we examine heterogeneity across economic subfields at the Summer Institute. This setting provides a novel quantification of female representation across subfields.

The gender representation differences we document across subfields leads to the larger question of why these differences exist. Economists use a toolset that works across different aspects of the discipline; unlike many of the sciences, economists have the technical skills to work on various economics topics over the course of their careers. Initial conditions in terms of investments in human capital in Ph.D. programs are very similar across economists, suggesting a strong initial desire by female economists choosing to work in applied micro fields over macro and finance.¹⁰ Nevertheless, the balkanization of economics concerning gender is puzzling.¹¹ Given the equal rates of acceptance across the topics, differences in either submission rates – women submitting fewer papers than men – or overall representation in the field could drive differences in gender representation across fields. It remains an open question what features of applied micro fields make them more attractive to female economists. Goldin (2013) speculates that there may be features of the way that economics is taught that may encourage or discourage women from becoming economics majors – the same may apply to teaching Ph.D. students and influencing their choice of subfields within economics.

The paper proceeds as follows. Section 2 describes the NBER Summer Institute dataset in detail along with a description of the names matching algorithm we use to identify gender. Section 3 presents the basic empirical results. We begin by describing the time-series patterns in the data followed by an analysis of the cross-sectional patterns across subfields. We also provide a benchmark for our findings using data from CSWEP. In Section 4, we examine gender differences in acceptance

⁸A summary of their findings is here: http://affectfinance.org/wp-content/uploads/2017/03/Summary-of-Data-presentation-at-AFA-reception_rev_Feb_2017.pdf

⁹ Thomas Cunningham and Zavodny (2008) find that women are underrepresented on the AEA program.

¹⁰These barriers are likely more significant as careers progress, e.g., switching from empirical health to international trade as an associate professor is likely difficult, due to upfront investments in a knowledge of the literature, commonly used theory, and empirical strategies. Also, as Eccles and Wang (2016) suggest for STEM fields, there may be cultural differences across economics subfields that likely play a role in observed gender composition.

¹¹Eccles and Wang (2016) suggest gender differences in selecting health, biological, and medical (HBMS) occupations rather than math, physics, engineering, and computer science (MPECS) careers result primarily from gender differences in occupational and lifestyle values. They suggest that women have preferences for work that is people-oriented and perceived to be altruistic relative to men. We can speculate whether fields such as labor, health, development, and children focus more on people whereas macro and finance focus more on markets.

rates and submission rates, and the potential channels affecting submissions. Finally, in Section 5, we discuss alternative potential gender differences. Section 6 concludes with a discussion of steps taken in a number of STEM disciplines to address the issue of gender imbalances on scientific conference programs.

2 Background & Data

The NBER Summer Institute is a high-profile annual conference held over the course of three weeks in July, showcasing the latest research advances across many subfields in economics. The conference hosts many different programs publicly available on the NBER website.¹² We construct a panel dataset of these conference programs from 2001 to 2018, containing information on the papers presented, their authors, the discussant of the paper, and the organizers of the program. This dataset construction was done in two phases, with the 2001-2016 dataset first constructed as described below, and then the 2017 and 2018 years added on subsequently.

To collect the data, we used a webscraping program to compile information for each of the sessions. This exercise results in 6,513 papers and 16,858 authors and discussants over the sample period. Due to issues with the formatting of the NBER website, an additional 625 papers were input by hand. After further data cleaning due to a few webscraping issues, 743 papers were dropped.¹³ Following the cleaning exercise, we were left with a final total of 6,867 papers and 17,474 authors and discussants across the 16-year period from 2001-2016.¹⁴

Next, we identify the gender of the authors in two steps. First, we use a database constructed by Tang et al. (2011), who used Facebook to assemble data on first names and self-reported gender.¹⁵ We construct a measure of the probability of male and female names ($\hat{\Pr}(\text{male}|\text{name})$ and $\hat{\Pr}(\text{female}|\text{name})$). We then merge this database with the list of authors from the NBER. We mark authors with $\hat{\Pr}(\text{male}|\text{name}) > 0.95$ as male, and authors with $\hat{\Pr}(\text{female}|\text{name}) > 0.95$ as female. For the remaining names, either because we have lower probability values or because the Facebook database does not include a name, we manually identify the author's gender.¹⁶ Of the 7,215 distinct

¹²Available here:<http://conference.nber.org/confer/old-conference.html>

¹³First, we drop entries where the webscraper incorrectly identifies the author name (e.g., including the university name as an author name). Additionally, to consistently compare presentations of post-Ph.D. researchers, we drop egg timer sessions and mini poster sessions since these sessions are usually done by current Ph.D. students.

¹⁴We do our best to clean and regularize the data, but it is possible that errors still exist in the data. Given the large number of observations, and the fact that these errors are unlikely to be correlated with gender, these errors ought not substantially impact our estimates.

¹⁵Database available here:<https://sites.google.com/site/facebooknamelist/namelist>

¹⁶Manual identification consists of searching for the author's name and affiliation and using any gendered text to identify the economist (e.g. "She is a leader in the field of..."). Alternatively, we use the economist's photo to identify gender. If

authors in our dataset, 5,604 authors are automatically identified and 1,611 are manually identified.¹⁷

To assure ourselves of the quality of the gender identification procedure, we also manually identify the gender of all participants in 2016 and verify the accuracy of the gender for names marked with a probability greater than 95 percent. We find that 99.5% of those marked automatically as male by the algorithm are male, and 97.38% of those marked automatically as female by the algorithm are female. In total, the algorithm only mislabels nine names in 2016.

We also use anonymized aggregated data on submissions to the 2016 and 2017 NBER Summer Institute to disentangle the share of accepted papers and the overall proportion of female economists submitting to the Summer Institute. The submissions data provide a metric to compare the acceptance rate of papers authored by gender to the submissions rate. To preserve anonymity, submissions data were reported in an aggregated format to the subfield level (finance, macro & international, and micro) by the NBER to us.¹⁸ To make our results comparable, we use these sub-disciplines in other components of our analysis.

We use four additional datasets to construct a set of comparison benchmarks of female representation in economics. First, we use data from the CSWEP Reports. Since 1993, CSWEP conducts surveys of economics departments to measure gender composition of faculty across ranks (assistant, associate, etc.), as well as across institution type and rank (graduate program vs. not, and Top 10/20 vs. all programs). We compiled the data from these reports to construct the time series on the share of female professors at different levels of seniority for three sets of types of universities: Top 10, Top 20 and “All” economics departments with a graduate program. In the most recent time periods, “All” refers to 126 departments surveyed by CSWEP.¹⁹

Second, we compile all NBER members since 1978 from the NBER website.²⁰ We then identify the gender of each member using the method described above. Out of 2,450 members, 2,368 members are automatically identified, and 268 are manually identified. The final NBER membership dataset includes name, appointment date, program, NBER affiliation, and gender. For our analysis, we will focus primarily on the stock of NBER members from 2001-2016. We also disaggregate the authors into

neither are available, we omit the author. This only occurs in a handful of cases.

¹⁷Since we assign gender as either male or female, based on first name or perceived preferred gender, our measure will mismeasure and fail to capture any non-binary gender economists.

¹⁸These categorizations were chosen in consultation with the NBER and reported in Appendix Table 1.

¹⁹More information is available here, with specifics of the survey methodology: <https://www.aeaweb.org/content/file?id=3643>. For annual data on the Top 10 and Top 20 faculty in years before 2011, we used data from the 2011 and other previous Reports.

²⁰Available here: http://nber.org/programs/program_members.html. These data do not include members who have passed away since 1978 or left the NBER because they moved overseas.

our three major subfields.

Third, we construct an additional NBER panel dataset using the Wayback Machine website to construct a panel of the Faculty Research Fellows (FRF) and Research Associates (RAs) at the NBER. This data is only available on the website from 2008 onwards, and we collect the names and NBER membership of each member from 2008 to 2018. We then harmonize the names and identify the gender of the members. This gives us a panel of member-year observations, where we are able to identify FRF versus RA membership, as well as their program memberships.

Finally, we use a database of papers published in the American Economic Review, Econometrica, Journal of Political Economy and Quarterly Journal of Economics from [Hengel \(2017\)](#) from 2001 to 2015. We merge this database based on paper title to our sample of NBER papers and identify the set that publishes in one of the top four journals. We use a fuzzy string matching software to accomplish this, and count matches as those with 99% match rate.

3 Empirical Trends and Comparisons

In this section, we first summarize the basic facts about the share of female authors at the NBER Summer Institute over time and across subfields. We then examine potential channels driving differential rates of female authorship on the programs.

3.1 Time Series

Panel A of Figure 1 reports the share of female authors across all papers divided into three-year bins to smooth out year-to-year fluctuations in gender share. For each bar, the whiskers plot the 95 percent confidence intervals for the means. Table 2 reports the corresponding year-by-year summary statistics. There is a small increase in the share of female authors on the program over this period: from roughly 18 percent in 2001-2003 to slightly over 21 percent in 2016-2018.

This small increase in female authors corresponds with a rise of the share of papers with both female and male coauthors, with over 40 percent of all accepted papers include at least one female co-author by 2018, compared to 25 percent in 2001. In contrast, the share of exclusively male-authored papers has declined, and the share of exclusively female-authored papers has remained flat over this period. The number of sole-authored papers declined substantially over the sample period and three- or four-authored papers grow in their stead. However there is no particular gender differences across these papers. Sole-authored papers do not have a larger share of women than four-authored papers. This pattern is consistent with a mechanical effect of more coauthors leading to a larger share of papers

with at least one female author. We report the share of female-authorship across papers by the number of co-authors in Appendix Figure A1.²¹

3.2 Time Series by Field

This relatively slow growth of female representation masks substantial heterogeneity across economic subfields. Panel B of Figure 1 decomposes the share of female authors over time into three major subfields – micro, macro/international and finance – with significant cross-sectional variation in gender representation across the fields.²² Table 2 reports the corresponding year-by-year summary statistics. Again, the whiskers plot the 95% confidence intervals for the sample means. In 2016-2018, finance has the lowest share of women as authors at 14.6%, macro & international is slightly higher, with 16.1% female authors, and micro has a much higher share of women overall at 26.5%. Growth rates over the period are similar across fields, with very modest growth across all three subfields. Finance grew from 11.1% in 2001-2003, macro & international from 13.7% and micro from 23.9%.

This growth was not uniform across time – finance made initial strides in growth from 2001-2003 to 2004-2006, but had very little growth subsequently. Similar initial growth occurred in macro/international until 2007-2009, with the share of female authors falling back and stabilizing for the next eight years. Finally, micro initially experienced a slight decline from the beginning of the sample until 2007-2009, experiencing a jump in 2010 and onwards. As a result, while there was a universal increase in the share of female authors from 2001-2003 to 2016-2018, it was neither large nor smoothly upward.

3.3 Across Programs

We further decompose the distribution of female authorship across individual programs. These individual programs reflect a wide range of underlying economic subfields, with substantial overlap across fields. To reduce the noisiness of our estimates, we focus on programs that have existed for at least five years.

We focus on the female author share at the program-year level, and compare across individual programs. Figure 2 presents a box plot sorted by the median share of female authorship for each program across years. Finance, macro & international and micro are each plotted in different colors. For each program, the box reflects the interquartile range across years from the 25th to 75th percentile.

²¹The number of co-authors on each paper rises substantially over time, growing from 1.8 in 2001 to more than 2.5 co-authors per paper by the end of the sample (Appendix Figure A2). If we assume a fixed percentage share of female authors and no assortative matching of coauthors based on gender, as the number of coauthors on a paper rises, there is a mechanical effect of increasing the probability of having a paper with at least one woman.

²²Table 1 shows the categorization of different programs into the three broad fields of finance, macro & international and micro.

The tails of the box represent the furthest value within 1.5 standard deviations (within program) of the interquartile range. The solid black line presents the across-program average female share, weighted by number of papers.

We see substantial variation in female representation both across- and within-programs. In particular, while there are exceptions across sub-fields, programs in finance and macro & international tend to sit below programs in micro. There is substantial variation across the individual programs, with the lowest median share of roughly zero percent (Productivity Growth and the Macro Economy) near the bottom and the highest median share with 37 percent (Children).

3.4 Benchmarking the share of female economists

To draw conclusions about the level of female representation at the Summer Institute, we need a benchmark of overall female representation in economics. This is difficult for two reasons. First, the composition of seniority on the NBER Summer Institute programs and of economists in the profession may not match. While untenured junior economists have stronger incentives to submit papers to conferences, established senior economists may have an easier path to acceptance. Second, it is not clear which economics departments provide the most appropriate benchmark for comparison. Since the Summer Institute is prestigious, the pool of relevant economists may draw from higher-ranked departments.

We tackle these difficulties by examining a range of different potential benchmarks. Figure 3 plots the share of women in tenure-track positions over time, both in aggregate and for junior & senior positions, in economics programs at universities with graduate programs. The data show that the overall share of women in all tenure-track positions grew steadily from 2001, from 12.9 percent to 20.1 percent in 2017. In contrast, the fraction of assistant professors who are women has stayed relatively constant since 2005, and the fraction of female full professors gradually rose post-2008 after being flat from 2001-2008.

When we compare these time-series trends to the share of female authors at the NBER Summer Institute, the share of women in all tenure-track positions is consistently lower, although the gap shrinks over time. In contrast, the share of female authors at the NBER Summer Institute is lower than the share of women amongst junior faculty. However, what is surprising is that in the period of 2003-2010, which saw a much larger share of female junior faculty at the Top 10 and Top 20 departments, there was not a larger uptick of female authors at the NBER. This suggests that the rank of the author's

institution may not be the relevant driver of participation on the program.

Instead, the measure that best matches the share of female NBER authors is the stock of female NBER members.²³ These NBER members include both Research Associates and Faculty Research Fellows at the NBER, and reflect a broader connection to the NBER organization. This finding is in line with the fact that NBER members are likely more aware of the Summer Institute, and thus more likely to submit to the conference.

To more directly examine the composition of faculty at the Summer Institute, we use manually identified data on the authors of accepted papers in 2016 and compare to statistics from the CSWEP reports. We find that the representation of male and female assistant professors at the NBER Summer Institute is much higher than at all 126 departments with doctoral programs, as well as at just Top 20 and Top 10 departments. In contrast, there are far fewer full professors as authors on the NBER Summer Institute programs relative to departments with doctoral programs (Appendix Figure A3).²⁴

The data from CSWEP also provides the share of women at all 126 doctoral departments, the Top 20 and Top 10 departments.²⁵ In Appendix Figure A4, we next compare the female share on the NBER schedule with the share at universities from the CSWEP data, for both Assistant and Full Professors. In both cases, the NBER Summer Institute female author shares roughly reflect the composition of women at Top 20 institutions, are higher than the composition at Top 10 departments, and lower than the figure for all 126 doctoral departments. While the composition of faculty at the NBER is heavily skewed towards junior faculty (as seen in Appendix Figure A3), when compared to the overall academic population, and by rank, the share of women on the NBER program in 2016 is comparable to the Top 20 departments. These results are consistent with the time series evidence above, where the share of female economists on the NBER SI program in 2016 is comparable to the share of female faculty at Top 20 departments in 2016.

These exercises present four facts about the Summer Institute: one, researchers on the program were far more junior than the average population of economists in 2016; two, the share of female economists on the NBER program was roughly comparable to the share of female assistant professors at the top 20 economics departments in 2016; three, this comparability is specious, as the share of

²³The square root of the sum of squared deviations is 0.013 between NBER membership and NBER female authorship, 0.025 between the female share of all tenure track professors and NBER female authorship, and 0.047 between NBER female authorship and the Top 10 or Top 20 female share of professors. The rest of the series are all more than double that of the Top 10 and NBER authors.

²⁴To make our datasets comparable, we exclude non-university economists and graduate students in the NBER dataset when calculating the shares.

²⁵See page 7 of the 2017 CSWEP Annual Report for details.

female assistant professors at top 20 economics departments was substantially higher in the 2000s, with no similar movement in the share of women on the NBER Summer Institute programs; four, the share of women with NBER membership is the measure that best matches the share of female NBER authors over time.

4 Acceptances, Submissions and Potential Channels

A key feature of our NBER Summer Institute results is that they focus on the realized outcomes of two processes. First, the decision for an author to submit a paper to the conference (and various sessions). Second, the choice by the organizers to accept the paper onto the program. In the benchmarking exercise, the decision of what group of economists to compare to the NBER Summer Institute in part reflects these concerns.

More formally, we would like to know the following:

$$\Delta = \Pr(\text{Accept} = 1 | \text{Female} = 1) - \Pr(\text{Accept} = 1 | \text{Female} = 0),$$

the unconditional difference in acceptance on the program between male and female economists. However, we only observe an acceptance conditional on a submission:

$$\begin{aligned}\pi &= \Pr(\text{Accept} = 1 | \text{Submit} = 1) \\ \pi^{F=1} &= \Pr(\text{Accept} = 1 | \text{Submit} = 1, \text{Female} = 1) \\ \pi^{F=0} &= \Pr(\text{Accept} = 1 | \text{Submit} = 1, \text{Female} = 0).\end{aligned}$$

By the law of total probability, we can then write, for $f \in \{0, 1\}$,

$$\Pr(\text{Accept} = 1 | \text{Female} = f) = \pi^{F=f} \Pr(\text{Submit} = 1 | \text{Female} = f).$$

since by definition, $\Pr(\text{Accept} = 1 | \text{Submit} = 0) = 0$.

Hence, we can decompose the relative share of women and men on the program by understanding two numbers: first, the relative rate of acceptance, conditional on submission, and second, by the rate of submission. In the next subsections, we explore these mechanisms.

4.1 Acceptance rates, conditional on submission

A potential explanation for the low share of women at the NBER may be differences in the acceptance rates between male and female-coauthored submissions. Using an anonymized dataset of submissions from the 2016 and 2017 NBER Summer Institute, we identify overall acceptance rates across papers, as well as within each field: finance, macro & international and micro.²⁶

Figure 4 shows nearly indistinguishable acceptance rates for women compared to men when the groups are pooled together. For both macro and micro, the differences are statistically indistinguishable from zero. For finance, we see a lower acceptance rate for female authors. The 2 percentage point difference in acceptance rates is statistically significant (p-value = 0.07). Given the lower base acceptance rate in finance, 2 percentage points is a non-trivial difference. Moreover, the difference in acceptance rates in finance appears in both years of the data. The very similar acceptance rates across other programs suggest that the overall proportion of women on programs reflects the submission rates by women.²⁷

The key empirical fact from our submissions data is that $\pi^{F=1} = \pi^{F=0} = \pi$. Hence, we can simplify our estimand of interest to

$$\Delta = \pi \underbrace{(\Pr(\text{Submit} = 1 | \text{Female} = 1) - \Pr(\text{Submit} = 1 | \text{Female} = 0))}_{\Delta_{\text{submit}}}.$$

As expected, the difference in the rates is driven by submission rates, since average acceptance is the same. Now the key question is how to approximate the difference in gender submission rates, Δ_{submit} .

4.2 Estimating submission rates

We next estimate the rate of submission for men and women. We first note that in the 2016 NBER submission data, 1,034 women and 3,680 men submitted papers. This gives us a numerator on the rate of submission. From the CSWEP measures of faculty, there were 3,138 male tenure and tenure-track researchers at doctoral + non-doctoral economics departments, and 2,984 male ABDs at doctoral programs in 2016. Ignoring missing non-academic researchers such as economists at policy institutions, central banks and so on, this would suggest a submission rate of 60% for men. In contrast,

²⁶We are extremely grateful to the Jim Poterba and Alex Aminoff for merging gender identifiers to the NBER submissions data and preparing summary tabulations relating to the 2016 and 2017 meetings for us.

²⁷One caveat is that while papers may be submitted to multiple programs and typically get accepted to one, the probability of a “unique” paper acceptance is likely higher. However, unless the number of submissions per paper is correlated with author gender, this ought not affect our overall analysis.

for women, there were 974 female tenure and tenure-track faculty at doctoral plus non-doctoral economics departments, and 1,469 female ABDs at doctoral programs. This would suggest a submission rate of 42.3% for women, and a difference in submission rates of $\Delta_{\text{submit}} = 17.7\%$. Combined with an acceptance rate (conditional on submission) of 14%, this implies a Δ in submissions rates of $0.14 \times 0.177 = 0.025$. This is a large difference when compared to the implied value of $\Pr(\text{Accept} = 1 | \text{Female} = 0)$, i.e., the probability of acceptance for male authors which is $0.14 \times 0.6 = 0.084$. This implies a difference in submissions rates of almost 30% across genders relative to the base acceptance rate.

These numbers provide an imperfect baseline for identifying the submission rates across gender, as the interpretation depends on the assumed base population. It is quite plausible that we are undercounting the number of total economists who could potentially submit to the NBER. However, these submission rates are only biased if the missing population of economists who could submit is substantially biased towards men. If the relative rates are similar, then this will only scale the Δ measure and the overall rate of acceptance for the unconditional population. The estimated 30 percent relative difference in submissions rates for women will still remain. Combined with the fact that acceptance rates, conditional on submissions, are not statistically significantly different for men and women, these facts suggest submissions rates can explain part of the female representation on the Summer Institute program. We next explore the potential channels that may affect submissions rate by gender.

4.3 NBER Membership

We next focus more carefully at the fact that female NBER membership appears to track female NBER authorship best in the time series. NBER membership is a salient feature on the NBER program; in Figure 5, we plot the distribution of the share of a program-year's papers with one or more NBER affiliated authors. We see that the majority of programs have over fifty percent of their papers with an NBER-affiliated co-author.

This prompts the question of whether accepted male and female authors on the program are differentially likely to be NBER members. Table 4 examines the rates of NBER membership across accepted authors. We first consider the following specification:

$$\text{NBER Member}_{it} = \beta \text{Female} + \gamma \text{Rank} + \tau X_{it} + \epsilon_{it} \quad (1)$$

The outcome variable in the regressions is an indicator for whether the accepted author is NBER mem-

ber. We include a dummy for whether the author is male or female, and also control for the rank of the authors' institutions according to RePec.²⁸ X_{it} includes various forms of fixed effects, and a dummy for if the institution rank is missing.²⁹ Column 1 of Table 4, Panel A shows that conditional on rank, female accepted authors are on average less likely to be NBER members than men. Second, authors from higher ranked institutions are more likely to be NBER members, but the effect is more muted for women. Figure 6, Panel A, presents a non-parametric representation the Column 1 specification. Holding rank fixed, the probability of male NBER member-authors is consistently higher than female NBER member-authors. As we scan the figure from left to right, the pattern holds across institutional rank. Panel B shows that the persistent gender-gap between NBER member-authors holds controlling for program-year fixed effects. The plots in both panels also visually make obvious that the relationship between rank and NBER membership is non-linear, as the relationship between institutional rank and the probability of NBER membership for accepted authors is very steep initially and then flattens out.

To account for these non-linearities in institutional rank, the remaining columns of Table 4 include a quadratic rank term as well. Column 2 also includes year and program fixed effects. The coefficient on the squared term is positive and statistically significant, suggesting that the effect of rank on an accepted author being an NBER member is non-linear. Column 3 includes program-by-year fixed effects and the patterns regarding gender and rank continue to hold; it is less likely that an accepted author is a NBER member if they are a women, or a member from a lower ranked institution. Collectively, the results in Columns 1-3 suggest that although a vast majority of papers on the Summer Institute program have an NBER-affiliated author, an accepted female author is roughly 8 percentage points less likely to be an NBER member, holding fixed institution rank and program-year.

We next examine how the gender gap in NBER membership changes over time. In Columns 5 and 6 we split the sample into a pre- and post-2010 period. The negative but smaller coefficient on the female term in Column 6 suggest that the gender gap between NBER members narrows in the post-2010 period. We repeat the same exercise as column 4 and 5, but for each major subfield, in Panel B. In both Micro and Macro/International, there is a shrinking gender gap, with Micro moving from an almost 10 percentage point gap to almost zero and Macro/International dropping by almost two-thirds from 18.8 to 6.22. In contrast, Finance's gap actually grew over this period, with female authors

²⁸Note that RePEc rank sorting is ordinal so that higher-ranked institutions have a lower rank, eg., Harvard University has a ranking of #1.

²⁹We set institution rank to zero in cases where the rank is missing. This dummy absorbs the effect of missing rank.

on the Finance program going from 13 percentage points less likely to be members to 15 percentage points.

What drives this shrinking NBER gender gap (but differential across fields)? We use another dataset to provide a partial explanation. We use an annual dataset of the NBER membership from 2008 to 2018, with identifiers of both the major programs that the members are a part of as well the members' rank. This rank can be either Faculty Research Fellow (FRF), which is a typically pre-tenure junior position, or Research Associate (RA), which is a more senior post-tenure position. In Panel A of Figure 7, we report the share of all NBER members who are women over this time period, and also report the share of women for FRF and RAs. As noted above, the female share of NBER members has roughly crossed 20 percent at the end of this period. However, the female share of FRFs is much higher, at nearly 30 percent, while the female share of RAs is around 18 percent. This implies that the flow of young NBER members (FRFs) is much more oriented towards women than the more senior stock of NBER members (RAs). We see a similar (but higher) pattern in Panel B, with members who are affiliated with Micro programs.³⁰ In Panel C, the same higher share of female FRFs in Macro and International implies that there is a larger flow of young female NBER members in the pool. For both Micro and Macro/International, the share of female NBER members is consistent with the share of authors on the NBER programs in those fields. However, in Panel D, the NBER members for Finance display very little difference between the FRFs, RAs and the overall NBER membership, suggesting that the flow of young NBER members who are women and do finance is not higher than the current stock. In more recent years, particularly in 2018, the share of female FRFs appears to have grown slightly.

The gender gap across fields and on the program could be indicative of evidence that the probability of submission is affected by NBER membership, both across time and fields. This could be either through institutional constraints or knowledge of the submission process. It's worth noting that the shares do not change very much over time, even within FRF and RA, consistent with a relatively unchanging share of female authors. Moreover, the female share of NBER members in each field is comparable to the share of female authors on the program in each field, with the exception being Finance, where female authors on the Summer Institute program are slightly higher than female NBER members on the program. This points to the possibility that despite equality conditional on acceptance, differences in knowledge or access might drive some of the differences in submission

³⁰Some individuals are members of several programs; for the purposes of these figures, each individual is only counted once in a given panel, but may be counted twice across Panel B, C and D.

across gender.

4.4 Organizers

Given the potential differences in submission rates, we can examine the role of organizers in gender composition on different programs. Organizers have the ability to both accept submitted papers (where they exhibit no average bias in favor of a gender) as well as solicit submissions (where submissions may come slightly more from men). If informal solicitations or formal calls for papers are correlated with an organizer’s ingroup, then we may see differences in female author share for male and female organizers.

In Table 5, we report the impact of having a female organizer on the share of female authors. This table presents regression results from alternative versions of the following benchmark specification:

$$\text{Female Share}_{it} = \alpha_i + \alpha_t + \text{Female Organizer}_{it} + \epsilon_{it}, \quad (2)$$

where the share of women on a program is the dependent variable, the main explanatory variable is “Female Organizer Share” is a continuous measure of the fraction of women organizers. In all specifications, we weight programs by the number of papers. Standard errors are clustered at the program level.

In our first specification, we examine the full pooled effect, with only year fixed effects in the regression, and report the results in Column 1. We find an insignificant positive effect of having a female organizer on the share of female authors. In Column 2, we also include program fixed effects along with the year fixed effects. The estimates suggest a positive and significant effect of about 3.5 percentage points of a female organizer on the share of women featured on a program. Since this regression exploits within-program variation in organizer gender, it highlights the fact that similar topics with female organizers appear to have a higher representation of women.

A caveat to bear in mind is that the observed patterns may be capturing differential trends across programs if the growth in female organizers coincides with a growth in the share of women. In other words, there may be a growing representation of women in a field that drives the increase in both female organizers and female authorship. Indeed, the share of programs with at least one female organizer has grown over time, with a particularly pronounced growth in micro and macro & international. We attempt to address this concern by controlling for subfield-by-year fixed effects (Finance, Micro and Macro/International by year). The inclusion of field-year fixed effects reduces

the coefficient estimates, but they remain significant and positive.

In Columns 4-6, we mimic the regressions from Column 1-3, but differentiate the coefficients by field. We see the positive effect of female organizers concentrated in macro & international, and surprisingly a negative effect in finance. These results persist with subfield-by-year fixed effects in Column 6.

In Table 6, we repeat the same regressions as Table 5, but examine the share of women among discussants as an outcome. Not all programs at the Summer Institute have discussants – amongst the 48 distinct programs we measure in 2016, for papers that we consider, only 29 of the programs have discussants. The gender representation of discussants is particularly noteworthy because organizers select discussants independent of submission. As a result, this can be a useful tool for studying female representation at a conference, independent of submission rates.

We see that in Columns 1-3, there is a positive effect of having a female organizer on the female share of discussants. However, these results are only significant in Column 1, and insignificant in Columns 2 and 3. When we focus by fields, we see that the positive effect of female organizers exists for all fields, but is only statistically significant with code and year fixed effects (in Column 5 and 6) for Finance.

Lastly, in unreported results, we compare the share of authors and discussants that are female over time.³¹ We find that in aggregate and across all fields, the share of women as discussants is lower than that of authors, but this difference is only statistically significant for micro fields.

This evidence can be interpreted both positively and negatively. On the plus side, a body of evidence suggests that women bear a larger brunt of the “service” tasks in academia (e.g. [Misra et al. \(2011\)](#)), and it suggests that this is not the case at the NBER. On the other hand, being a discussant (particularly at a high-prestige venue such as the NBER summer institute), can be considered an important way to create visibility for young academics, and one in which organizers have substantial discretion. Being a discussant is both a burden and a benefit – empirically it is unclear whether either dominates.

5 Alternative Channels

We finally consider two alternative aspects of NBER authors that may differ by gender: paper quality measured by publication outcome and the institutional rank of authors. These two approaches

³¹To make a fair comparison, we examine the subset of programs that have at least one discussant in a given year (54% of all program-years)

attempt to proxy for the quality of the papers or the authors. Both measures are relatively crude, but find little evidence of substantial research quality differences across men and women on the NBER Summer Institute programs.

5.1 Publications

Conditional on NBER acceptance, how do papers publish? For a subset of years (2001-2011), we identify the share of NBER papers on programs subsequently published in either the Journal of Political Economy (JPE), the Quarterly Journal of Economics (QJE), Econometrica and the American Economic Review (AER), using data from [Hengel \(2017\)](#). We estimate the following equation:

$$Y_{it} = \beta \text{Female Co-Author}_{it} + \tau X_{it} + \epsilon_{it}, \quad (3)$$

where Y_{it} denotes a variety of outcomes, including an indicator for whether the paper was published in one of the Top 4 journals listed above, or an indicator for each of the individual journals (QJE, ECMA, AER, JPE). Female Co-Author denotes whether a paper had a female co-author on the paper. X_{it} denotes program-by-year fixed effects. These results are almost identical if we include additional controls for the institution rank of the authors, or allow for less exhaustive fixed effects. We cluster standard errors at the program level.

In Table 3, we report the results from estimating Equation 3. On average, a paper on the NBER program during this period had a roughly ten percent chance of being published in one of the Top 4 in our dataset. Moreover, we find that the probability of publishing in one of the Top 4 journals is 1.1 percentage points lower for female co-authored papers, but statistically insignificant, with large standard errors of around 1.1 percentage points. We also examine across journals and find that for all journals but the JPE, this difference is insignificant. However, for the JPE, the effect is negative and significant, with female coauthored papers having a 1.4 percentage point lower chance of publication. This is almost entirely the size of the overall average outcome of 1.7 percentage points for the JPE. This lack of difference by gender is consistent with the assumption that papers with female co-authors tend to be of similar quality at the high end and hence have a similar rate of publication.

5.2 University Rank

An alternative proxy for research quality is the rank of the institution with which an author is affiliated. Figure 8 plots the cumulative share of authors accepted onto the NBER programs across RePEc

rankings. For all accepted authors, we calculate the cumulative share as the share of authors for each institutional rank, divided by the total number of authors identified by rank, and cumulated across ranks. For each gender, we calculate the share within gender. A steeper curve implies a larger share of higher-ranked institutions.³² The area under the curve in the plot from Figure 8 shows that roughly 50% of the authors come from the top 30 institutions in RePec rankings, consistent with the prior that a prestigious conference like the NBER summer draws authors from the top-ranked institutions.

Conditional on institutional rank, however, there do not appear to be significant differences across gender. The distribution of female authors appears to be slightly lower across ranks, but the difference is small. Given the steepness of the cumulative plots and the closeness of the series by gender, the data suggest that both men and women from top institutions are highly represented on the Summer Institute program. Table 7 highlights the top ten schools represented on the program and shows that 34% of papers come from top ten schools. Both panels of the table corroborate the prestigious nature of the conference.

6 Conclusion

We find that over the period from 2016-2018, women made up 21 percent of all authors on scheduled papers, but there was large dispersion across different sub-disciplines. While the average share of women on programs has risen slightly over the past 18 years from 18 percent in 2001-2003, the gap of women between finance, macroeconomics and microeconomics subfields has remained constant.

Using two years of anonymized submission data, we find statistically indistinguishable acceptance rates across men and women. Hence, the gender representation at the NBER Summer Institute likely reflects the gender composition of the submissions pool. However, it is not possible to measure with precision the pool of academics who submit to the NBER summer institute, we venture to approximate an estimate of the submissions rates by gender. From our analysis, the only comparable benchmark of female economists that matches both the level and time series of female representation at the NBER is the share of women who are NBER affiliates. While the NBER Summer Institute makes a substantial effort to email and contact all departments with doctoral programs to solicit submissions, our results suggest that either information or some other barriers may influence the probability of submission. For programs interested in increasing female representation, encouraging a larger share of female submissions may be effective.

³²RePec rankings are from <https://ideas.repec.org/top/top.inst.allbest10detail.html>

We are also left with the puzzling question of why there are such stark differences across fields in female representation. Indeed, far from being homogeneous, we find that for an economist attending the first week of the Summer Institute in 2016 (dominated by finance and macroeconomics sessions), 17.5 percent of the authors on papers presented were women. In contrast, the third week of papers (a week focused on labor and public economics) had almost twice as many women on the program; 30.5 percent of the authors were women. While finance acceptance rates appear to have a small tilt in favor of men, this is not the case for macro & international, which also have much lower representation of women. A potential explanation is that women have a preference for topics in certain subfields of economics and actively choose to enter these fields. Given evidence on the role of mentoring (e.g. [Neumark and Gardecki \(1998\)](#), [Carrell, Page and West \(2010\)](#), [Bettinger and Long \(2005\)](#)), future research could consider the impact of mentors on encouraging more women to enter particular subfields of economics. Alternatively, there may be unexplored barriers to entry in sub-fields in finance. These barriers appear puzzling and worth exploring in future research.

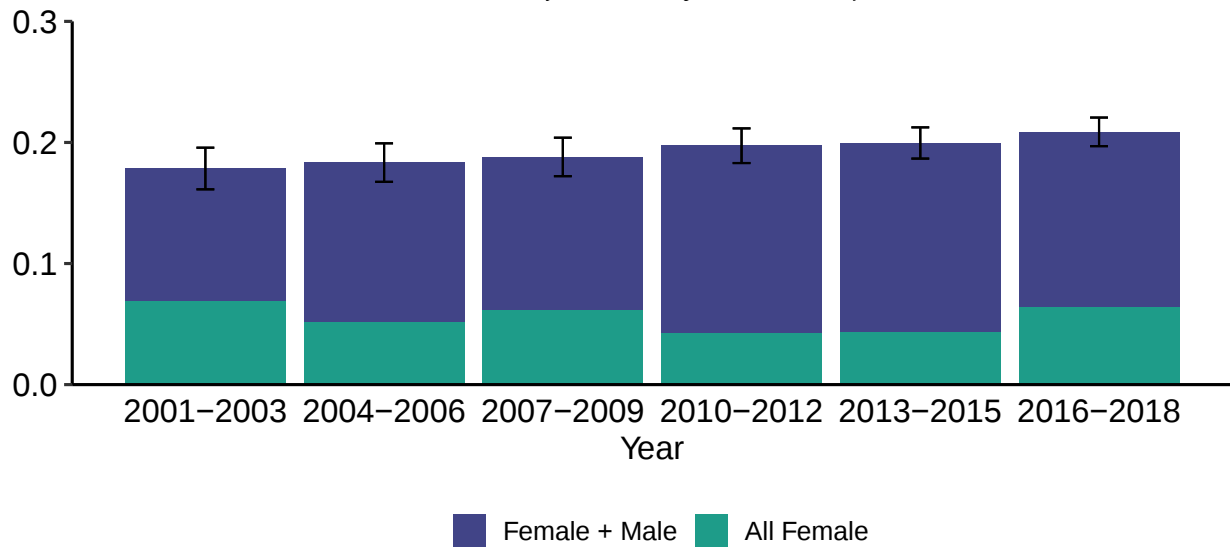
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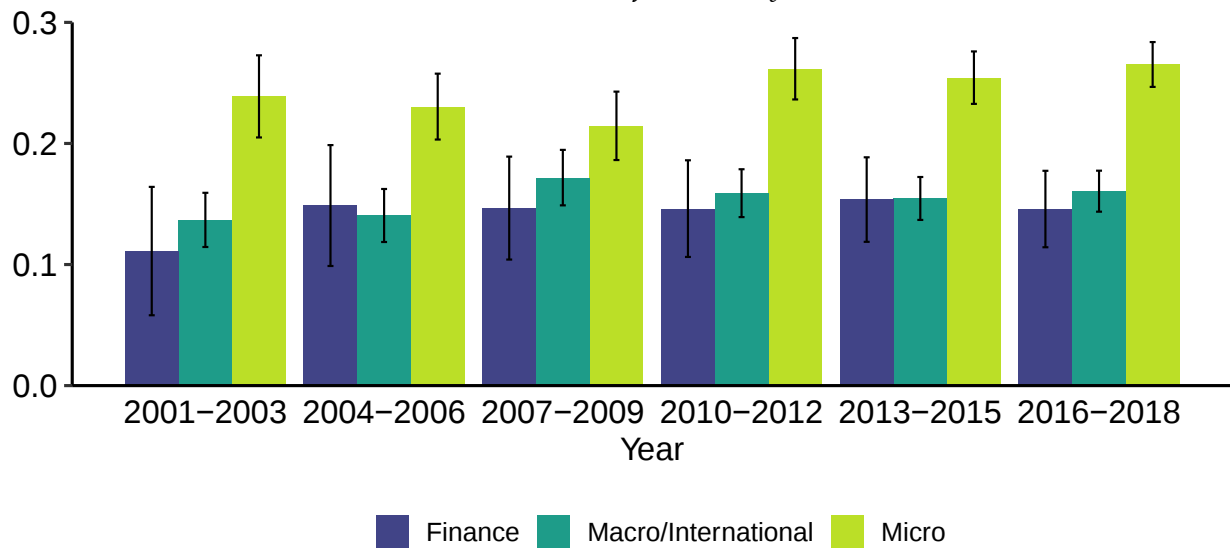
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Figure 1: Gender Composition over Time

Panel A: Female Share of Authors by Author Composition

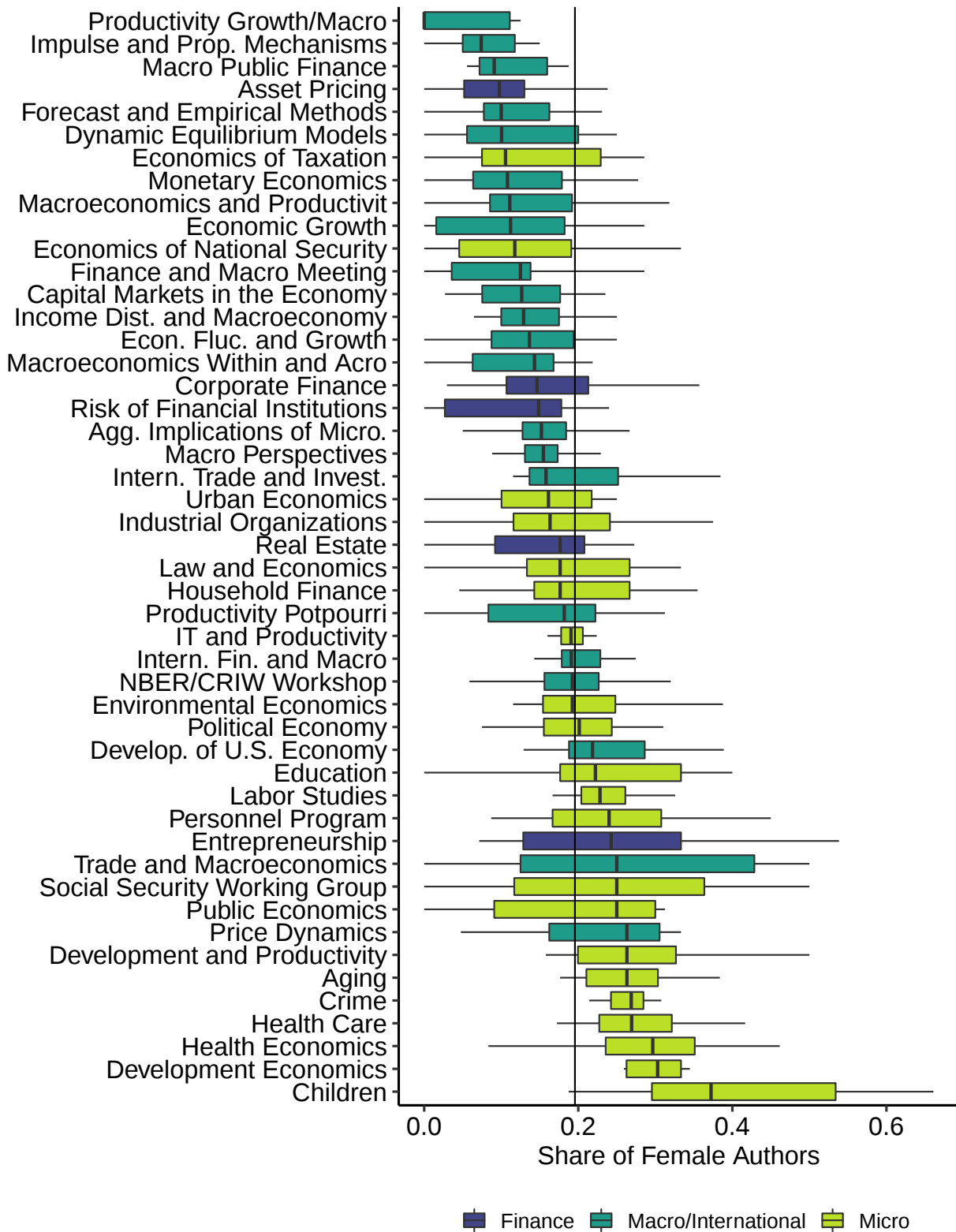


Panel B: Female Share of Authors by Field



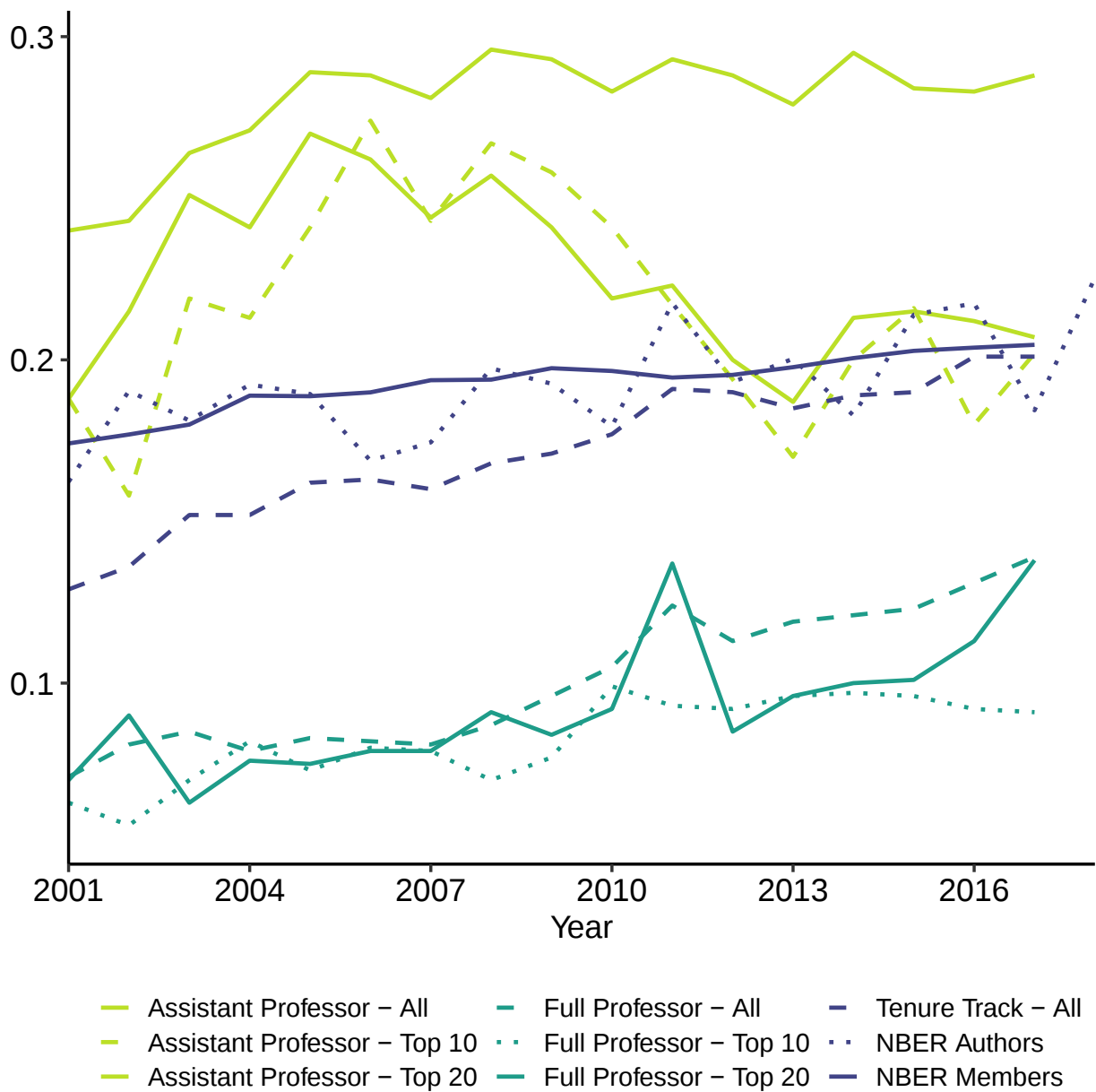
Note: This figure plots the overall representation of female economists divided into four year buckets. Panel A reports the share of female authors across all papers. Panel B shows the composition of authors across accepted papers broken down into categories based on author composition. The error bars represent ± 1.96 times the standard error of the mean.

Figure 2: Gender Composition Across Programs



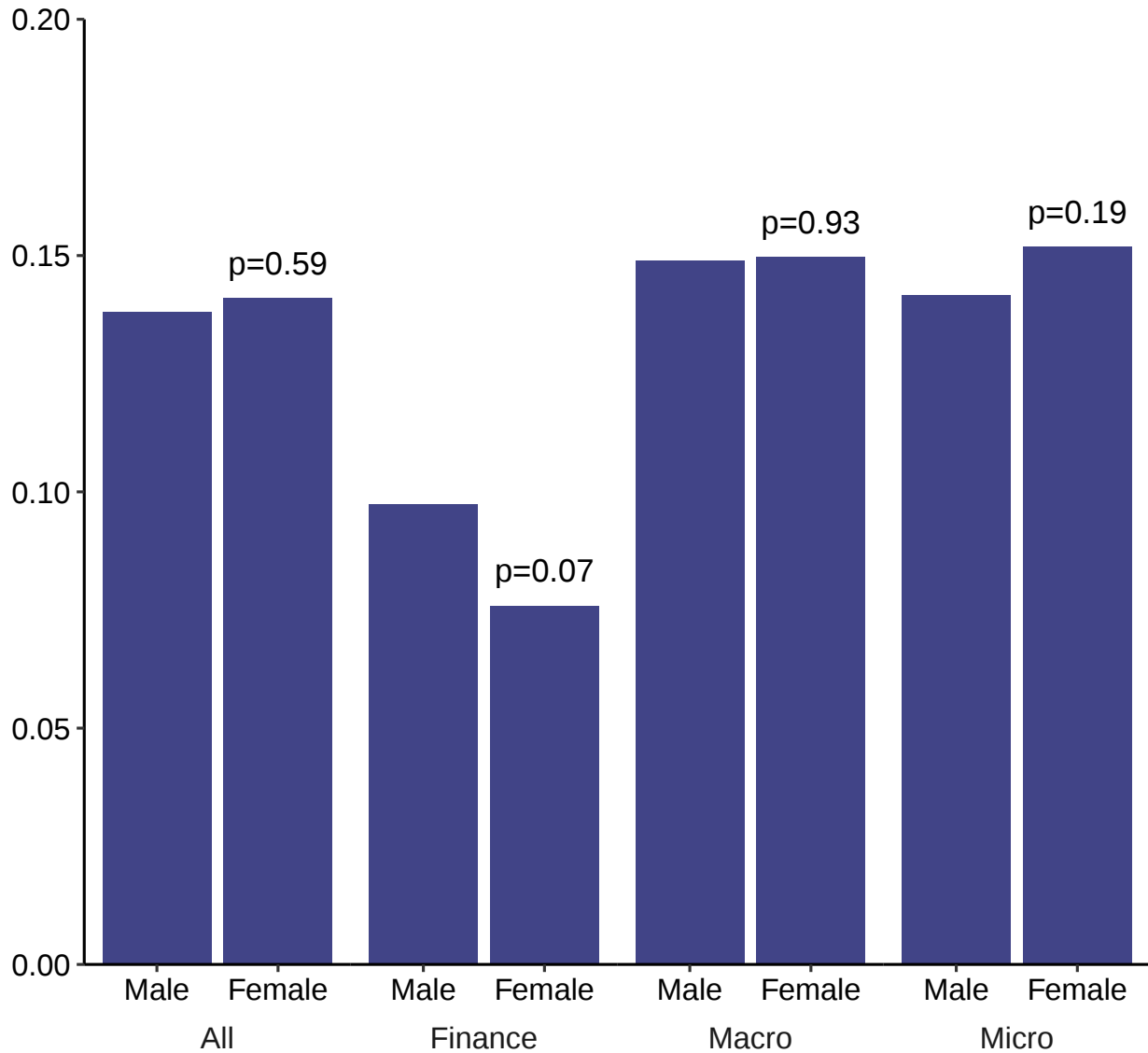
Note: This figure plots a box plot of the gender composition across programs using all data from 2001 to 2018. For each program, the box reflects the interquartile range, with the middle line reflecting the median. The lines reflect the furthest value that is within 1.5 standard deviations of the interquartile range, where the standard deviations are measured within program. The overall black line reflects the overall average share of female authors. We only report programs that have a minimum of 5 years of data. Programs are coded into fields using the categorization in Table 1.

Figure 3: Benchmarking the share of female economists over time



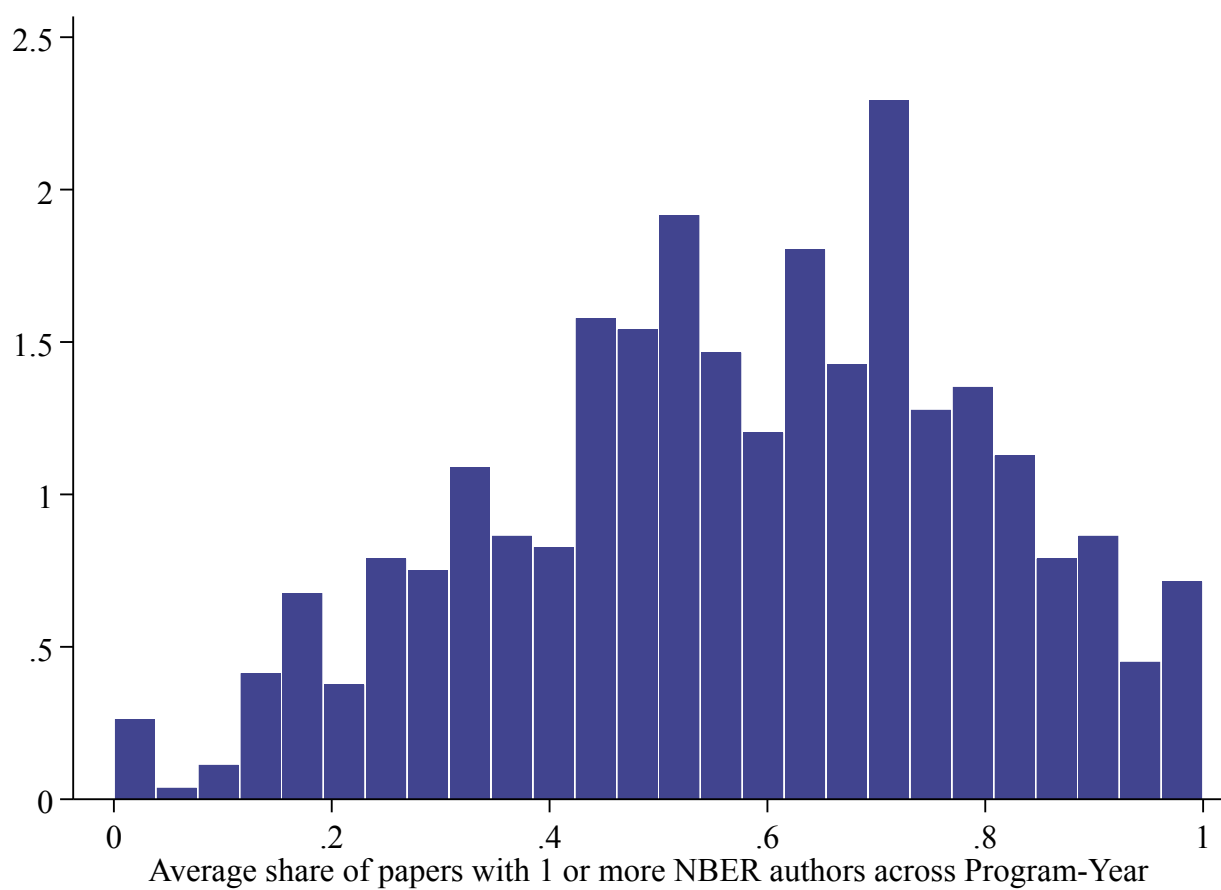
Note: This figure plots the share of female economist in different categories over time. The bottom set of lines report the share of women who are Full professors at all institutions with graduate programs, or at the Top 10 and Top 20 institutions. The top lines report the share of assistant professors that are women across the three sets of universities. All of these statistics come from the CSWEP report on representation of women in economics. The solid middle line reports the share of NBER members (research associates and faculty research fellows) that are women. This comes from the NBER website on NBER members. The dotted middle line reports the share of authors that are female on the NBER programs, and the dashed middle line reports the share of all tenure track professors from CSWEP at all institutions with graduate programs.

Figure 4: NBER Acceptance Across Fields and Gender



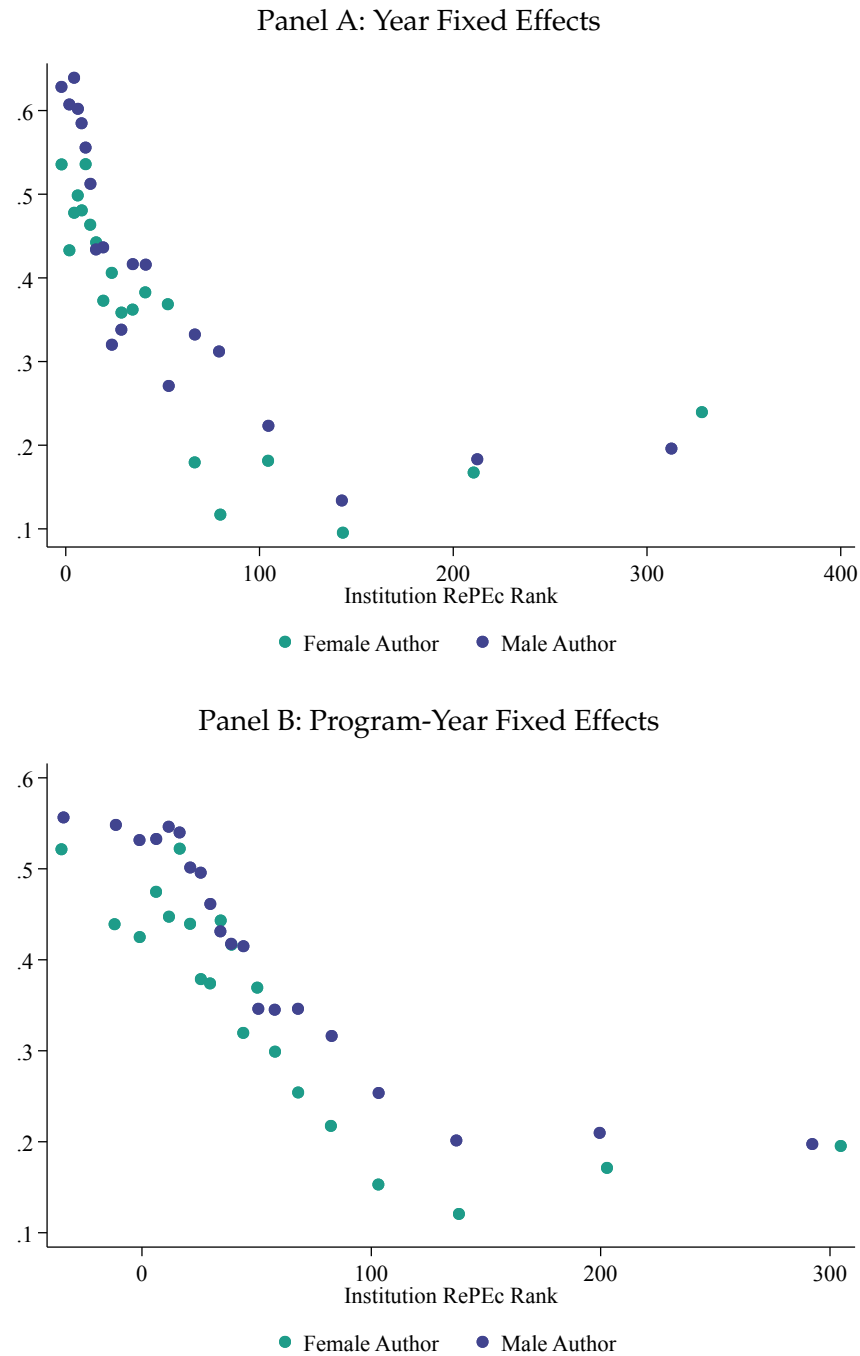
Note: This figure plots the acceptance rate into the NBER, conditional on submission, of authors for the 2016 and 2017 NBER Summer Institute. The first set of bars plot the acceptance rate for male and female authors for all fields pooled. The next three sets split out acceptance rates by field. None of the differences is significant, except for finance, with a p-value of 0.07. Reported p-values are from a t-test of difference in means between male and female acceptance rates.

Figure 5: Share across programs of papers with one or more NBER Author



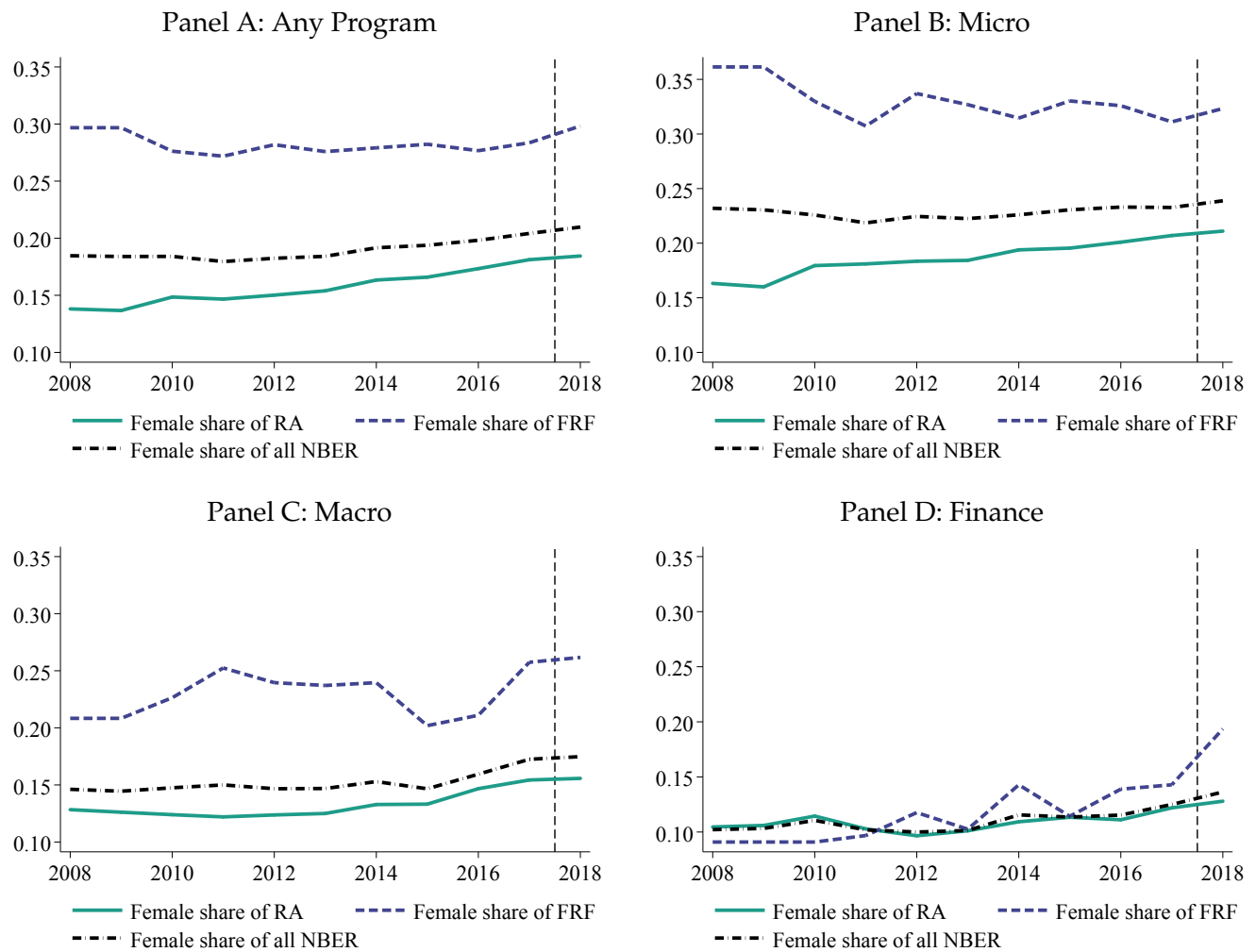
Note: This figure plots the distribution of the share of papers in a given program-year at the NBER Summer Institute that have at least one NBER member as an author.

Figure 6: Probability an Author is an NBER Member by Institution Rank



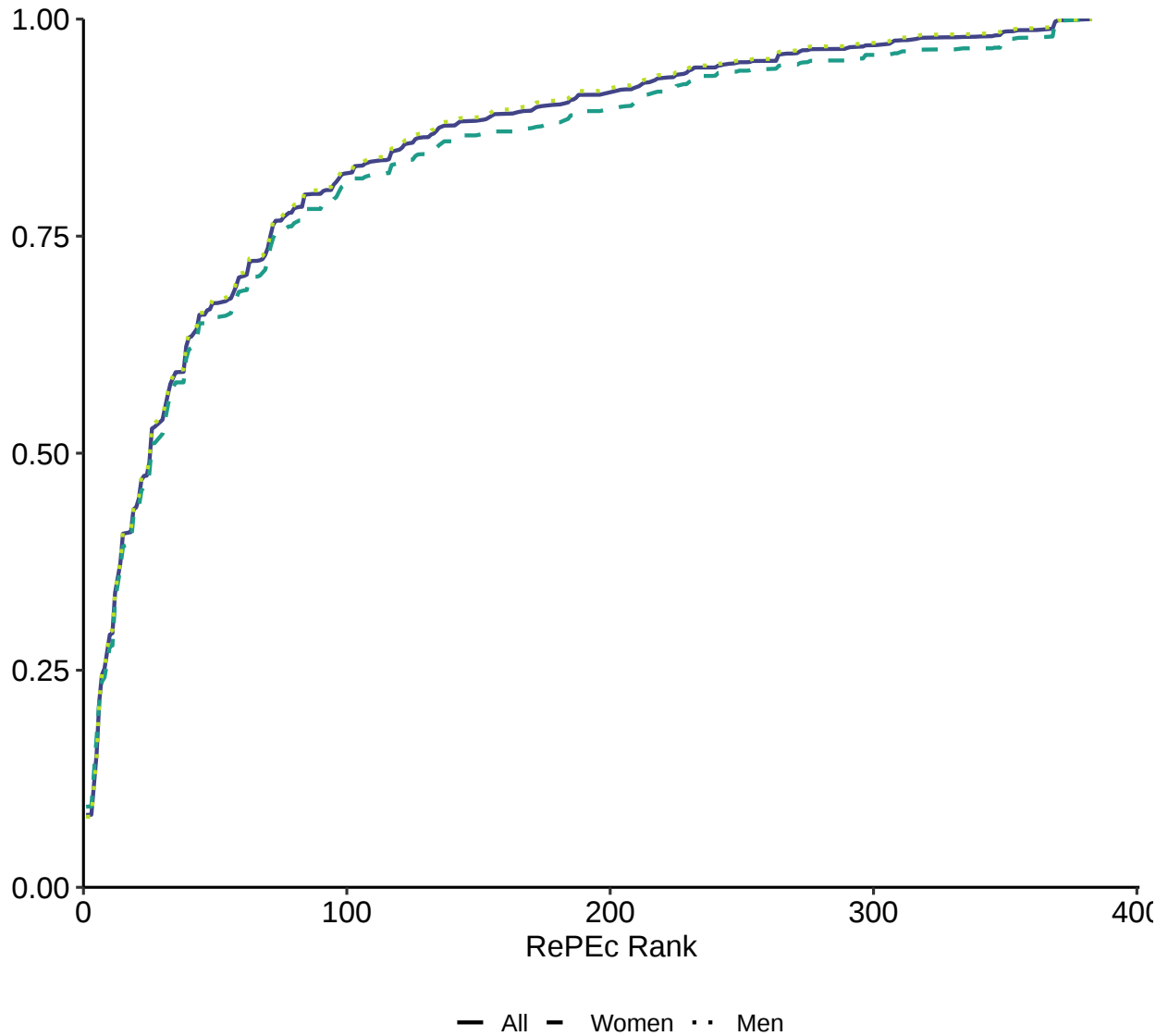
Note: These figures plot the probability that an NBER summer institute author is an NBER member. For Panel A, we use year fixed effects as controls. In Panel B, we use program-by-year fixed effects. To construct each binned scatter plot, we first regress both the y- and x-axis variable on the control variables and calculate residuals. We then group the observations into twenty equal-sized (five percentile-point) bins based on the x-axis residual and scatter the means of the y- and x-axis residuals within each bin.

Figure 7: Female share in the NBER Membership by type of affiliation



Note: This figure plots the share of female NBER members over time from 2008 to 2018. On each panel, the female share is plotted for three groups: all NBER members, Faculty Research Fellow (FRF) members and Research Associates (RA) members. In Panel B, Micro is defined as membership in Aging, Children, Development of the American Economy, Development, Education, Environment and Energy Economics, Health Care, Health Economics, Industrial Organization, Law and Economics, Labor Studies, and Public Economics. Macro is defined as membership in Economic Fluctuations and Growth, International Finance and Macroeconomics, International Trade and Investment, Monetary Economics, Political Economy or Productivity Innovation and Entrepreneurship. Finance is defined as membership in Corporate Finance or Asset Pricing.

Figure 8: Cumulative Author Distribution by Rank and Gender



Note: This figure plots the cumulative share of authors accepted onto the NBER programs across RePEc rankings. For all authors, it calculates the cumulative share as the share of authors for each rank, divided by the total number of authors (for those with identified ranks), and cumulated across ranks. For each gender, it calculates the share within gender. A steeper curve implies a larger share in higher ranked institutions. RePEc rankings are pulled from here: <https://ideas.repec.org/top/top.inst.allbest10detail.html>

Table 1: Field Categorization of NBER Programs

Finance	Macro/International	Micro
Asset Pricing	Aggregate Implications of Microeconomic Consumption Behavior	Aging
Corporate Finance	Capital Markets in the Economy	Children
Entrepreneurship	Development of the American Economy	Crime
Real Estate	Dynamic Equilibrium Models	Development Economics
Risk of Financial Institutions	Econ Fluct and Growth	Development and Productivity
	Economic Fluctuations - Behavioral/Macro	Economics of National Security
	Economic Growth	Education
	Finance and Macro Meeting	Environmental Economics
	Forecast and Empirical Methods	Health Care
	Impulse and Propagation Mechanisms	Health Economics
	Income Distribution and Macroeconomics	Household Finance
	International Finance and Macroeconomics	IT and Productivity
	International Trade and Investment	Industrial Organizations
	Macro Perspectives	Innovation
	Macro Public Finance	Labor Studies
	Macroeconomics Within and Across Borders	Law and Economics
	Macroeconomics and Productivity	Personnel Program
	Monetary Economics	Political Economy
	NBER/CRIW Workshop	Public Econ: Taxation and Social Insurance
	Price Dynamics	Social Security
	Trade and Macroeconomics	Urban Economics

Note: This table gives the categorization of programs used for the figures and tables throughout the paper. We combine programs together in cases where names changed slightly.

Table 2: Summary Stats by Year

Year	Number	Female Share	All Male	Paper Breakdown	
	of Papers	of Papers		Male + Female	All Female
	(1)	(2)	(3)	(4)	(5)
<i>All Fields</i>					
2001	332	0.16	0.74	0.17	0.08
2002	370	0.19	0.69	0.18	0.13
2003	320	0.18	0.70	0.21	0.09
2004	381	0.19	0.69	0.22	0.09
2005	361	0.19	0.68	0.25	0.07
2006	377	0.17	0.71	0.20	0.08
2007	371	0.17	0.69	0.23	0.08
2008	368	0.20	0.67	0.20	0.13
2009	416	0.19	0.67	0.23	0.10
2010	437	0.18	0.67	0.27	0.06
2011	469	0.22	0.64	0.28	0.08
2012	435	0.20	0.65	0.28	0.07
2013	487	0.20	0.62	0.30	0.08
2014	508	0.18	0.67	0.26	0.07
2015	499	0.22	0.56	0.37	0.06
2016	586	0.22	0.60	0.30	0.10
2017	577	0.19	0.67	0.24	0.10
2018	597	0.23	0.57	0.33	0.10

Note: this table reports the year-by-year summary statistics from the sample of NBER authors. Column 1 reports the total number of papers on the program each year in our sample. Column 2 reports the average share of authors on the programs that were women. Columns 3-5 report the shares of papers in each year that had all male authors, male and female authors, and all female authors, respectively.

Table 2: Summary Stats, Continued; by Year + Field

Year	Number of Papers	Female Share of Papers	All Male	Paper Breakdown	
				Male + Female	All Female
	(1)	(2)	(3)	(4)	(5)
<i>Micro</i>					
2001	99	0.22	0.69	0.18	0.13
2002	128	0.28	0.59	0.23	0.17
2003	99	0.22	0.64	0.27	0.09
2004	156	0.22	0.63	0.28	0.09
2005	139	0.24	0.58	0.35	0.06
2006	143	0.23	0.64	0.29	0.08
2007	131	0.18	0.66	0.28	0.06
2008	140	0.23	0.64	0.21	0.15
2009	142	0.24	0.61	0.27	0.11
2010	151	0.23	0.58	0.34	0.08
2011	188	0.30	0.48	0.39	0.12
2012	164	0.24	0.59	0.35	0.07
2013	199	0.27	0.52	0.36	0.13
2014	211	0.25	0.55	0.35	0.09
2015	209	0.26	0.48	0.44	0.09
2016	271	0.27	0.52	0.32	0.16
2017	249	0.25	0.57	0.29	0.14
2018	323	0.28	0.49	0.36	0.15
<i>Macro/International</i>					
2001	168	0.12	0.79	0.17	0.04
2002	169	0.14	0.76	0.14	0.10
2003	158	0.15	0.77	0.14	0.09
2004	165	0.16	0.76	0.16	0.08
2005	153	0.15	0.76	0.18	0.06
2006	177	0.12	0.79	0.12	0.09
2007	185	0.17	0.72	0.19	0.09
2008	170	0.19	0.71	0.17	0.12
2009	198	0.16	0.72	0.19	0.09
2010	201	0.17	0.70	0.25	0.05
2011	213	0.15	0.74	0.21	0.05
2012	207	0.16	0.71	0.23	0.06
2013	216	0.15	0.71	0.24	0.05
2014	224	0.13	0.78	0.16	0.07
2015	229	0.18	0.62	0.32	0.05
2016	257	0.19	0.64	0.30	0.06
2017	260	0.14	0.74	0.20	0.06
2018	212	0.16	0.68	0.28	0.04
<i>Finance</i>					
2001	21	0.13	0.86	0.10	0.05
2002	22	0.06	0.86	0.09	0.05
2003	24	0.15	0.71	0.25	0.04
2004	29	0.18	0.66	0.28	0.07
2005	32	0.13	0.72	0.22	0.06
2006	32	0.14	0.72	0.22	0.06
2007	31	0.12	0.74	0.19	0.06
2008	30	0.16	0.67	0.30	0.03
2009	41	0.15	0.71	0.24	0.05
2010	46	0.11	0.78	0.17	0.04
2011	44	0.12	0.77	0.20	0.02
2012	40	0.20	0.65	0.28	0.08
2013	47	0.17	0.62	0.36	0.02
2014	53	0.13	0.72	0.25	0.04
2015	54	0.17	0.63	0.37	0.00
2016	58	0.12	0.76	0.21	0.03
2017	61	0.13	0.72	0.23	0.05
2018	54	0.19	0.57	0.39	0.04

Table 3: Publication Outcomes in Top Journals by Gender

	Accepted in Journal				
	Top 4	QJE	ECMA	AER	JPE
Female Co-Author	-0.011 (0.011)	-0.004 (0.006)	-0.001 (0.003)	0.008 (0.008)	-0.014*** (0.004)
Number of Papers	4208	4208	4208	4208	4208
Avg. Acceptance Rate	0.099	0.031	0.009	0.043	0.017
Code $\times$ Year F.E.	Yes	Yes	Yes	Yes	Yes

Note: this table presents the results from the following estimating equation:

$$Y_{it} = \beta \text{Female Co-Author}_{it} + \tau X_{it} + \epsilon_{it}, \quad (4)$$

where Y_{it} denotes a variety of outcomes, including an indicator for whether the paper was published in one of the Top 4 journals listed above, or an indicator for each of the individual journals (QJE, ECMA, AER, JPE). Female Co-Author denotes whether a paper had a female co-author on the paper. X_{it} denotes program-by-year fixed effects. In each column, we report the results for each potential outcome. We cluster standard errors at the program level.

Table 4: Rates of NBER Membership across accepted authors

Panel A: All Programs						
Probability an accepted author is NBER member						
	Full Sample			Year $\leq$ 2010	Year $>$ 2010	
	(1)	(2)	(3)	(4)	(5)	
Female	-7.688*** (1.945)	-7.447*** (2.088)	-8.500*** (1.945)	-13.663*** (3.523)	-5.807*** (1.860)	
RePEc Rank	-0.151*** (0.018)	-0.455*** (0.030)	-0.430*** (0.027)	-0.384*** (0.037)	-0.453*** (0.035)	
RePEc Rank ²		0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	
Female $\times$ RePEc Rank	0.046*** (0.017)	0.050 (0.032)	0.044 (0.032)	0.117* (0.064)	0.010 (0.041)	
Female $\times$ RePEc Rank ²		-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	
Observations	17594	17594	17594	6486	11108	
Year F.E.	Yes	Yes	Yes	Yes	Yes	
Program FE	No	Yes	Yes	Yes	Yes	
Program-Year FE	No	No	Yes	Yes	Yes	

Panel B: By Field						
Probability an accepted author is NBER member						
	Micro		Macro/International		Finance	
	Year $\leq$ 2010	Year $>$ 2010	Year $\leq$ 2010	Year $>$ 2010	Year $\leq$ 2010	Year $>$ 2010
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-9.443** (4.094)	-1.581 (2.578)	-18.806*** (4.823)	-6.223* (3.238)	-13.081* (7.257)	-15.021** (5.642)
RePEc Rank	-0.336*** (0.058)	-0.347*** (0.034)	-0.384*** (0.043)	-0.520*** (0.035)	-0.453*** (0.127)	-0.621*** (0.054)
RePEc Rank ²	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001** (0.000)	0.001*** (0.000)
Female $\times$ RePEc Rank	0.164 (0.103)	-0.085 (0.052)	0.078 (0.098)	0.010 (0.071)	0.079 (0.163)	0.168 (0.114)
Female $\times$ RePEc Rank ²	-0.001** (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)
Observations	2332	4839	2908	4678	596	1184
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	Yes	Yes	Yes	Yes	Yes	Yes
Program-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: this table reports the results from the following specification:

$$\text{NBER Member}_{it} = \beta \text{Female} + \gamma \text{Rank} + \tau X_{it} + \epsilon_{it} \quad (5)$$

The outcome variable in the regressions is an indicator for whether the accepted author is NBER member. We include a dummy for whether the author is male or female, and also control for the rank of the authors' institutions according to RePec. Note that RePec rank sorting is ordinal so that higher-ranked institutions have a lower rank, eg., Harvard University has a ranking of #1. X_{it} includes various forms of fixed effects, and a dummy for if the institution rank is missing. Standard errors are clustered at the program level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Organizer Effects on Female Author Share

	Share Female Author					
	(1)	(2)	(3)	(4)	(5)	(6)
Share Female Organizers	0.072 (0.052)	0.069** (0.029)	0.060** (0.030)			
× Finance				-0.112 (0.070)	-0.077*** (0.013)	-0.067*** (0.024)
× Micro				-0.022 (0.044)	0.043 (0.036)	0.031 (0.039)
× Macro				0.130** (0.058)	0.106*** (0.035)	0.094** (0.036)
Observations	650	650	650	650	650	650
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	Yes	Yes	No	Yes	Yes
Field-Year FE	No	No	Yes	No	No	Yes

Note: In Panel A, we regress the probability of the NBER SI papers being published in the American Economic Review, Econometrica, Journal of Political Economy and Quarterly Journal of Economics using data on outcomes from [Hengel \(2017\)](#) matched to our sample, limited to papers in the SI before 2015 and controlling for program-by-year fixed effects and clustering at the program level. Panel B and C of this table presents regression results from versions of the following specification:

$$\text{Female Share}_{it} = \alpha_i + \alpha_t + \text{Female Organizer}_{it} + \epsilon_{it}, \quad (6)$$

where the share of women on a program is the dependent variable, the main explanatory variable is Female Organizer Share, which is a continuous measure of what fraction of organizers are women. The unit of analysis is a program-year. In Column 1, we report the coefficients using just year fixed effects. In Column 2, we add program fixed effects. In Column 3, we add field-year fixed effects to the specification from column 2. In Columns 4-6, we mimic the regressions from Column 1-3, but split out the coefficients by field. Programs are coded into fields using the categorization in Table 1. Standard errors are clustered at the program level, and regressions are weighted by the number of papers on a program in a given year. Column 1 reports the probability of publishing in any of the 4, and Columns 2-5 report for each journal individually. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Organizer Effects on Female Discussant Share

	Share Female Discussants					
	(1)	(2)	(3)	(4)	(5)	(6)
Share Female Organizers	0.053* (0.029)	0.033 (0.030)	0.025 (0.038)			
× Finance				0.123 (0.105)	0.149** (0.056)	0.109*** (0.038)
× Micro				0.026 (0.030)	0.014 (0.055)	0.032 (0.088)
× Macro				0.072** (0.034)	-0.004 (0.024)	-0.017 (0.038)
Observations	289	289	289	289	289	289
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Program FE	No	Yes	Yes	No	Yes	Yes
Field-Year FE	No	No	Yes	No	No	Yes

Note: In Panel A, we regress the probability of the NBER SI papers being published in the American Economic Review, Econometrica, Journal of Political Economy and Quarterly Journal of Economics using data on outcomes from [Hengel \(2017\)](#) matched to our sample, limited to papers in the SI before 2015 and controlling for program-by-year fixed effects and clustering at the program level. Panel B and C of this table presents regression results from versions of the following specification:

$$\text{Female Share}_{it} = \alpha_i + \alpha_t + \text{Female Organizer}_{it} + \epsilon_{it}, \quad (7)$$

where the share of women on a program as discussants (Panel B) is the dependent variable, the main explanatory variable is Female Organizer Share, which is a continuous measure of what fraction of organizers are women. The unit of analysis is a program-year. In Column 1, we report the coefficients using just year fixed effects. In Column 2, we add program fixed effects. In Column 3, we add field-year fixed effects to the specification from column 2. In Columns 4-6, we mimic the regressions from Column 1-3, but split out the coefficients by field. Programs are coded into fields using the categorization in Table 1. Standard errors are clustered at the program level, and regressions are weighted by the number of papers on a program in a given year. Column 1 reports the probability of publishing in any of the 4, and Columns 2-5 report for each journal individually. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Top Share of Papers by Rank and Gender

Affiliation	Author Share of Papers			Cumulative Share
	Women	Men	All	All
<i>Panel A: Sorted by Total Share</i>				
Harvard University	1.4	5.2	6.5	6.5
University of Chicago	0.6	4.1	4.7	11.3
Massachusetts Institute of Technology	0.9	3.1	4.0	15.3
Stanford University	0.8	2.9	3.7	18.9
University of Pennsylvania	0.5	2.6	3.1	22.0
New York University	0.4	2.3	2.7	24.7
Columbia University	0.6	2.1	2.6	27.3
Princeton University	0.3	2.1	2.4	29.7
Northwestern University	0.4	1.9	2.3	32.0
Yale University	0.5	1.6	2.1	34.1
<i>Panel B: Sorted by Female Share</i>				
Harvard University	1.4	5.2	6.5	6.5
Massachusetts Institute of Technology	0.9	3.1	4.0	10.5
Stanford University	0.8	2.9	3.7	14.2
University of Chicago	0.6	4.1	4.7	18.9
Columbia University	0.6	2.1	2.6	21.5
University of Pennsylvania	0.5	2.6	3.1	24.6
Yale University	0.5	1.6	2.1	26.7
New York University	0.4	2.3	2.7	29.4
University of Michigan	0.4	1.3	1.8	31.2
Northwestern University	0.4	1.9	2.3	33.5

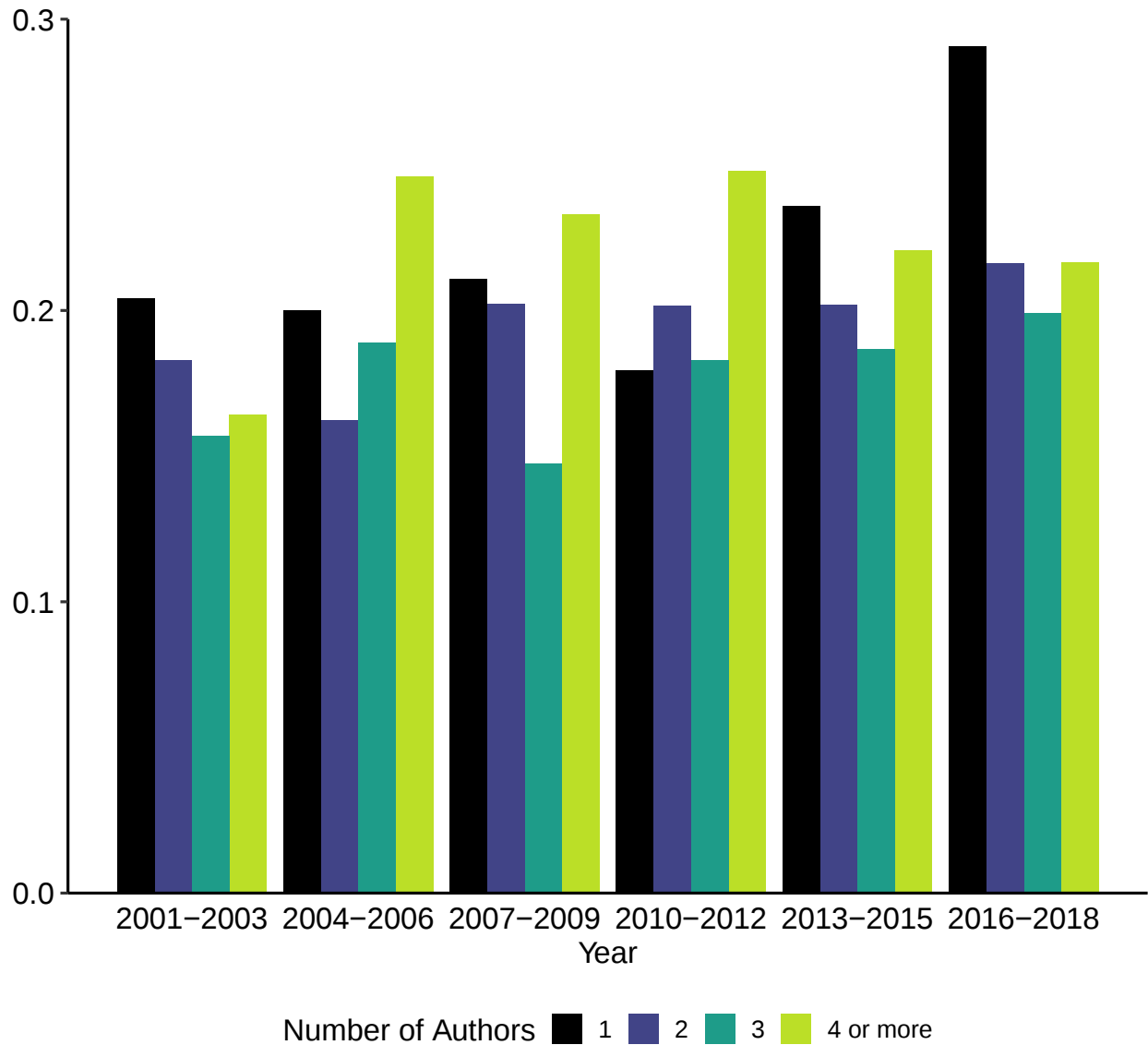
Note: This table presents the top ten university affiliations that have the highest cumulative share of authors on the NBER SI programs. This share is calculated only amongst authors for whom affiliation can be identified, which is roughly 70% of the sample.

Gender Representation in Economics Across Topics and Time: Evidence From the NBER Summer Institute

Online Appendix

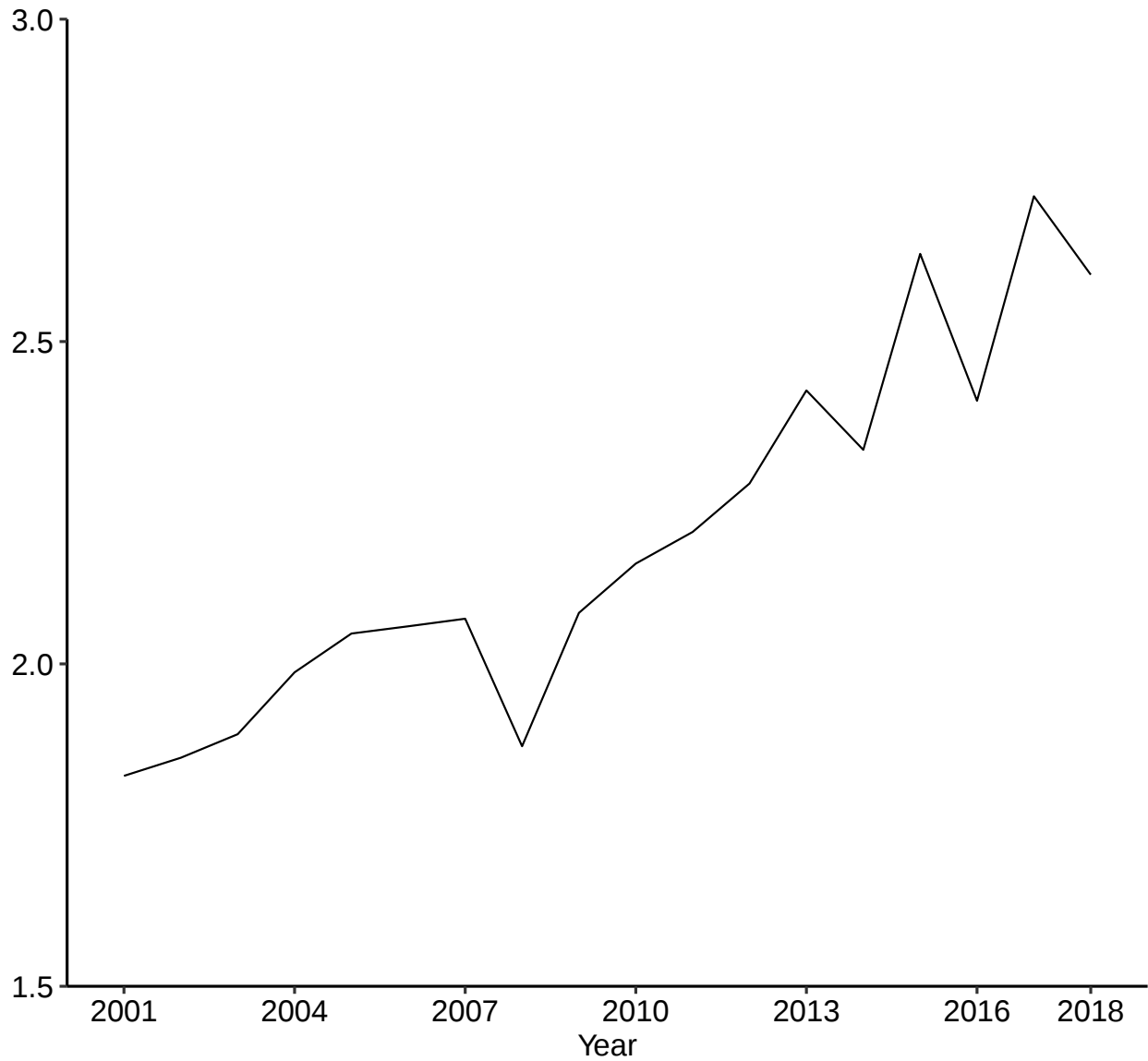
Anusha Chari Paul Goldsmith-Pinkham

Figure A1: Composition of Authorship Gender over Time



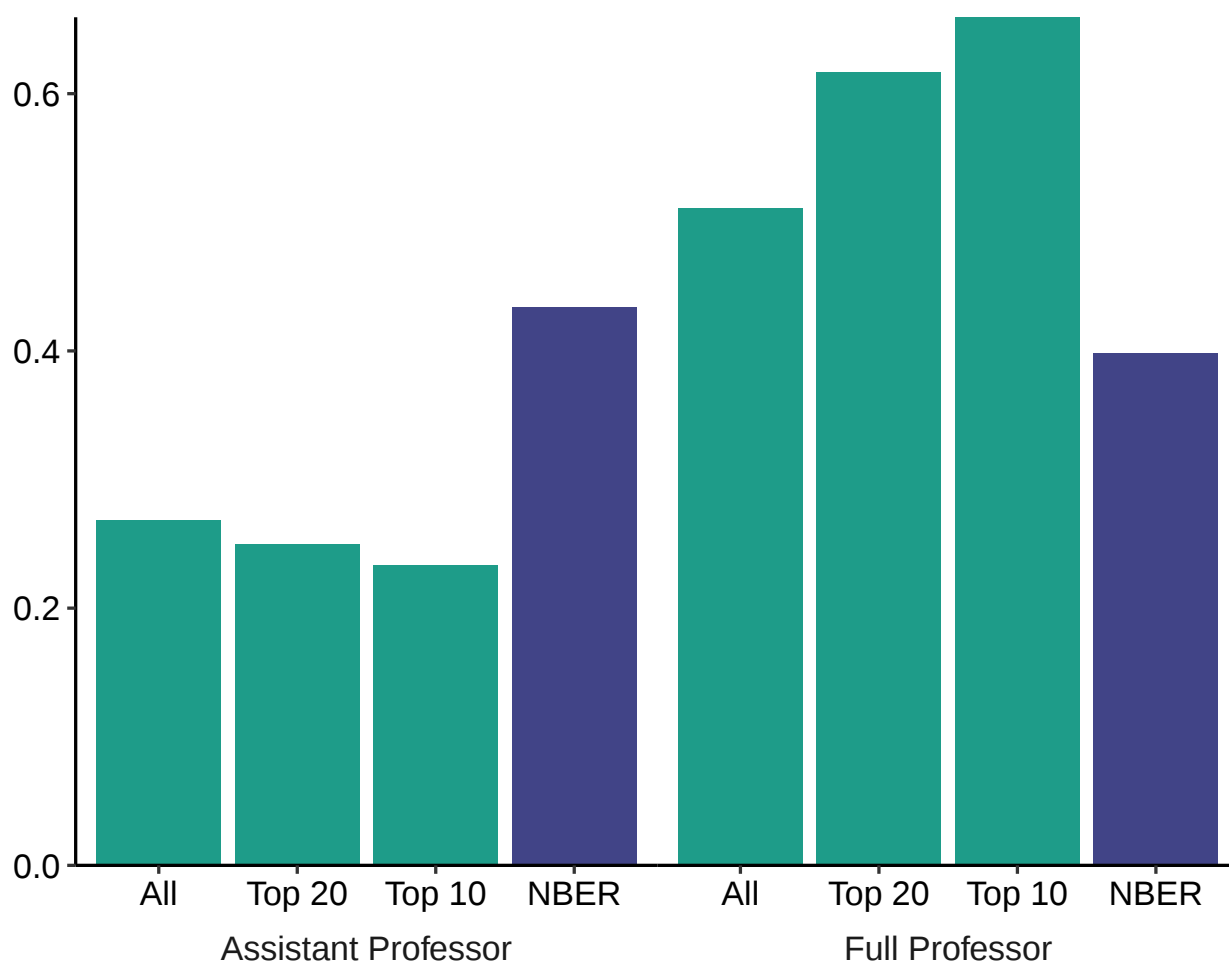
Note: This figure plots the composition of authors across accepted papers broken down into categories based on author composition.

Figure A2: Number of Coauthors per Paper Over Time



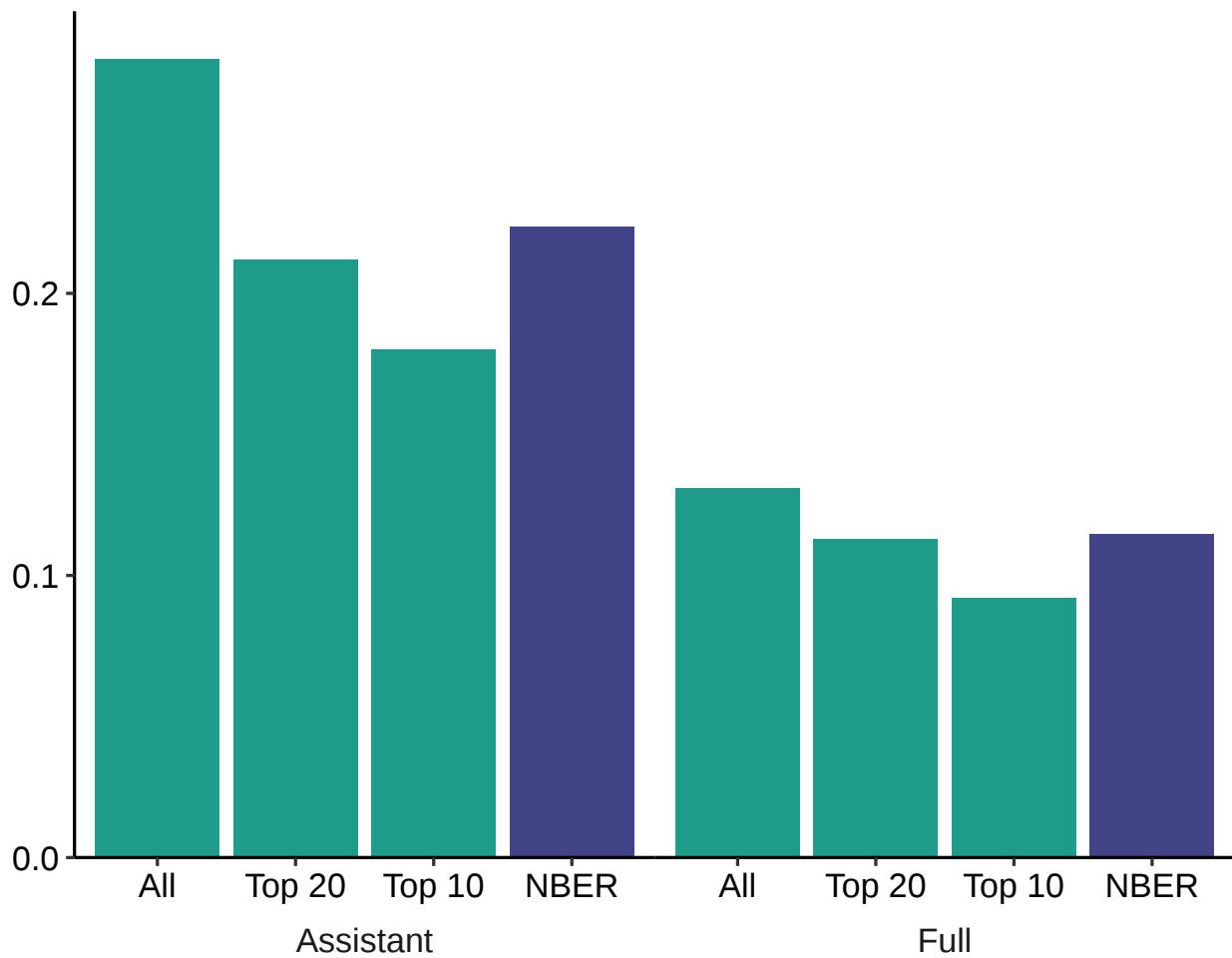
Note: This figure plots the average number of co-authors on a paper by year.

Figure A3: Seniority Share at Universities and the NBER Summer Institute



Note: This figure plots the share of seniority at the NBER and at economics departments with doctoral programs. The left four columns are the share of faculty that are assistant professors (including both men and women), with the first three columns corresponding to economics departments with doctoral programs as reported by CSWEP, and the fourth column corresponding to the authors on the NBER programs. The right four columns repeat the same exercise, but for the share of Full professors. All data is for 2016, and for the NBER data in both panels, we only include authors from universities to match the CSWEP Data.

Figure A4: Female Share at Universities and the NBER Summer Institute, by Seniority



Note: In this figure we report, for a given faculty rank – either assistant or full professor – the share of female economists either in an economics department or on the NBER programs. The left four columns are the share of assistant professors that are women, with the first three columns corresponding to economics departments with doctoral programs as reported by CSWEP, and the fourth column corresponding to the authors on the NBER programs. The right four columns repeat the same exercise, but for full professors. All data is for 2016, and for the NBER data in both panels, we only include authors from universities to match the CSWEP Data.

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Felix Bransch

Otto-von-Guericke University Magdeburg

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ABSTRACT

Male Gatekeepers Gender Bias in the Publishing Process?*

Using data on articles published in the top-five economic journals in the period 1991 to 2010, we explore whether the gender composition of editorial boards is related to the publishing success of female authors and to the quality of articles that get published. Our results show that female editors reduce, rather than increase, the share of articles that are (co-)authored by females. We also find evidence that female editors benefit article quality at low levels of representation on editorial boards, but harm article quality at higher levels. Several robustness checks corroborate these findings. Our results are broadly consistent with existing evidence on the behavior of gender-mixed hiring committees and of relevance for gender equality policy.

JEL Classification: A14, J16, J71

Keywords: gender bias, citations, journals, editors

Corresponding author:

Felix Bransch
Otto-von-Guericke University Magdeburg
Universitätsplatz 2
39106 Magdeburg
Germany
E-mail: felix.bransch@ovgu.de

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1 Introduction

In many areas in the economy, women are still severely under-represented. The economics profession is no exception, notwithstanding some significant changes over the last two decades. According to the annual report of the *Committee on the Status of Women in the Economics Profession (CSWEP)*¹, the share of female full-time economics professors has doubled between 1993 and 2015, increasing from a low 6.7% to 12.2% (Bartlett, 1999; McElroy, 2016) – which is still a very small figure, by any standard. Moreover, with only one in eight full-time economic professors being female, but a nearly threefold share (34.7%) of females among new PhD students in 2015, far fewer female than male economists are destined to enter the upper echelons of the academic hierarchy (McElroy, 2016). The reasons for this differential performance in careers are still disputed, despite extensive past research on the root causes of gender bias in employment and promotions both within and outside academia.

In this study, we explore a potential channel which to date has received surprisingly little, if indeed any, attention in the economics literature, the male domination of editorial boards and its consequences for the publishing success of female economists. Editors are important nodes, or gatekeepers, in the publishing process who ultimately decide which articles get slots in journals.² Such slots are limited and highly competitive, particularly in top economics journals.³ Top publications are regarded a prime indicator for the productivity and potential of economists, and as such of great importance for tenure decisions, pay levels, and the ability of researchers to obtain third-party funding (Hamermesh, 2017).⁴ Gender bias in the editorial process, if indeed present, may also entail significant efficiency losses if such bias adversely affects article quality. Knowledge of the role that

¹The *CSWEP* is a standing committee of the *American Economic Association* since 1971. One of its tasks is to regularly monitor and report on the progress of professional women economists. Since its founding, *CSWEP* has surveyed some 250 departments annually.

²Editors can also take more indirect influence, e.g. by selectively assigning submissions to reviewers who favor certain subjects or do a better job at reviewing (which improves manuscript quality), or by influencing the decisions of other editors in board meetings or informal talks (Addis and Villa, 2003).

³Acceptance rates in the top five economic journals have fallen from 15 percent to approximately 6 percent over the last two decades (Card and DellaVigna, 2013).

⁴The overarching importance of publications for academic promotions find vivid expression in the popular proverb “publish or perish”, a term first used in the academic context in 1927 (Doyle et al., 2012).

male-dominated editorial boards play in the publishing process is hence of great interest for equity (gender equality) *and* efficiency reasons. We explore both dimensions by analysing articles published in the period 1991 to 2010 in the top-five economics journals, that is, the *American Economic Review (AER)*, *Econometrica (ECO)*, the *Journal of Political Economy (JPE)*, the *Quarterly Journal of Economics (QJE)*, and the *Review of Economic Studies (RES)*. Exploiting for identification variation across journals and time in the share of female editors, we produce first empirical evidence on two related questions: first, whether the share of females in an editorial board has an impact on the share of articles (co-)authored by females that are published in a journal; and second, whether the extent of female representation on editorial boards affects article quality, as measured by the citations that published journal articles receive.

Our results show that female editorship affects both the frequency of female authorship and the quality of published articles. Specifically, we find the appointment of female editors to reduce the share of articles that are (co-)authored by females. We also find evidence that female editors benefit article quality at low levels of representation on editorial boards, but tend to harm article quality at higher levels. These findings suggest that the publishing process in economics is not governed by simple sex discrimination against women that could be easily rectified by (and hence would justify undifferentiated calls for) greater female representation on editorial boards. Given our data, we cannot test explicitly for the causal pathways underlying these relationships. However, our results are broadly consistent with theories, and findings in related areas, that stress the importance of gender composition of hiring committees for committee behavior.

Our study complements and contributes to the existing literature in several ways. First and foremost, this is the first study, to the best of our knowledge, to inquire into how the gender composition of editorial boards is related to the publishing success of female researchers and to the quality of articles that get published. Very few studies, in fact, have to date investigated the behavior of journal editors, despite their pivotal role in the publishing process and the importance of publications for academic careers (Laband and Piette, 1994; Medoff, 2003; Brogaard et al., 2014; Colussi, 2017). These studies, however, focus on professional ties, not gender differences, between editors and authors and whether

such professional ties harm article quality because of favoritism. Second, we also add to the still small, but closely related, strand of literature which explores how the gender composition of evaluation committees in academia impacts the chances of female candidates to get hired or promoted (Bagues and Esteve-Volart, 2010; Bagues et al., 2017). Bagues and Esteve-Volart (2010) find relatively more female evaluators in recruiting committees for positions in the four main Corps of the Spanish Judiciary to reduce the chance of female candidates to be hired. Bagues et al. (2017), in turn, find that a larger presence of female evaluators in hiring committees for associate and full professorship positions in all academic disciplines in Italy and Spain does not increase either the quantity or the quality of female candidates who qualify. If anything, there is some indication that gender-mixed committees on some occasions tend to be less favorable towards female candidates than all-male committees and that men become less favorable towards female candidates as soon as a woman joins the committee. Finally, our study relates to a large and diverse literature which is concerned with various root causes for the female under-representation in the economics profession. Conceptually, this literature falls into two types, demand-side and supply-side explanations. Demand-side explanations center around the potential discrimination of women by employers, i.e. universities and research institutions (Kahn, 1993; Paola and Scoppa, 2015; Addis and Villa, 2003; Ginther and Kahn, 2004). Studies in this branch of literature suggest that women may suffer from statistical discrimination when productivity is unobservable or from decision-makers' aversion to interact with women. Supply-side explanations, in turn, emphasize potential male-female productivity gaps, as women often lack professional networks and female mentors (Blau et al., 2010; McDowell et al., 2006). There is also some evidence from this literature that women are less inclined to apply for promotions (Paola et al., 2015), that they shy away more from competition (Niederle and Vesterlund, 2010), and that they devote relatively more time to socially desirable tasks which do not get rewarded through promotions (Misra et al., 2012).

The paper proceeds as follows. Section 2 describes the data and identification strategy we use in our empirical analysis. Section 3 presents and discusses our regression results, including various robustness tests and heterogeneity checks. Finally, Section 4 summarizes our main findings, highlights areas that warrant further study, and concludes.

2 Data and Empirical Strategy

2.1 Data

For the empirical analysis, we compiled a new data set that contains information on all regular articles published in the period 1991 to 2010 in the top-five economics journals (*AER*, *ECO*, *JPE*, *QJE*, and *RES*).⁵ Our observation period starts in 1991 because of a major change in the *Journal of Economic Literature* (*JEL*) classification system in 1990 (see below for details) and ends in 2010 so that each article has a minimum vintage since publication of at least six years before we measure their quality on 30 December 2016 through the cumulative citations they have received until this date. Overall, our data set contains information on 4,431 articles.

For each article in our data set, we collected and merged information from three sources: the article itself, editorial information provided in individual issues, and *Web of Science* (*WoS*) citation statistics. From the articles themselves, which are our unit of analysis, we recorded the journal in which they appeared, their year of publication, their issue number, their first and last page number, and the names and institutional affiliations (at the time of publication) of each of their authors. We then merged to each article editorial information (names of editorial board members) for the years 1988 to 2010 which we obtained from the *Front Matter* of individual issues in the respective journal a particular article was published. Finally, we added *WoS* cumulative citation counts to our data (our measure of article quality), which we extracted in December 2016. From this raw data, we constructed our two dependent variables (female authorship and article citations), our key explanatory variable (female editorship), as well as various control variables which capture features of articles of potential relevance for their scholarly impact. In the following, we discuss each of these in turn.

Female Authorship: The gender of authors is not reported in articles (and neither is the gender of editors in the front matters). We assigned gender to authors (and editors)

⁵We exclude articles that are comments, replies, or notes. We also exclude articles which were published in special issues and in the *Papers and Proceedings* issues of the *AER*.

using a three-step procedure. First, we checked (by hand) whether the first name provided a clear indication of a person’s gender. If it did not, we checked for auxiliary information (such as photos) on the person’s website that could help determine the gender. Finally, for cases still unresolved, we took recourse to two lists of first names (one for women and one for men) created after the 1990 U.S. Census by the *Post-enumeration Survey (PES)*.⁶ Both lists contain first names and their respective likelihoods to appear in the *PES*. If a first name appears both in the female and in the male list, we assigned that gender to a person for which the first name has a higher likelihood of appearance.⁷ Using this gender information, we then constructed our measures of female authorship (and female editorship). In line with the literature (Laband and Piette, 1994; Medoff, 2003; Brogaard et al., 2014), we define female authorship of an article in our baseline specification by way of a dichotomous variable which takes value one if an article has at least one female author, and zero otherwise.⁸

Female Editorship: Finding an appropriate measure for the degree of female representation on an editorial board of a journal at the time that it decides on the acceptance or rejection of a particular article submitted for publication is more demanding than defining female authorship. This is for two reasons. First, the top-five economics journals publish different types of editors in the *Front Matter* of their issues which may not be involved to the same degree in the actual editorial decision process. Second, as lags between the submission and actual publication of articles vary across articles, journals, and time (El-lison, 2002), and are often very sizable in length, editors named in the *Front Matter* of a particular issue need not be the editors that have actually decided to accept the articles published in that issue. Concerning the first issue, there is little consensus in the literature that could provide guidance (Laband and Piette, 1994; Medoff, 2003; Brogaard et al., 2014;

⁶The *PES* is an independent survey conducted after a census that is used to evaluate the quality of the census.

⁷For about 45 percent of the articles, the gender of all authors could be determined using the first method. For about 97 percent of the articles, the gender of all authors could be determined using the first two methods, and for about 98 percent of the articles, the gender of all authors could be determined using all three methods. For less than two percent of articles, the gender of all authors could not be determined. We exclude these articles from our estimation sample. The gender of all editors could be obtained with the first and second method.

⁸In our robustness analysis, we will use also alternative thresholds to define female authorship of an article.

Colussi, 2017).⁹ We therefore asked the editorial office of each journal, which editors at the journal actually directly handle, and ultimately decide on, submitted manuscripts. Based on the feedback we received from these inquiries, we consider for the *QJE* the board of editors (3-4 persons, depending on the issue), for *ECO* the editor and coeditors (1 editor and 3-6 coeditors, depending on the issue), for the *RES* the managing editors (2-5 persons, depending on the issue), for the *AER* the editor and coeditors (1 editor and 3-6 coeditors, depending on the issue), and for the *JPE* only the editors (4-7 persons, again depending on the issue) which are named also on the *Front Matter* of its issues. Henceforth, we will refer to these decision-makers as 'editors', irrespective of their formal status and denomination at a particular journal outlet.¹⁰ Concerning the second issue, previous studies either ignore submission-to-publication lags (Laband and Piette, 1994; Medoff, 2003; Colussi, 2017), or consider the editorial board in charge one, two, or three years before the publication of an article (Brogaard et al., 2014). In our study, we follow the latter approach. Specifically, we consider in our baseline specification the average share of female editors of a journal over the three years before an article was published (henceforth referred to as 'editor share'), but also make use of alternative measures in our robustness checks.¹¹

Article Citations: As a proxy for the quality of articles, we obtained cumulative *Web of Science (WoS)* citation counts for each article in our data set from the *WoS* website.¹² We used the advanced search option on the *WoS* website for a listing of all published articles by journal and year and their citations reported in the different *WoS* databases. Our citation count is based on the total number of citations reported in these databases.

⁹Laband and Piette (1994) consider all editors, coeditors, and associate editors. Medoff (2003) and Colussi (2017) consider only the editor and coeditors, and Brogaard et al. (2014) only editors.

¹⁰Female editors in our sample have a lower *h-index* and have published less articles in the top-five economics journals in the five years prior to their appointment than their male editorial colleagues at the time of their appointment. All female editors, as well as nearly all male editors, are affiliated to top-ranked US universities.

¹¹Knowing the editors for each issue, we first calculated for each issue the share of female editors named in the respective *Front Matter*. We then calculated the mean annual share for a particular year by adding the female editor shares of all issues and dividing this sum by the total number of issues in the respective year. Note that this share is affected not only by appointments and retirements of editors, but also by changes in the absolute number of editors and the time that a new appointment or retirement occurs within a particular year (i.e. from which issue in a year an editorial change takes effect).

¹²Access to the *WoS* website at <https://apps.webofknowledge.com> is restricted to registered individual or institutional users and requires login.

We collected this citation data on a single day, 30 December 2016. Articles in our data therefore have a vintage of at least six years before taking stock of the scholarly impact.

JEL Codes: Some fields are more heavily researched than others, and some fields may be researched more by female economists than male economists. This is of importance, as articles from more heavily researched fields are likely to get cited more often. To control for such potential level differences in citations by research area, we generate a set of indicator variables that classify articles into major fields – the twenty 1-digit *Journal of Economic Literature* (*JEL*) codes – using the *JEL* information provided for each article on the *EconLit* webpage (Medoff, 2003). Most articles state more than one field and hence have more than one *JEL* code. The last major change in the *JEL* classification system occurred in 1990 (Cherrier, 2017). It is for this reason that we restrict our analysis to articles which have been published after 1990.

No. of Authors, Length of Article, and Year of Publication: The ability of an article to generate citations (our measure of article quality) may also vary with the number of authors to an article, its length, and its year of publication. More authors are likely to enjoy efficiency gains from specialization and a division of labor (Boschini and Sjörgen, 2007), and higher quality research may require more pages (Medoff, 2003). Time of publication is likely to correlate systematically with citations. As we record citations for all articles at the same point in time (30 December 2016), articles published earlier are of older vintage when we measure their scholarly impact. To account for these potentially confounding influences in our regression analysis, we generated two sets of indicators, one for the year of publication of an article, and one for the number of authors to an article. We also generated a measure of the standardized page length of an article. For this, we first calculated the unadjusted page length of an article as the difference between the page number of the last and first page of an article, plus one. As the formats of published articles and hence their page densities (in terms of letters to a page) differ between journals, we then normalized the page length of an article to a page length compliant to *AER* page limits, using the procedure in Card and DellaVigna (2013).

2.2 Summary Statistics

Table 1 presents summary statistics for all regular articles published in the top-five economics journals in 1991-2010. Columns 1-5 consider each of the five journals separately, column 6 the total sum of all articles published in these journals. The *AER* accounts for most articles in our sample (25.4%), the shares of the other journals vary between 18.1% and 19.2%.¹³ Overall, our data set contains information on 4,431 articles.

Table 1 provides several insights. First, as shown in the first row of Panel A, females account for only 4.1% of editors among the top-five economics journals in the observation period. This very low average is caused to a large part by two factors. First, two journals, the *QJE* and the *RES*, have no female editor in any year of our observation period. Second, no top-five journal has a non-zero female editor share before 1997. These important heterogeneities across journals and time are illustrated also in Figure 1, which plots for the period 1991 to 2010 for each journal and year our baseline measure of the female editor share, i.e. the average share of female editors for the 3 years prior to a particular calendar year. Figure 1 reveals that the three top-five journals with a non-zero female editor share (*AER*, *ECO*, *JPE*) display sizable year-to-year changes in the gender composition of their editorial boards. The female editor share hence exhibits great variability both across journals and time, a variability we will exploit for identification in our empirical analysis.

Second, articles with at least one female author account for only 16.3% of all articles in our data (see second row of Panel A in Table 1). Female-authored articles are most common in the *QJE* (21.0%), and least frequent in *ECO* (10.5%). The shares in the other journals fall in a narrow range between 15.9% and 17.6%. Further insights are provided by Figure 2, which plots for each journal the share of articles per annum that have some female author. First, the share of female-authored articles has risen steadily for all journals over the twenty years we consider in our data; and second, the share of female-authored articles in a journal, and differences in that share between journals, displays great variability across time.

¹³The *AER* publishes by far the most articles per year (an average of 56.3 per year in our observation period), and *RES* the least (40.1). *QJE*, *JPE*, and *ECO* publish respectively 41.4, 41.4, and 42.5 articles per year.

Table 1: SUMMARY STATISTICS

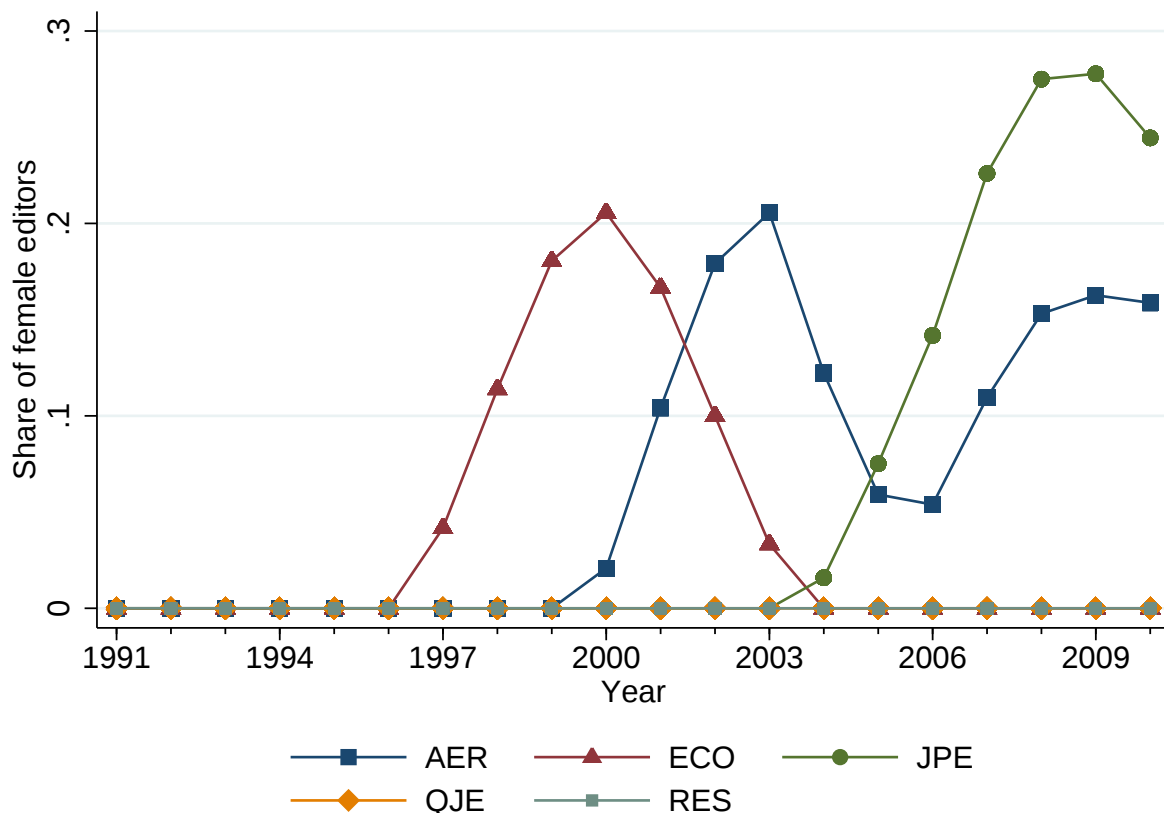
	<i>AER</i>	<i>ECO</i>	<i>JPE</i>	<i>QJE</i>	<i>RES</i>	All
<i>A. Gender composition (share female):</i>						
Editorship	.082	.042	.083	.000	.000	.041
Authorship	.176	.105	.159	.210	.160	.163
<i>B. Article citations:</i>						
<i>WoS</i> (mean)	126.8	123.3	123.5	184.0	71.8	126.2
<i>WoS</i> (median)	71.0	59.0	62.0	109.0	33.0	63.0
<i>C. Article features (mean):</i>						
No. of standardized pages	38.6	40.7	36.3	37.3	39.7	38.5
No. of authors	1.9	1.8	1.9	2.0	1.8	1.9
No. of <i>JEL</i> codes	1.9	1.4	1.8	1.8	1.6	1.7
Vintage (years)	15.1	15.8	16.2	15.6	15.0	15.5
<i>Share of articles:</i>	.254	.192	.187	.187	.181	1
<i>No. of articles:</i>	1,125	849	828	827	802	4,431

Notes: The table reports summary statistics for all regular articles published in the top-five economics journals in the years 1991-2010. All entries are means, except for *WoS* (median) article citations reported in Panel B. Panel A reports the share of female editors and the share of articles with at least one female author. Panel B reports mean and median cumulative *Web of Science* (*WoS*) article citations as of December 2016. Panel C reports mean article length based on standardized pages, which were calculated using a routine suggested by Card and DellaVigna (2013), the mean number of authors of articles, the mean number of 1-digit *JEL* codes recorded for articles on *EconLit*, as well as the mean vintage (in years) of articles published in our observation period (1991-2010) at the time we measure their scholarly impact by *WoS* citations in December 2016.

Third, mean citations vary greatly across the top-five economics journal (see Panel B in Table 1). They are highest for the *QJE* (184.0 citations), and lowest for *RES* (71.8 citations), with shares for the remainder of journals all clustered closely around 125 citations per article. The clear top position for the *QJE* in our data, but not the bottom one for *RES*, is consistent with recent *Journal Citation Reports* by *Thomson Reuters*, the most widely referenced journal ranking in use.¹⁴ Furthermore, median *WoS* citations are much

¹⁴However, the top rank for the *QJE*, and the bottom rank for the *RES* we find, is consistent with the journal rankings emerging from previous research that covers observation periods similar to the one

Figure 1: Share of female editors per annum in the top-five economics journals, 1991-2010

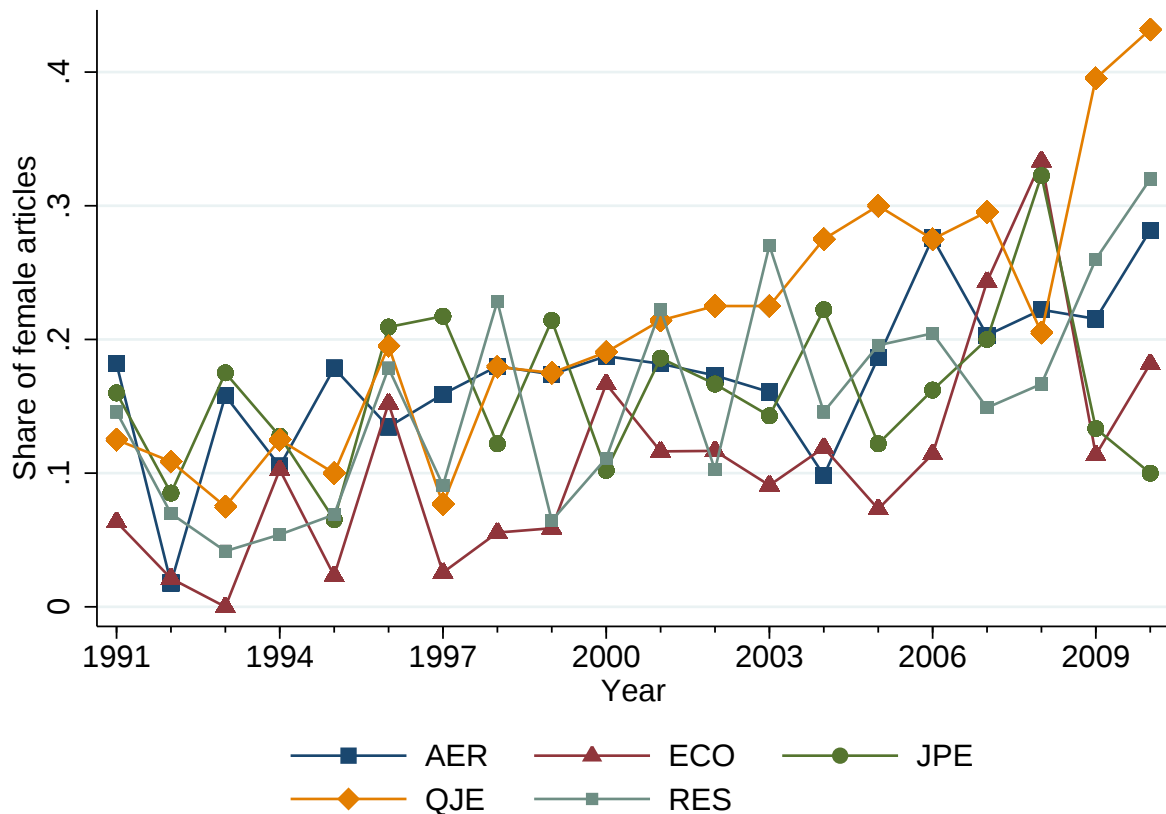


Notes: The figure plots the female editor shares for the period 1991 to 2010 in the *American Economic Review* (AER), *Econometrica* (ECO), the *Journal of Political Economy* (JPE), the *Quarterly Journal of Economics* (QJE), and the *Review of Economic Studies* (RES). The female editor shares are averages of the shares of female editors over the last 3 years prior to a particular calendar year.

smaller than mean *WoS* citations for all five journals, which indicates that the citation distribution is heavily right-skewed. Our *WoS* citation counts also host some sizable outliers. 5.4% (15.1%) of articles have received less than 10 (20) citations as of 2016; at the same time, the most cited paper (5,075 citations) received 40.2 times as many citations as the average article in our data (not shown in table). In the empirical analysis, we will take into account both such (potentially influential) outliers and the skewness of the citation distribution.

Fourth, concerning article features of potential relevance for the scholarly impact of a considered in this study (Card and DellaVigna, 2013; Hamermesh, 2017).

Figure 2: Share of female-(co-)authored articles per annum in the top-five economics journals, 1991-2010



Notes: The figure plots for each of the top 5 economic journals (AER, ECO, JPE, QJE, and RES) in the period 1991 to 2010 the annual share of articles that are (co-)authored by a female researcher.

study, several insights are provided by Panel C in Table 1. For one thing, mean article length (measured in standardized pages) varies little across journals. Articles in *ECO* are the longest (40.7 pages), and articles in the *JPE* the shortest (36.3 pages). Average article length in our data is 38.5 pages. Over time, average page length has increased substantially in all five journals – in our data, by about a third from 1991-2000 to 2001-2010 (not shown in Table 1).¹⁵ For another, articles with multiple authorship clearly dominate, in particular joint work by two co-authors. Articles with two authors account for nearly half (47.2%) of all articles in our data, while single-authored articles account for only a third (34.4%)

¹⁵This trend development is well documented in the literature (Card and DellaVigna, 2013; Ellison, 2002).

(not shown in Table 1).¹⁶ The average number of authors to an article in our data is 1.9. Concerning thematic breadth, the average number of *JEL* codes used to classify an article is 1.7 and varies from 1.4 for *ECO* to 1.9 for the *AER*. The three *JEL* codes used most often in the classification of an article are *(D) Microeconomics* (41.0%), *(J) Labor and Demographic Economics* (18.0%), and *(C) Mathematical and Quantitative Methods* (17.7%).¹⁷ Although all journals cover also the remaining *JEL* codes (with one common exception), frequency distributions of *JEL* classifications are not the same across the five journals.¹⁸ In *ECO*, *JEL* code *(C) Mathematical and Quantitative Methods* is highly overrepresented, and *JEL* code *(J) Labor and Demographic Economics* underrepresented; and in the *QJE* and *JPE*, *(J) Labor and Demographic Economics* is overrepresented. Finally, considering the vintage of articles on 31 December 2016 (the day we record their cumulative citation counts), average article age in our data set is 15.5 years. Among the five journals, mean article age is highest in the *JPE* (16.2 years), and lowest in *RES* (15.0 years). The top position for the *JPE* is the result of a sizable reduction in the number of articles published in this journal outlet over time, falling from 50 in 1991 to just 30 in 2010. Similarly, the low average vintage of articles in *RES*, is caused in large part by an upward trend in the total number of articles it publishes. Following a decline in article output per annum to less than 30 per year in the years 1995 to 1997, output rose steadily thereafter to 50 articles in 2010. The youngest articles in our sample are 6 years when taking stock of their quality. At this minimum vintage, cumulative citations received should provide a good proxy for the long-run scholarly impact of an article (Hamermesh, 2017).

¹⁶Multiple authorship has expanded strongly over time. Of all articles published in 1991 to 2000, 59.4% had multiple authors; in the decade that followed (2001 to 2010), this figure had risen to 71.7% (not shown in Table 1). Like the development in average article length, this trend decline of single-authored papers has been noted and documented in the literature (Card and DellaVigna, 2013).

¹⁷The *JEL* code descriptors can be found on the website of the *American Economic Association*, at <https://www.aeaweb.org/econlit/jelCodes.php>.

¹⁸*JEL* code *(Y) Miscellaneous Categories* is not used in any journal to classify articles, and no article in the *RES* is assigned *JEL* code *(A) General Economics and Teaching*.

2.3 Empirical Strategy

To explore whether the gender composition of editorial boards is related to the publishing success of female authors, we estimate variants of the following linear probability model:

$$femart_{ijt} = \alpha_0 + \alpha_1 femedshare_{jt} + \delta_j + \gamma_t + \varepsilon_{ijt}, \quad (1)$$

where $femart_{ijt}$ is a dichotomous variable taking value one if article i published in journal j in year t has at least one female author, and zero otherwise. The explanatory variable of key interest is $femedshare_{jt}$. It measures the female editor share for journal j and year t in which article i was published. We also control for journal fixed effects (δ_j) to account for potential time-invariant systematic differences between journals in the likelihood to publish an article that is (co-)authored by a female (base journal is *AER*), and time fixed effects (γ_t) to account for common trend changes across journals in the publishing success of female economists (base year is 1991). ε_{ijt} is an error term. Throughout, we will cluster standard errors at the journal-year level.

The coefficient of primary interest is α_1 . It captures the ceteris paribus marginal effect of a change in the female editor share on the probability that a published article has at least one female author. Prior research provides little guidance on the sign to expect of α_1 . Studies exploring the importance of gender for evaluators' decisions on and preferences for candidates produced mixed findings. Some studies found evaluators to prefer same gender candidates (Wenneras and Wold, 1997; Casadevall and Handelsman, 2014; Paola and Scoppa, 2015), which suggests $\alpha_1 > 0$, i.e. more articles with female (co-) authors should be published when female representation on editorial boards rises. Other studies found exactly the opposite, i.e. a preference of editors for candidates of the opposite rather than the same gender (Donald and Hamermesh, 2006; Broder, 1993; Ellemers et al., 2004), which favors $\alpha_1 < 0$. There is also some empirical evidence which suggests that the gender of candidates is irrelevant for the preferences and decisions of evaluators (Blank, 1991; Marsh et al., 2009; Abrevaya and Hamermesh, 2012; Bagues et al., 2017), implying $\alpha_1 = 0$.

To explore whether the gender composition of editorial boards is related to the quality of articles that get published, we estimate variants of the following linear regression model:

$$\log citations_{ijt} = \beta_0 + \beta_1 femedshare_{jt} + \mathbf{x}_{ijt}'\phi + \delta_j^* + \gamma_t^* + v_{ijt}, \quad (2)$$

where $\log citations_{ijt}$ is the log total citation count (plus one) as of December 2016 of article i published in journal j in year t . We use the logarithm of citations because the citation distribution is heavily skewed and exhibits some sizable outliers (see discussion in Section 2.2). The explanatory variable of key interest is again $femedshare_{jt}$, i.e. the female editor share of journal j in the year t that article i was published. Journal (δ_j^*) and time (γ_t^*) fixed effects control for permanent quality differences between journals, respectively common trends across journal outlets in average article quality over time and the fact that articles published earlier are of older vintage when recording their total citation count. Vector $\mathbf{x}_{ijt}$ contains further controls for article features of potential relevance for the scholarly impact of a study. These include a measure of article length, measured in standardized pages, a set of indicators for the number of authors to an article (base group is single author), which ranges from 1 to 5 in our data, and a set of indicators for the 1-digit JEL codes assigned to an article (base group is category A). The error term of the model is v_{ijt} . Again, we will cluster standard errors at the journal-year level.

The coefficient of interest is β_1 . It captures how a marginal change in the female editor share affects the citation count of published articles, i.e. their quality. If $\beta_1 > 0$, higher quality articles tend to get published when females are more strongly represented on editorial boards. If $\beta_1 < 0$, greater female representation on editorial boards tends to harm article quality, and if $\beta_1 = 0$, the gender composition of editorial boards is of no consequence for the scholarly impact of published articles.

3 Results

This section reports and discusses our findings. Section 3.1 presents our results on female editorship and the frequency of female authorship, Section 3.2 our results on female editorship and article quality. In each section, we test for the robustness of our results. In Section 3.2, we also consider potential effect heterogeneity in the relationship between female editorship and article quality. We conclude each section with a discussion of our findings and the potential causal pathways that may explain them.

3.1 Female Editors and Female Authorship

Table 2 contains our main regression output on the relationship between the share of female editors and the extent of female authorship (cf. model equation (1)). We report results for three different estimation samples. The first sample is the largest and covers all journals in all years of our observation period (see column (1) of Table 2). The second sample excludes articles from the *QJE* and *RES*, as these two journals at no point in the observation period ever have a positively-valued female editor share. The third sample excludes on top of the *QJE* and *RES* also all articles published in 1991 to 1996, as no journal has a positive female editor share in these first six years of our observation period (see discussion in Section 2.2 and Figure 1). The use of these different estimation samples provides a test of robustness or sensitivity of our findings to the exclusion of journal outlets and calendar years with zero variation in, and zero level of, the female editor share across time (in the case of journal outlets), respectively journals (in the case of calendar years). Both in this section, and in Section 3.2 that follows, we will make use of these three estimation samples.

Our baseline regression for the unrestricted sample produces a negative coefficient estimate for our measure of female editorship which is statistically significant at the 5% level (see column (1) of Table 2). According to this point estimate, an increase in the share of female editors by ten percentage points reduces the likelihood of an article to have a (at least one) female author by 2.58 percentage points. This is a quite sizable effect, given that only 16.3% of articles published in the top-five economics journals in 1991 to 2010 are

Table 2: FEMALE EDITORS AND FEMALE AUTHORSHIP

	Dep. variable: female authorship (0/1)		
	(1)	(2)	(3)
Editor share	−0.258** (0.122)	−0.202** (0.099)	−0.203** (0.097)
QJE	0.021 (0.016)		
JPE	−0.011 (0.016)	−0.012 (0.014)	−0.022 (0.017)
ECO	−0.074*** (0.015)	−0.072*** (0.013)	−0.072*** (0.017)
RES	−0.036*** (0.016)		
Constant	0.144*** (0.030)	0.330*** (0.054)	0.333*** (0.055)
R^2	0.031	0.026	0.019
Observations	4,346	2,755	1,884

Notes: The table shows selected estimated coefficients from three different linear regressions. The first column considers all articles published in 1991-2010. The second column considers all articles published in 1991-2010, but excludes articles published in the QJE and in RES. The third column considers all articles published in 1997-2010 and excludes articles published in the QJE and in RES. The endogenous variable in all regressions is dichotomous taking value one if at least one author of an article is female, and zero otherwise. *Editor share* measures the average female editor share of a journal in the three years prior to the publication of an article. All specifications control for main effects of journal outlet (base category is AER) and year fixed effects (base year is 1991). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

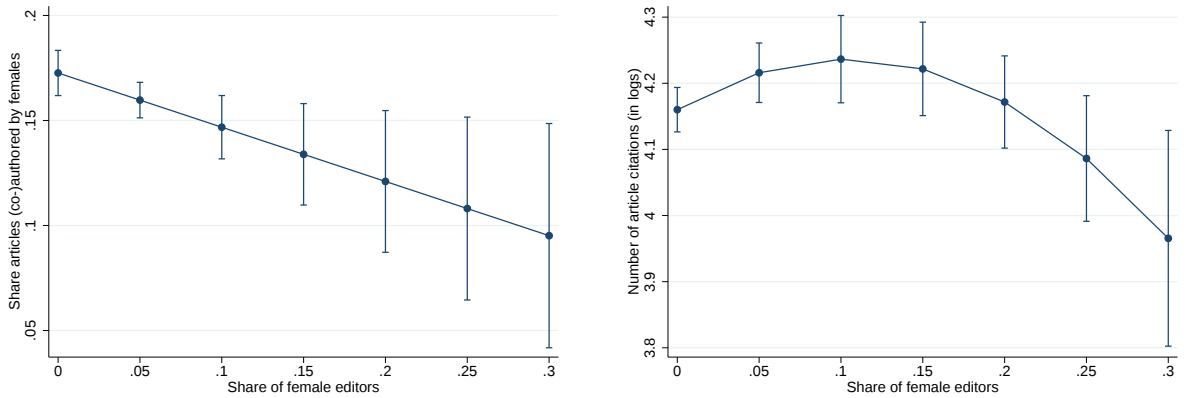
(co-)authored by females (see summary statistics in Table 1). Restricting the estimation sample to the *AER*, *JPE*, and *ECO*, as done in our second specification (see column (2) of Table 2), produces similar results, both qualitatively and quantitatively. The same holds true, when we omit in addition all articles published in the years 1991 through 1996 (see column (3) of Table 2). For both the unrestricted and the two restricted estimation samples, we hence find an increase in the female editor share to be associated with a decline in the share of articles that are (co-) authored by a female.¹⁹ Greater female representation on editorial boards, it appears, tends to harm rather than benefit female authors in the publishing process.²⁰ Based on estimates from the unrestricted sample, the left graph in

¹⁹We obtain similar results when we assign the articles that were dropped because of missing gender information to female authored articles or to male only articles.

²⁰Estimating probit instead of linear models produces similar results, both qualitatively and quantitatively. In the unrestricted sample, the estimated marginal effect is −0.26, and in the two restricted samples, it is respectively −0.23 (each of these estimates is significant at the 5% level). Full probit results are available from the authors upon request.

Figure 3 plots the predicted probability of an article to be (co-)authored by a female for different female editor shares, which range from 0% to 30% in our data. Over this range, the predicted share of articles (co-)authored by females declines almost by half, from 17.2% when no female is on the editorial board to 9.2% when women account for a third of editors.

Figure 3: Predicted share of articles (co-)authored by females and predicted log number of article citations for different female editor shares



Notes: The left graph plots the predicted share of articles (co-)authored by females for different female editor shares based on our baseline estimates for the unrestricted estimation sample reported in column (1) of Table 2 which covers all articles published in the top-five economics journals in the period 1991 to 2010. The right graph plots predicted log citations to an article for different female editor shares based on our estimates reported in column (1) of Table 6 which are also for the unrestricted estimation sample and cover all articles published in the top-five economics journals in the period 1991 to 2010. The point estimates are marked by a dot. The vertical bands indicate the 90% confidence interval of each estimate.

We conducted a series of further checks to assess the robustness of our finding (see Table 3). First, we added a quadratic term of the share of females on an editorial board to our set of regressors to allow for potential non-linearities in the relationship between the extent of female authorship among published articles and the degree of female representation on editorial boards of journals. Re-estimating our model in equation (1) for the three estimation samples considered in Table 2, however, does not produce evidence to suggest that our baseline linear model suffers from mis-specification in functional form. As shown in Panel A of Table 3, the estimated coefficient of the squared female editor share turns out statistically insignificant in all three regressions, while the estimated coefficient of the non-squared female editor share remains negative throughout and also statistically significant at the 10% level in two out of the three regressions (in the unrestricted and in the most restricted estimation sample).

Table 3: FEMALE EDITORS AND FEMALE AUTHORSHIP - ROBUSTNESS CHECKS I

	Dep. variable: female authorship ^a		
	(1)	(2)	(3)
<i>A. Linear-quadratic editor term:</i>			
Editor share	-0.526* (0.294)	-0.388 (0.282)	-0.545* (0.280)
Editor share sq.	1.287 (1.582)	0.880 (1.322)	1.608 (1.322)
<i>B. Female authorship ($\geq 50\%$):</i>			
Editor share	-0.153* (0.087)	-0.121 (0.073)	-0.126* (0.073)
Editor share ^b	-0.177* (0.097)	-0.135* (0.079)	-0.140* (0.079)
<i>C. Articles/authors per journal and year:</i>			
Editor share ^c	-0.260** (0.103)	-0.202* (0.101)	-0.199* (0.106)
Editor share ^d	-0.131** (0.057)	-0.100* (0.055)	-0.097* (0.055)
<i>D. Annual female editor share in $t - 2$:</i>			
Editor share	-0.216** (0.101)	-0.184** (0.081)	-0.184** (0.080)

Notes: The table shows estimated coefficients of the female editor share in different regressions using the unrestricted (in column (1)) and two restricted estimation samples (in columns (2) and (3)) from the previous regression table (see notes to Table 2 for details). Entries in each column of Panel A are from a different regression. In the other panels, estimates in each cell are from a different regression. ^a In Panels A and D, the dependent variable is dichotomous and takes value one if at least one author of an article is female, and zero otherwise; in Panel B, the dependent variable is dichotomous and takes value one if at least 50% of authors of an article are female, and zero otherwise; in Panel C, the dependent variable measures the share of all articles in a journal outlet per annum that are co-authored by females (first row estimates in Panel C), respectively the share of all authors who publish in a journal outlet per annum who are female (second row estimates in Panel C). ^b Second row estimates in Panel B are obtained from regressions that exclude articles which are co-authored by females but where females account for less than 50% of authors to an article. ^c First row estimates in Panel C are based on regressions in which the unit of analysis is the article output of a journal in a given year. ^d Second row estimates in Panel C are based on regressions in which the unit of analysis is the total number of authors who publish in a journal in a given year. Estimates in Panel D are from regressions that use the annual female editor share two years prior to the publication of an article. The number of observations in columns (1), (2), and (3) is respectively 4,346, 2,755, and 1,844 in Panel A, in the first row of Panel B and in Panel D, 4,163, 2,657, and 1,801 in the second row of Panel B, and 100, 60, and 42 in Panel C. All specifications control for main effects of journal outlet (base category is AER) and year fixed effects (base year is 1991). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

Second, we changed our dependent variable to a dichotomous measure of female authorship of an article that takes value one if at least 50% of authors of an article are female, and zero otherwise. This alternative dependent variable hence identifies only articles with significant or predominantly female authorship (rather than all articles with a positive female author share that may be but marginal on occasion). We estimated two sets of regressions, one for all articles in the respective three estimation samples (see first row estimates in Panel B of Table 3), and one for articles that are either all male in authorship or that have at least 50% females among their authors (see second row estimates in Panel B of Table 3).²¹ As is evident, estimated coefficients in all six specifications are again negatively signed and differ but little within and across our three basic estimation samples. Furthermore, five of the six estimates are statistically significant at the 10% level. Our basic finding of a negative relationship between the female editor share and female authorship hence proves robust also to changes in the way we measure such authorship and changes in the baseline type of article we consider in the analysis as a benchmark (all-male, respectively not all-male authored).²²

Third, we changed the unit of analysis from an individual article to the body of all articles published in a journal per annum (see first row estimates in Panel C of Table 3), respectively the total of authors who published in a journal in a particular year (see second row estimates in Panel C of Table 3). These changes necessitate also a change in our dependent variable. For the first exercise, we consider the yearly share of articles per journal that are co-authored by females;²³ and for the second, we consider the yearly share of female authors per journal.²⁴ By virtue of the first change, we exploit only journal-year variation in female authorship and in the female editor share. The second change, in turn,

²¹In the former case, a zero value of our dichotomous dependent variable hence identifies articles with a zero or low share ($< 50\%$) of females among the authors. In the latter, a zero value is assigned only to all-male articles and articles where women account for a minority of authors are dropped from the estimation sample.

²²We obtain similar results when we use the share of females among the authors of an article as dependent variable.

²³The yearly share of articles that are co-authored by females is obtained by dividing the number of female co-authored articles published in a journal in a given year by the total number of articles published in that journal and year.

²⁴The yearly share of female authors is obtained by dividing the number of female authors who published in a journal in a particular year by the total number of authors who published in that journal in the same year.

provides a way to check whether the gender composition of authors to an article may be affected by changes in the female editor share in a way such that less articles with at least one female author may be published (our baseline result) but at the same time the share of females among all authors who publish in a journal outlet per year does not show such a decline (or possibly even an increase). However, both type of analyses again produce an estimated negative coefficient of the female editor share that is significant at least at the 10% level. Consistent with our baseline findings, more female editors are associated with less articles that are co-authored by females, as well as fewer females among the authors who publish in a journal outlet per annum.

Fourth, we replaced the female editor share for the three years prior to the publication of an article with the annual female editor share two years prior to the publication of an article. The latter measure has been favored and used in some of the literature (see Brogaard et al. (2014)). However, estimated coefficients of the female editor share again remain negatively signed and statistically significant in all three estimation samples.²⁵

Finally, we used two alternative measures of female representation on an editorial board that better reflect the discrete nature of changes (or differences) in the gender composition of editorial boards that is caused by the appointment (or presence) of a female editor. So far, we have explored only the impact of a *continuous* change in the female editor share on the publishing success of female authors. Such change, however, need not be caused by the appointment of a female editor and does not differentiate between changes in the gender composition of boards at the extensive and intensive margin.²⁶ In a first set of regressions (see first row estimates in Table 4), we replaced the continuous female editor share with a dichotomous variable that takes value one if the female editor share is above 0%, and zero otherwise. This alternative measure hence considers only changes at the extensive margin. Furthermore, in a second set of regressions (see second row in Table 4),

²⁵The same holds true if we use the annual female editor share one and three years (instead of two years) prior to the publication of an article.

²⁶As noted in Section 2.1, a change in the editor share may be caused not only by appointments and retirements of editors, but also by changes in the absolute number of editors, the particular time that a new appointment or retirement occurs within a given year (i.e. from which issue in a year an editorial change takes effect), and by averaging over a moving three-year window prior to the publication of an article.

we used (as yet another alternative measure) a dichotomous variable that takes value one if a female editor was newly appointed to an editorial board in the three years prior to the publication of an article and excluded from the estimation sample all observations where the female editor share is above 0% but no female editor has been appointed in these three pre-publication years. The latter specification hence entails a comparison between articles published by boards that are either all male or have recently appointed a female editor. As is evident, however, estimated coefficients remain negatively signed in both specifications and are statistically significant at the 10% level in five out of the six regressions.

Table 4: FEMALE EDITORS AND FEMALE AUTHORSHIP - ROBUSTNESS CHECKS II

	Dep. variable: female authorship		
	(1)	(2)	(3)
Female Editor (0/1) ^a	−0.037** (0.016)	−0.025 (0.015)	−0.028* (0.015)
Female Editor (0/1) ^b	−0.035** (0.015)	−0.028* (0.014)	−0.034** (0.013)

Notes: The table shows estimated coefficients in different regressions of a dummy variable which indicates whether a women is present on an editorial board. The first column considers all articles published in 1991-2010 (unrestricted sample), the second column excludes from this sample all articles published in the QJE and in RES (restricted sample 1), and the third column furthermore excludes all articles published in 1991-1996 (restricted sample 2). The endogenous variable in all regressions is dichotomous, taking value one if at least one author of an article is female, and zero otherwise. Estimates in each cell are from a different regression. ^a First row estimates are from regressions that use a dichotomous explanatory variable which takes value one if the share of female editors is above 0%. ^b Second row estimates are from regressions that use a explanatory dichotomous variable which that takes value one if a female editor was appointed in the three years prior to the publication of an article. In this second set of regressions, observations are excluded from the estimation sample where the female editor share is above 0% but no female editor was appointed in the three years prior to the publication of an article. The number of observations in columns (1), (2), and (3) is respectively 4, 346, 2, 755, and 1, 844 in the first row and 4, 020, 2, 429, and 1, 558 in the second row. All specifications control for main effects of journal outlet (base category is AER) and year fixed effects (base year is 1991). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

Summarizing the above, our key finding of a negative relationship between the share of female editors and the extent of female authorship proves robust to a whole set of sensitivity checks. While our results provide no evidence on the specific causal pathways underlying this negative relationship, they are consistent with several explanations put forward in the literature. First, female editors may expect that there is an upper limit

to the number of female authors who get accepted in the male dominated publishing process. To protect their standing as top female economists, female editors may hence discriminate against submissions by female authors (Broder, 1993). Second, male editors may be more supportive of submissions by female authors in an all-male editorial board than in a mixed-gender board, if female evaluators strengthen male identity (Akerlof and Kranton, 2000). Third, the behavior of female editors may be characterized by a "queen bee syndrome" which makes female editors prefer male over female authors. Female editors may discriminate against female authors because they have got used to the male dominated system, have adjusted to it, and do not want it to change (Ellemers et al., 2004). Fourth, the appointment of a top female economist as an editor may significantly reduce the time she has available for research and harm her scholarly output. If so, and if the pool of top female economists is small, the (submission and) publication share of females in top-five economics journals may suffer as a consequence (Vernos, 2013).²⁷ Finally, female authors may submit fewer articles to journals with female editors because they expect a higher likelihood of rejection by female editors. It is also possible that female authors submit lower quality articles to journals with female editors because they expect, but do not receive, a preferential treatment by female editors. Hence, more female articles are rejected and less female articles get published.

Given our data, we cannot adjudicate between these rival, yet potentially also complementary, explanations. In any case, however, our findings clearly suggest that the publishing process in economics is not governed by simple sex discrimination of men against women that could easily be rectified by (and hence would justify undifferentiated calls for) greater female representation on editorial boards. The various potential root causes we reviewed above also support this critical view and call for utmost caution in the choice of policy tools to promote greater gender equality.

In the next section, we explore whether the female editor share is of consequence also for the average quality of articles that get published in a journal, as measured by the

²⁷We re-estimated all specifications dropping articles co-authored by the female editors in our sample. The estimated coefficients of the female editor share, however, remain negative, significant, and virtually identical in magnitude to those of our baseline regressions. The same holds true when we only drop articles published by the female editors in the journals where they are editors at some point in time.

cumulative citations an article receives. We will also investigate, whether greater female representation on editorial boards has a different effect on the quality of articles that are co-authored by females, i.e. we will explore potential effect heterogeneity by gender of author.

3.2 Female Editors and Article Quality

Tables 5 and 6 contain our main regression output on the relationship between the share of female editors and the quality of published articles, as measured by the log of cumulative citations an article has received by December 2016. We estimate two versions of model equation (2), one that controls for the female editor share only in levels (see Table 5), and one that adds also its quadratic to the set of regressors (see Table 6). As in the last section, we again report results in each case for three different estimation samples, the unrestricted full sample, and the two samples with restricted journal coverage, respectively restricted journal and year coverage.

The main regression output for the first model version is shown in Table 5. As is evident, the female editor share does not exert a statistically significant influence on the citation count of an article in any of the three estimation samples.²⁸ Other regressors have estimated coefficients that are signed as expected and also statistically significant (see discussion in Section 2.1). Articles in the *QJE* tend to receive the most citations and articles in *RES* the least. The length of an article (measured in standardized pages) and the number of co-authors to an article both exert a positive effect on the cumulative number of citations an article receives. JEL fixed effects also help to explain variation in article performance (not shown).²⁹ Overall, the estimated models explain between one fifth and one fourth of the total variation in log citations in our data, a sizable fraction.

However, the models we estimated assume a linear relationship between the female editor share and log article citations, which might be too restrictive a functional form.³⁰

²⁸Running quantile regressions for the 10th, 25th, 50th, 75th, and 90th percentiles also produce coefficient estimates for the female editor share that lack statistical significance.

²⁹The F-statistic for the joint significance of the JEL fixed effects is 7.31.

³⁰Note also that estimated coefficients of our key regressor, although statistically insignificant, are all of

Table 5: FEMALE EDITORS AND ARTICLE CITATIONS

	Dep. variable: log(citations+1)		
	(1)	(2)	(3)
Editor share	0.002 (0.271)	0.397 (0.280)	0.349 (0.251)
QJE	0.242*** (0.054)		
JPE	-0.108** (0.049)	-0.105** (0.046)	-0.213*** (0.048)
ECO	-0.188*** (0.043)	-0.171*** (0.045)	-0.200*** (0.053)
RES	-0.673*** (0.047)		
Article length	0.024*** (0.002)	0.023*** (0.002)	0.021*** (0.002)
1 coauthors	0.158*** (0.035)	0.118** (0.045)	0.135** (0.053)
2 coauthors	0.297*** (0.052)	0.225*** (0.067)	0.214*** (0.079)
3 coauthors	0.583*** (0.095)	0.556*** (0.138)	0.479*** (0.158)
4 coauthors	0.837*** (0.206)	0.204 (0.163)	0.142 (0.188)
Constant	3.432*** (0.107)	2.667*** (0.144)	2.814*** (0.145)
R^2	0.238	0.186	0.203
Observations	4,431	2,802	1,915

Notes: The table shows selected estimated coefficients from three different regressions. The first column considers all articles published in 1991-2010 (unrestricted sample), the second column excludes from this sample all articles published in the QJE and in RES (restricted sample 1), and the third column furthermore excludes all articles published in 1991-1996 (restricted sample 2). The dependent variable in all regressions is the log of the total citations count of an article plus one as of December 2016. All specifications control for main effects of journal outlet (base category is AER), year fixed effects (base year is 1991), and 1-digit JEL code fixed effects (base category is A). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

We therefore re-estimated all specifications using a linear-quadratic instead of a linear term for our key explanatory variable, i.e. the female editor share. As shown in Table 6, allowing for potential non-linearities in the relationship between the female editor share and log citations proves crucial. In all three estimation samples, the estimated coefficient of the female editor share is now positive *and* significant. Moreover, the estimated coefficient of its squared term is throughout negative and significant. The respective absolute magnitudes

the same sign. This is at least indicative of a systematic relationship between the female editor share and average article quality.

Table 6: FEMALE EDITORS AND ARTICLE CITATIONS - ALTERNATIVE SPECIFICATION

	Dep. variable: log(citations+1)		
	(1)	(2)	(3)
Editor share	1.471* (0.763)	2.724*** (0.863)	1.734* (0.868)
Editor share sq.	-7.065** (3.178)	-11.07*** (3.425)	-6.546* (3.632)
R^2	0.238	0.188	0.204
Observations	4,431	2,802	1,915

Notes: The table shows estimated coefficients of the female editor share and its square in different regressions. The first column considers all articles published in 1991-2010 (unrestricted sample), the second column excludes from this sample all articles published in the QJE and in RES (restricted sample 1), and the third column furthermore excludes all articles published in 1991-1996 (restricted sample 2). The dependent variable in all regressions is the log of the total citations count of an article plus one as of December 2016. All specifications control for main effects of journal outlet (base category is AER), year fixed effects (base year is 1991), article length (number of standardized pages), number of coauthors (base category is single-authored article), and 1-digit JEL code fixed effects (base category is A). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

of these differently signed estimates imply that the sign of the total effect of the female editor share eventually changes from positive to negative when the size of the female editor share gets larger.³¹ This is illustrated graphically in the right graph of Figure 3 which plots predicted log citations to an article for different female editor shares based on our estimates reported in column (1) of Table 6 for the unrestricted estimation sample. Marginal increases in the female editor share begin to exert a negative effect on article quality when female representation on editorial boards exceeds 11.7%, and female editor shares above 22.2% even cause average article quality to fall below the level predicted for boards with zero female representation. In other words, female editors seem to benefit article quality at low levels of representation on editorial boards, but tend to harm article quality at higher levels.

We also checked the robustness of this finding in several ways. First, we used an alternative system of classifying articles into major thematic fields to control for potential level differences in citations by research area. Replacing our set of indicators for 1-digit

³¹Least-absolute deviation (LAD) regressions yield virtually identical results in terms of the sign, magnitude, and statistical significance of our key estimated coefficients. The estimated coefficient of the squared female editor share in specification (3), however, is only imprecisely estimated when using LAD.

Table 7: FEMALE EDITORS AND ARTICLE CITATIONS - ROBUSTNESS CHECKS I

	Dep. variable: $\log(\text{citations}+1)$		
	(1)	(2)	(3)
<i>A. Alternative JEL classification:</i>			
Editor share	1.485* (0.805)	2.731*** (0.920)	1.718* (0.916)
Editor share sq.	-6.726** (3.322)	-10.69*** (3.657)	-5.999 (3.784)
<i>B. Articles per journal and year:</i>			
Editor share	4.889*** (1.634)	5.649*** (1.671)	4.676*** (1.557)
Editor share sq.	-26.33*** (7.292)	-27.98*** (7.441)	-23.74*** (6.970)
<i>C. Annual female editor share in $t - 2$:</i>			
Editor share	1.310** (0.626)	1.998*** (0.638)	1.424** (0.630)
Editor share sq.	-5.916** (2.375)	-7.510*** (2.278)	-5.162** (2.325)

Notes: The table shows estimated coefficients of the female editor share and its square in different regressions. The first column considers all articles published in 1991-2010 (unrestricted sample), the second column excludes from this sample all articles published in the QJE and in RES (restricted sample 1), and the third column furthermore excludes all articles published in 1991-1996 (restricted sample 2). The dependent variable in all regressions, except those in Panel B, is the log of the total citations count of an article plus one as of December 2016. Entries in each column of a panel are from a different regression. In Panel B, the dependent variable measures the log of the total number of citations that the sum of articles published in a particular journal and year have received as of December 2016. The unit of analysis in Panel B is hence the entire article output of a journal in a given year. Estimates in Panel C are from regressions that use the annual female editor share two years prior to publication as independent variable. The number of observations in columns (1), (2), and (3) is respectively 4,431, 2,802, and 1,915 in Panels A and C, and 100, 60, and 42 in Panel B. All specifications control for main effects of journal outlet (base category is AER), year fixed effects (base year is 1991), article length (number of standardized pages), number of coauthors (base category is single-authored article), and 1-digit JEL code fixed effects (base category is A), except those in Panel A, which use instead indicators for fourteen thematic groups following the classification of Card and DellaVigna (2013). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

JEL codes, we make use of a classification suggested by Card and DellaVigna (2013) which groups articles into fourteen thematic groups. As shown in Panel A of Table 7, however, this change in classification proves immaterial. The relationship between log citations and

female editor share remains hump-shaped.³² In fact, estimated coefficients for the female editor share and its square differ little from those obtained in our baseline regressions reported in Table 6.

Second, we again changed the unit of analysis from an individual article to the body of all articles published in a journal per annum and regress the log of total citations received by articles published in a particular journal and year on the female editor share of that journal for the same year (see Panel B of Table 7). By virtue of this change in the unit of analysis, we exploit only journal-year variation in article citations and in the female editor share in the analysis. As is evident, however, this robustness check also produces estimated coefficients for the female editor share and its square that are positively, respectively negatively signed, and statistically significant in all three estimation samples.

Third, we again replaced the average female editor share over the last three years before an article was published with the annual female editor share two years prior to its publication (see Brogaard et al. (2014)). Estimated coefficients of the female editor share and its square remain positively, respectively negatively signed and statistically significant in all three estimation samples.³³

Fourth, we again used two alternative measures of female representation on an editorial board that better reflect the discrete nature of changes (or differences) in the gender composition of editorial boards that is caused by the appointment (or presence) of a female editor. First, to consider only changes at the extensive margin, we replaced the continuous female editor share with a dichotomous variable that takes value one if the female editor share is above 0%, and zero otherwise (see first row estimates in Table 8). Second, to compare articles published by boards that are either all male or have recently appointed a female editor, we used instead a dichotomous variable that takes value one if a female editor was newly appointed to an editorial board in the three years prior to the publication of an article and excluded from the estimation sample all observations where the female editor share is above 0% but no female editor has been appointed in these three pre-publication

³²The same holds true if we omit all controls for classifying articles into alternative fields.

³³We again obtain qualitatively identical (albeit at times imprecisely estimated) coefficients if we use the annual female editor share one and three years (instead of two years) prior to the publication of an article.

Table 8: FEMALE EDITORS AND ARTICLE CITATIONS - ROBUSTNESS CHECKS II

	Dep. variable: log(citations+1)		
	(1)	(2)	(3)
Female Editor (0/1) ^a	0.034 (0.046)	0.120** (0.051)	0.089* (0.047)
Female Editor (0/1) ^b	0.032 (0.046)	0.092* (0.050)	0.049 (0.041)

Notes: The table shows estimated coefficients in different regressions of a dummy variable which indicates whether a women is present on an editorial board. The first column considers all articles published in 1991-2010 (unrestricted sample), the second column excludes from this sample all articles published in the QJE and in RES (restricted sample 1), and the third column furthermore excludes all articles published in 1991-1996 (restricted sample 2). The dependent variable in all regressions is the log of the total citations count of an article plus one as of December 2016. Estimates in each cell are from a different regression. ^a First row estimates are from regressions that use a dichotomous explanatory variable which takes value one if the share of female editors is above 0%. ^b Second row estimates are from regressions that use a explanatory dichotomous variable which that takes value one if a female editor was appointed in the three years prior to the publication of an article. In this second set of regressions, observations are excluded from the estimation sample where the female editor share is above 0% but no female editor was appointed in the three years prior to the publication of an article. The number of observations in columns (1), (2), and (3) is respectively 4,431, 2,802, and 1,915 in the first row and 4,101, 2,472, and 1,585 in the second row. All specifications control for main effects of journal outlet (base category is AER), year fixed effects (base year is 1991), article length (number of standardized pages), number of coauthors (base category is single-authored article), and 1-digit JEL code fixed effects (base category is A). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

years (see second row estimates in Table 8). Reassuringly, estimated coefficients turn out positively signed (albeit at times imprecisely estimated) in both specifications and for all estimation samples (unrestricted and restricted).

Finally, we added two types of control variables to capture thematic congruence between editors and articles (not tabulated).³⁴ In a first set of regressions, we used a dichotomous variable that takes value one if the thematic field of an article is congruent with at least one of the two main research fields of any editor in charge in the last three years prior to the publication of the article, and zero otherwise.³⁵ In a second set of regressions, we added in addition to this binary variable also a dichotomous variable that takes value one if the thematic field of an article is congruent with the main research fields of a female editor

³⁴Tabulated regressions results are available from the authors upon request.

³⁵We defined the main research fields of an editor by the two most frequently assigned one-digit JEL codes of the articles the editor published in the years 1992 until 2017.

(if present) at the journal outlet over the same period, and zero otherwise. Estimating both specifications for the three estimation samples using our linear-quadratic term for the female editor share produces identical results to those of our baseline specification reported in Table 6. Moreover, the coefficients of the two binary indicators for thematic congruence of articles and editors lack statistical significance in both specifications and all estimation samples.

Before we discuss potential explanations for our findings on the relationship between the female editor share of a journal and the average quality of the articles it publishes, we explore whether this relationship is subject to effect heterogeneity by gender composition of an article’s authorship, i.e. whether greater female representation on editorial boards has a different effect on the quality of articles whose authorship is largely or exclusively female. For this purpose, we augment regression model (2) by adding to its set of regressors an indicator that takes value one if at least 50% of its authors are female, and zero otherwise, and the interactions of this indicator with the female editor share variable and its square. Estimated key coefficients of this modified model for our three estimation samples are reported in Table 9. Estimated coefficients of the female authorship dummy are throughout insignificant and also alternate in sign. Articles with a largely or exclusively female authorship hence do not differ systematically from other articles in the average number of citations they receive. Estimated coefficients of the female editor share and its square, in turn, are signed as before, suggesting a hump-shaped relationship between log citations and the female editor share of a journal outlet. The two interaction terms, however, both lack statistical significance in all three estimation samples. This suggests that the relationship between the female editor share of a journal and the average quality of its articles does not depend on the gender composition of an article’s authorship.³⁶

Given our data, we may again only speculate on the factors behind the robust hump-shaped relationship between the female editor share of a journal and log citations of its articles. We review two potential explanations which have received some support in the literature but were advanced for areas other than the scientific publishing process in eco-

³⁶We obtain similar results when we use an alternative system to classify articles into major thematic fields or replace the female editor share with the annual average share of female editors two years prior to publication.

Table 9: FEMALE EDITORS AND ARTICLE CITATIONS - EFFECT HETEROGENEITY

	Dep. variable: log(citations+1)		
	(1)	(2)	(3)
Female authorship ($\geq 50\%$)	-0.024 (0.054)	0.048 (0.072)	0.131 (0.096)
Editor share	1.406* (0.769)	2.676*** (0.849)	1.769* (0.884)
Editor share sq.	-6.738** (3.223)	-10.82*** (3.402)	-6.499* (3.741)
Female authorship ($\geq 50\%$) $\times$ Editor share	-0.515 (1.477)	-1.556 (1.652)	-2.914 (1.915)
Female authorship ($\geq 50\%$) $\times$ Editor share sq.	1.211 (5.938)	4.568 (6.331)	9.095 (6.881)
R^2	0.237	0.190	0.209
Observations	4,346	2,755	1,884

Notes: The table shows selected estimated coefficients from different regressions. The first column considers all articles published in 1991-2010 (unrestricted sample), the second column excludes from this sample all articles published in the QJE and in RES (restricted sample 1), and the third column furthermore excludes all articles published in 1991-1996 (restricted sample 2). The dependent variable in all regressions is the log of the total citations count of an article plus one as of December 2016. All specifications control for main effects of journal outlet (base category is AER), year fixed effects (base year is 1991), article length (number of standardized pages), number of coauthors (base category is single-authored article), and 1-digit JEL code fixed effects (base category is A). ***, **, * denote statistical significance at the 1%, 5%, and 10% level. Standard errors are throughout clustered at the journal-year level and reported in parentheses.

nomics. First, the hump-shape relationship may be explained by the existence of gendered networks, their break up and growth. Gendered networks, which have been used to explain, amongst others, gender differences in labor market outcomes (Saloner, 1985), may impede the merit-based selection process in the publishing process if they cause articles of lesser quality of network members (insiders) to be published and articles of higher quality of non-members (outsiders) to be rejected. In economics, men dominate editorial boards. At low levels of representation on editorial boards, female editors may break up existing networks of male editors, sort out particularly low quality papers of insiders and thereby help to realize efficiency gains. At higher levels of representation, however, female networks themselves may start to take root and bias the selection of articles for publication in the editorial decision process, harming article quality.

A second explanation for our finding of a hump-shaped relationship between the female editor share of a journal and log citations of its articles is that the appointment of women

to a group of male evaluators may improve the performance of this group (Wooley et al., 2010) by enabling them to better identify articles of the highest quality, but that such productivity effect is reversed and group performance even harmed when the share of female evaluators reaches a critical value.

4 Conclusion

Although female economists today are found more often in higher academic positions than some decades ago, they continue to be severely under-represented in the higher echelons of academic professions. In this study, we have explored a new potential root cause of this differential performance by gender, the male domination of editorial boards. Based on a self-compiled data set for the top-five economics journals containing information on the gender composition of their editorial boards and the gender mix of the authorship of articles published by these journals in the years 1991 to 2010, we have explored whether the female editor share is of consequence for the share of articles that are (co-)authored by females and the quality of articles that get published.

Our findings suggest that the gender composition of editorial boards does affect both dimensions. However, female editors appear to reduce, rather than increase, the share of articles that are (co-)authored by females. The under-representation of female editors in the top-five economics journals hence does not seem to be an obstacle for female economists in the academic publishing process. Several reasons may account for this finding. While we cannot test for these, given our data, we have reviewed potential candidate explanations that have been advanced in the literature, albeit for different areas. We also found that the female editor share is systematically related to the quality of articles that get published in a journal, as measured by their citation count. Specifically, we found a hump-shaped relationship between the female editor share and log citations, which suggests that female editors tend to benefit article quality at low levels of representation on editorial boards, but harm article quality at higher levels. Moreover, in additional explorations, we did not find any evidence that this relationship is subject to effect heterogeneity by gender composition of an article's authorship. We reviewed two potential explanations for this finding, but

given our data cannot test them to assess their respective importance.

Our first set of findings suggests that the publishing process in economics is not governed by simple sex discrimination of men against women that could easily be rectified by (and hence would justify undifferentiated calls for) greater female representation on editorial boards. The various potential root causes we reviewed for this finding also support this critical view and call for utmost caution in the choice of policy tools to promote greater gender equality. Future research is required to test these rival, yet potentially complementary explanations and identify the major causal pathways for our results on the publishing success of female authors and the quality of articles. Such research could also fruitfully broaden the scope of analysis by considering a larger set of journals and by expanding the observation period to include also the more distant past.

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THE CHALLENGE OF INCREASING MINORITY FACULTY REPRESENTATION IN U. S. BUSINESS SCHOOLS: AN EMPIRICAL EXAMINATION INTO WHAT MATTERS MOST (AND IT'S NOT WHAT YOU THINK).

Authors: E. HOLLY BUTTNER, KEVIN B. LOWE and LENORA BILLINGS-HARRIS

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Abstract

Theoretical explanations argue that minority business faculty under-representation is due to a lack of leader diversity sensitivity, discrimination, the (small) pipeline, unequal opportunity, rational person economic theory, and low strategic priority. Results indicated that leader racial awareness, perceived importance of cultural change, recruitment, and feedback efforts predicted minority faculty representation.

The Gender Gap in Economics Degrees: An Investigation of the Role Model and Quantitative Requirements Hypotheses

Authors: Tisha L. N. Emerson, KimMarie McGoldrick, John J. Siegfried

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Abstract

Using a panel of 159 institutions over 10 years, we investigate the role model effect of women faculty and quantitative requirements on the female proportion of undergraduate economics majors. We find no evidence that female faculty attract female students. Calculus, however, does matter. A one semester calculus requirement is associated with more female majors at institutions offering business degrees and liberal arts colleges. A second semester calculus requirement deters women from majoring in economics at Ph.D.-granting universities, but is associated with more female majors at liberal arts colleges. Econometrics requirements are unrelated to the gender gap in economics majors.

Women and Science, Technology, Engineering, and Mathematics (STEM): Are Differences in Education and Careers Due to Stereotypes, Interests, or Family?

Authors: Shulamit Kahn and Donna Ginther

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Abstract

Researchers from economics, sociology, psychology, and other disciplines have studied the persistent underrepresentation of women in science, technology, engineering, and mathematics (STEM). This chapter summarizes this research. It argues that women's underrepresentation is concentrated in the math-intensive science fields of geosciences, engineering, economics, math/computer science, and physical science. Its analysis concentrates on the environmental factors that influence ability, preferences, and the rewards for those choices. The chapter examines how gendered stereotypes, culture, role models, competition, risk aversion, and interests contribute to the gender STEM gap, starting in childhood, solidifying by middle school, and affecting women and men as they progress through school and higher education and into the labor market. The results are consistent with preferences and psychological explanations for the underrepresentation of women in math-intensive STEM fields.

Gender Differences in Recognition for Group Work

Heather Sarsons*

November 4, 2017

Abstract

How is credit for group work allocated when individual contributions are not perfectly observed? Do demographic traits like gender influence the allocation of credit? Using data from academic economists' CVs, I test whether coauthored and solo-authored publications matter differently for tenure for men and women. Because coauthors are listed alphabetically in economics, coauthored papers do not provide specific information about each contributor's skills or ability. Solo-authored papers, on the other hand, provide a relatively clear signal of ability. I find that men are tenured at roughly the same rate regardless of whether they coauthor or solo-author. Women, however, become less likely to receive tenure the more they coauthor. The result is most pronounced for women coauthoring with men and less pronounced among women who coauthor with other women. I contrast economics with sociology, a discipline in which coauthors are listed in order of contribution, and find that when contributions are made clear, men and women receive equal credit for coauthored papers.

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1 Introduction

How do employers infer workers' productivity under uncertainty? In many workplaces, employers must make hiring and promotion decisions under incomplete information or in the face of subjective productivity measures (Prendergast, 1999; MacLeod, 2003). Employees working in teams is an example of this. Unless employers can perfectly observe each worker's contribution to the team's output, employers must decide how to allocate credit without having full information as to what each worker did. This is of increasing relevance as many organizations rely predominantly on group work for production¹. Yet there is little empirical evidence on how credit for group work is allocated and whether demographic characteristics such as gender play a role.

In this paper, I test whether uncertainty over an individual's contribution to a project leads to differential attribution of credit that contributes to the gender promotion gap. In many industries, women are not only hired at lower rates than men are, they are also promoted at lower rates. Blau and DeVaro (2007), for example, find that across jobs, women are less likely to be promoted than men conditional on worker's performance and ability ratings. In the UK, female managers are nearly 40% less likely to be promoted than male managers (Elmins et al. 2016). A significant portion of the promotion gap remains unexplained even after accounting for factors such as productivity, personality and behavioural differences (such as competition aversion), and fertility preferences².

I specifically look at tenure decisions within academia, an ideal setting for two reasons. First, there is a large tenure gap between men and women, over 30% of which can not be explained by observable productivity differences or family commitments (Ginther and Kahn, 2004). Second, disciplines within academia differ in their treatment of authorship. This provides variation in the clarity of signals that employers receive. For example, in economics, coauthors are listed alphabetically, making it difficult to discern who did what on a coauthored paper. Solo-authored papers, on the other hand, provide a clear signal of the author's ability. In sociology, authors are listed in order of contribution, making both coauthored and solo-authored papers clear signals.

I primarily use data from economists' CVs to track individuals' career trajectories and compare whether the trajectory is different for individuals who coauthor versus solo-author, and whether there is a difference by gender. I then contrast economics with sociol-

¹Lazear and Shaw (2007), for example, report that the share of large U.S. firms whose workers predominantly work in teams rose from 27% to 78% between 1987 and 1996

²There is a large literature documenting gender differences in productivity, attitudes toward different types of work, and family choices. See, for example, Niederle and Vesterlund (2007), Antecol et al. (2016), Ceci et al. (2014), and Ginther and Kahn (2004).

ogy to test whether there is a smaller unexplained promotion gap in academic disciplines where it is easier to discern an author's specific contribution.

Within economics, I find that men and women who solo-author most of their work have similar tenure rates conditional on a proxy for the quality of papers. However, an additional coauthored paper is correlated with an 8% increase in tenure probability for men but only a 2% increase for women. This gap is significantly less pronounced for women who coauthor with women, suggesting that the attribution of credit is related to the gender mix of coauthors. Furthermore, a man who coauthors is no less likely to receive tenure than a comparable man who solo-authors even though there is presumably more uncertainty as to how much work he did. In sociology, women who coauthor are as likely to receive tenure as men who coauthor, suggesting that it is the uncertainty contained in the alphabetical ordering of authors that disproportionately hurts women.

To ensure that I am not picking up on ability differences between men and women, I control for the quality of papers using both journal rankings and citations, allowing for a comparison of men and women with similar research portfolios. The results are also robust to including other individual-level controls such as length of time to tenure and the seniority of one's coauthors, as well as tenure year, tenure institution, and primary field fixed effects.

While I cannot pinpoint a specific mechanism that explains why coauthoring has lower returns for women, I rule out several standard explanations. The difference in credit does not appear to be due to women's own behaviour: they are not especially likely to coauthor with senior or high-ability faculty, nor do they present their coauthored work less. The empirical patterns are also inconsistent with taste-biased discrimination.

The remainder of the paper is organized as follows. Section 2 describes the data and shows that a tenure gap exists between male and female economists. In Section 3, I show that the tenure gap is driven by women having a lower probability of tenure for each additional coauthored paper than men. I then contrast economics with sociology to see how results change based on the quality and clarity of the signal. I show that the results are robust to using different journal rankings and definitions of tenure. In Section 4, I test four theories that might explain this relationship and argue that none can fully explain the observed empirical patterns. I look at how the relationship between coauthoring and tenure has changed over time and by school in Section 5 and conclude in Section 6.

2 Data

To examine the relationship between paper composition and tenure, I construct a dataset using the CVs of economists who came up for tenure between 1985 and 2014 at one of the top 30 U.S. PhD-granting universities³. The academic progression documented in the CVs makes it possible to evaluate the relationship between the individual's research output and career progression. I can then compare the degree of collaborative work and reward for that work, and compare these results for men versus women.

2.1 Sample Selection and Data Overview

I include only PhD-granting institutions in the sample so that, as much as possible, I am comparing individuals facing similar tenure requirements. For example, liberal arts colleges place greater weight on teaching ability for tenure, something that I cannot measure. I exclude business and public policy schools for similar reasons. Many business schools require professors to write cases, for example, and it is not clear how this factors into tenure decisions. It is reasonable to assume that the top 30 economics departments in the U.S. emphasize research which is measured by the number and quality of papers one produces.

One problem in collecting tenure information is that the CVs of individuals who went up for tenure, were denied it, and left to industry or government are difficult to find, leading to a sample selection problem. To deal with this issue, I was able to collect historical faculty lists from 17 of the 30 schools and locate over 90% of faculty who had ever gone up for tenure at these 17 institutions. For the remaining 13 schools, I looked at the top 75 U.S. institutions, the top 5 Canadian institutions, and the top 5 European institutions to locate anyone who went up for tenure at a top 30 U.S. school and then moved to another institution. I also checked economists' CVs at the major Federal Reserve Boards and other large research institutes, such as Mathematica, in the U.S. While there might still be a sample selection problem, I show in Section 3.3.1 that the results are robust to using only the sample for which I have historical faculty lists.

From individuals' CVs, I code where and when they received their PhDs, their employment and publication history, and their primary and secondary fields. When looking at the relationship between publications and tenure in the main analysis, I only include papers that were published up to and including the year an individual goes up for tenure. Forthcoming papers and book chapters are not included in the paper count, but I later include such papers as a robustness check.

³The list of institutions included can be found in Appendix A

I primarily use the 2015 RePEc/IDEAS ranking of economics journals to control for the quality of a person's publications. For this, I take the top 85 journals and give the top journal a score of 86. The lowest quality journal has a score of two. Any journals below this are given a score of one⁴. Finally, I include current citations of pre-tenure papers as a control variable. These citations were scraped from Google Scholar.

I supplement this dataset with results from a survey designed to measure individuals' beliefs about the returns to various types of papers. The survey also contains information on how frequently individuals present their papers. The exact questions and nature of the survey are discussed in greater detail in Section 4.

2.2 Construction of Tenure

To determine whether someone received tenure, I follow the guidelines on each school's website (as of 2015) as to when tenure decisions are made. The majority of schools require faculty to apply for tenure 7 years after their initial appointment. I therefore consider years 6-8 to be the "tenure window" in which someone applies for tenure to account for people who go up for tenure early or late (because of a leave of absence, for example). I assume that an individual is denied tenure if s/he moves to a university ranked 5 positions below the initial institution during the tenure window. Similarly, I assume that an individual is denied tenure if he moves from academia to industry during the tenure window. Defining tenure in this way accounts for the fact that some people switch institutions 2-3 years after their initial appointment, not because they were denied tenure but for personal preferences, and that some people might choose to move to a comparable school around the time of tenure even though they were offered tenure at their original institution. For example, someone who moves from MIT to Harvard after 7 years was presumably offered tenure at MIT but chose to move to Harvard for other reasons.

As mentioned, a person who moves 5 or fewer years after his or her initial appointment is not assumed to have been denied tenure since s/he moved before the tenure window starts. If someone moves before the tenure window, I use the second institution they were at to determine tenure. For example, if a person's first job is at University A but s/he moves to University B after three years, I use University B as the tenure institution but do not start the tenure clock over. In this example, I would look 3-5 years after the individual starts at University B (that is, 6-8 years after the initial position) to determine whether the individual received tenure. If a person moves from an academic institution into industry before the tenure window, I exclude them from the sample.

⁴Less than 10% of papers are published in journals not included in the RePEc/IDEAS ranking.

2.3 Summary Statistics

Table 1 presents summary statistics of the data. Approximately 70% of the full sample received tenure, but this masks a stark difference between men and women. Only 52% of women received tenure while 75% of men did.

Total Papers, *Solo-authored*, and *Coauthored* are the number of papers in each group that an individual had published by the time of tenure. These publication counts do not include books or book chapters. Papers published in non-economics journals (such as a political science journal) are included but receive a ranking of 1 (the lowest ranking). The results are robust to excluding publications in non-economics journals.

There is no statistically significant difference in the number of papers that men and women produce. Panel B looks at differences in the quality of papers. Men are no more likely to publish their papers in "Top 5" journals (American Economic Review, Econometrica, Journal of Political Economy, Quarterly Journal of Economics, and The Review of Economic Studies) than women are. The only statistically significant productivity difference is that men tend to publish their coauthored papers in slightly higher-ranking journals. I therefore control for the quality of papers, measured as the average journal ranking and average citations, throughout the analysis.

Panel C displays differences in coauthoring patterns between men and women. *Total Unique CAs* is the number of unique coauthors an individual has had by tenure. Men and women have roughly the same number of coauthors and women are no more likely to coauthor with senior faculty than men are. The only significant difference in coauthorship is that 26% of women's coauthors are other women whereas only 11% of men's coauthors are women.

3 Empirical Strategy and Results

To understand how credit for group work is allocated, I correlate paper composition with tenure while controlling for individual-level characteristics as well as school, year, and primary field fixed effects. While an additional solo-authored paper is associated with the same increase in tenure probability for men and women, an additional coauthored paper is correlated with a larger increase in tenure probability for men than for women.

After establishing this result, I contrast economics with sociology, a discipline in which authors are listed according to contribution rather than alphabetically. In this case, an author's contribution is clear and there is no longer a gender difference in the relationship between coauthored work and tenure. Taken together, these results suggest that the un-

certainty created by alphabetically ordering authors leads to women receiving less credit and contributes to the gender promotion gap.

3.1 Main Results

I show three main results. I first establish that a significant tenure gap exists between men and women. I then show that the gap becomes more pronounced the more women coauthor, and that women who solo-author all of their papers have comparable tenure rates to men. Finally, I show that the gender of a woman’s coauthor matters. Women who coauthor with other women do not suffer a coauthor penalty, providing evidence that women receive less credit for joint work than men do, whether warranted or not.

3.1.1 The Tenure Gap

Figure 1 plots the lines of best fit from estimating

$$T_{ifst} = \beta_1 TotPapers_i + \gamma' Z_i + \theta_f + \theta_s + \theta_t + \epsilon_{ifst} \quad (1)$$

separately for men and women using OLS. The dependent variable, T_{ifst} , is an indicator that individual i in field f at school s receives tenure in year t . $TotPapers_i$ is the number of papers (both coauthored and solo-authored) individual i has at the time he or she went up for tenure. The vector of individual-level controls, Z_i , includes average journal rank, total citations, the number of years it took i to go up for tenure, and the number of coauthors on papers. Tenure institution (θ_s), tenure year (θ_t), and field fixed effects (θ_f) are also included as tenure standards likely vary over time and by field and department.

The figure shows that a significant tenure gap exists between men and women even after controlling for productivity, primary field, tenure institution, and tenure year. While an additional paper is correlated with a roughly 4 percentage point increase in tenure probability for both men and women, women are consistently 17 percentage points less likely to receive tenure than men conditional on having written the same number of papers of similar quality. The corresponding estimates for equation 1 using a probit model are presented in Column 1 of Table 2.

3.1.2 The Tenure Gap and Paper Composition

If solo-authored papers provide a clear signal of ability, we would expect men and women to benefit similarly from an additional solo-authored paper, conditional on paper quality.

Figure 2 plots the coefficients $\hat{\beta}_1$ and $\hat{\beta}_1 + \hat{\beta}_2$ from

$$T_{ifst} = \beta_1 S_i + \beta_2 (fem_i \times S_i) + \beta_3 CA_i + \beta_4 (fem_i \times CA_i) + \delta_1 fem_i + \gamma' Z_i + \theta_f + \theta_s + \theta_t + \epsilon_{ifst} \quad (2)$$

where S_i and CA_i are the number of solo-authored and coauthored papers an individual has at the time of tenure. Here we see a large tenure gap between men and women who have few solo-authored papers. However, the gap converges as women write more solo-authored papers. It seems that the signal from the solo papers begins to outweigh the employer's prior, which is consistent with a model in which employers start with lower beliefs about women and update as they receive clear signals about a woman's ability.

If coauthored papers are an unclear signal of ability, an employer must make a judgment call as to how much each coauthor contributed to the paper which could lead to differential attribution of credit. Indeed, we see tenure rates diverging in Figure 3, which plots the relationship between an additional coauthored paper and tenure ($\hat{\beta}_3$ and $\hat{\beta}_3 + \hat{\beta}_4$ from equation 2). While an additional coauthored paper helps both men and women, men benefit much more than women, suggesting that coauthored work is typically attributed to men. Columns 2 and 3 of Table 2 show the corresponding coefficients for equation 2, estimated using a probit model. From these estimates, men's tenure rates increase by 7.7 percentage points when they produce a coauthored paper whereas women's increase by 2 percentage points.

The results are summarized in Figure 4. This figure plots the relationship between the fraction of an individual's papers that are solo-authored, controlling for the total number of papers, citations, journal quality, number of coauthors, and tenure institution, year, and field fixed effects. For men, it does not matter if one coauthors or solo-authors: tenure rates are comparable conditional on the quality of papers. Women who write all of their papers alone have similar tenure rates to men. However, women who coauthor all of their papers have an approximately 40% tenure rate, substantially lower than that of men who coauthor all of their papers (75%). The slope for women is 0.37 and is statistically significant at the 5% level (s.e.=0.167).

3.1.3 Does Coauthor Gender Matter?

The probability of receiving tenure is not lower for all women who coauthor. In Table 3, I categorize coauthored papers into those written with only men, only women, or a mix of men and women:

$$\begin{aligned}
T_{fst} = & \beta_1 S_i + \beta_2 (fem_i \times S_i) + \beta_3 CA_{male_i} + \beta_4 (fem \times CA_{male_i}) + \beta_5 CA_{mix_i} \\
& + \beta_6 (fem \times CA_{mix_i}) + \beta_7 CA_{fem_i} + \beta_8 (fem_i \times CA_{fem_i}) + \beta_9 fem_i \\
& + \gamma' Z_i + \theta_f + \theta_s + \theta_t + \epsilon_{fst}
\end{aligned} \tag{3}$$

As before, S_i is the number of solo-authored papers individual i has. CA_{fem_i} is the number of coauthored papers individual i has in which all of the coauthors are female. Similarly, CA_{male_i} is the number of papers i has in which all of the coauthors are male and CA_{mix_i} is the number of papers i has in which the coauthors consist of men and women.

The estimated coefficients on the interaction terms show that women receive almost no marginal benefit from producing a coauthored paper with a man but receive some benefit when there is either a mix of male and female coauthors or only female coauthors. The point estimates suggest that an additional paper that a woman writes with a mix of men and women improves tenure chances by 3.6% and an additional paper with other women improves tenure probability by 9.2%, the same increase a man receives. While the estimates are imprecise due to sample size, I can rule out that an additional coauthored paper with a woman has the same effect as an additional coauthored paper with a man. The estimates are robust to including all of the control variables discussed earlier.

These results imply that the differential attribution of credit arises when signals are noisy and that men tend to disproportionately benefit from this noise. If a woman coauthors with a woman, credit is given to both of them. However, when a woman coauthors with a man, the man receives the bulk of the credit, suggesting that employers rely on gender in some way to infer ability or effort. However, this does not mean that the employer is acting sub-optimally or is biased against women. I explore possible explanations in Section 4. First, though, I test whether removing the noise from a signal reduces the gender gap in credit.

3.2 Testing Against Other Coauthoring Conventions

If the uncertainty contained in a “coauthored” signal is contributing to the gender gap, clearly stating an individual’s role on a project would alleviate this problem. I test whether this is true by looking at sociology, where authors are listed by order of contribution. This removes uncertainty over each author’s contribution to the paper. Of course it should be noted that sociology is not the perfect comparison as many other factors differ across the two disciplines, including the fraction of women in each discipline. Still, the results shed

light on whether the uncertainty contained in coauthored papers in economics contributes to a promotion gap.

The sociology sample consists of randomly sampled faculty at the top 20 sociology PhD-granting departments in the U.S.⁵. There are 250 sociologists in the sample, 40% of whom are female. Summary statistics are presented in Table 4. There is no statistically significant difference between men and women's tenure rates (with the mean tenure rate being 76%) although men seem to publish more solo-authored articles than women.

To test whether men and women are treated differently, I reestimate equation 2 but include measures of the number of papers that researcher i is first author on. The results are presented in Table 5. I include the number and fraction of papers a researcher is first author on in Columns 1 and 2 respectively, along with female dummy interaction terms.

Being first author on a paper is correlated with a 5% increase in tenure probability for both men and women. Importantly, women are not penalized for coauthoring. Results are somewhat noisy due to the small sample, but the coefficient on the female/total coauthored papers interaction term is close to zero, indicating that women receive credit for their work when their contribution to a project is clear.

3.3 Robustness Checks

One may be concerned that the results are a product of the types of productivity measures used or of missing data. In this section, I show that the results are robust to using only the sample for which I have no missing observations, to using different journal rankings, and to accounting for papers published shortly after tenure.

3.3.1 Attrition

The results might be biased if the sample excludes individuals who are denied tenure and go into industry, government, or other institutions where I do not observe them. This would be particularly problematic if men who go to industry after being denied tenure disproportionately coauthored their papers. If this is true, I would be overestimating the benefit of coauthoring for men. I would have a similar problem if women who go to industry after being denied tenure typically wrote solo-authored papers.

As discussed in Section 2.1, I attempted to find such individuals by searching institutions outside of the top 30 U.S. schools, federal reserves, and other research institutes. Doing so certainly does not guarantee I found everyone who went up for tenure, though.

⁵Ranking from U.S. News Education

To allay concerns about sample selection, I run the analysis on the sample for which I received historical faculty lists. These lists allow me to track who went up for tenure and find them even if they left academia. The results, presented in Column 1 of Table 6, do not change when run on the sample for which there should be very few missing observations.

3.3.2 Journal Rankings

While the economics profession largely agrees on what the “top” journals are, rankings of field journals or lower-tier journals have changed over time and might be disputed. Furthermore, including an average journal ranking could mask differences in the rankings of solo and coauthored papers between men and women. In Columns 2 and 3 of Table 6, I attempt to account for this by using two alternative journal ranking metrics.

In Column 2, I separately include the average ranking of one’s solo and coauthored papers. In addition, I convert each journal ranking into its “AER equivalent” where each raw publication is converted into its number of American Economic Review-equivalent papers. This has the advantage of standardizing the journal quality measure, and for allowing different distances between paper ranks. For example, in the RePEc/IDEAS ranking, *Econometrica* is one ranking below the *AER*. Using the *AER*-equivalent measure, a paper in *Econometrica* is nearly equivalent to having a paper in the *AER*. A paper in many of the top field journals is equivalent to having published 0.15-0.2 papers in the *AER*. For details on the methodology and the ranking, see Kalaitzidakis, Mamuneas, and Stengos (2003). Again, the results are unchanged.

In Column 3, I allow journal rankings to change over time. I use historical rankings of economics journals (drawn from Laband and Piette, 1994, and combined with current rankings) and match each paper a person publishes with its journal ranking at the time it was published. In Column 3, the variable *Avg Journal Rank* is then the average rank of an individual’s papers, measured using the historical rankings. Using these rankings accounts for journals moving in rank over time as well as new journals being added. Again, the results do not qualitatively change. An additional coauthored paper is associated with a 7.7 percentage point increase in tenure probability for men but only a 2.2 percentage point increase for women. In section 4, I also separate papers into “Top 5s” and “non-Top 5s”.

3.3.3 Tenure Definition

In the main analysis, I only consider papers that were published up to and including the year that an individual goes up for tenure. If an individual goes up for tenure in 1995, for

example, papers published in 1996 are not included in the paper count even though they may have been “revise and resubmits” at the time of tenure. This could affect the results if men who coauthor have several promising unpublished papers at the time of tenure but women who coauthor do not, in which case I am not actually comparing people with similar publication records. In Columns 4 and 5 of Table 6, I include papers that are published one and two years after a person’s tenure year in the paper count variables. The results do not change: women continue to benefit less from coauthored papers than men do.

4 Channels

There are many possible explanations for the above findings, not all of which can be tested with these particular data. Here I shed light on four standard and testable channels: ability-based sorting, preference-based sorting, women not claiming credit for their work, and taste-based discrimination. The empirical patterns are inconsistent with all of the proposed explanations, most of which would have suggested that a woman’s own behaviour leads her to receive less credit for joint work.

4.1 Ability-Based Sorting

Employers might rationally deny women who coauthor tenure if individuals sort such that only lower ability women coauthor with men. This could arise for several reasons. For example, if coauthoring lowers the cost of producing a paper, but women know that they receive less credit for papers, high ability women might forego the cost savings and choose to work alone. They know they can produce high quality papers by themselves and send the employer a clearer signal of their ability. However, if low ability women can only produce high quality papers with the help of a high ability man, they might coauthor even if they receive less credit. High ability men will agree to coauthor with them if it reduces the cost of the paper without reducing the quality. Employers would then know that any woman coauthoring with a man is lower ability.

A simple sample of worker sorting and promotion is presented in Appendix B. The framework provides intuition for when women of different ability types would choose to coauthor with men. If women do not know that they receive less credit for coauthoring, we should see assortative matching. Men and women of the same ability level will collaborate, making the decision to deny coauthoring women tenure sub-optimal. If women do know that they receive less credit, high ability women will opt to work alone while,

under certain conditions, low ability women will coauthor. In this case, it is optimal for an employer to tenure coauthoring women at lower rates than men.

In what follows, I test whether women anticipate receiving less credit and consequently sort accordingly. To do so, I first present survey evidence suggesting that women do not know that the returns to coauthoring are lower than solo-authoring. I then show that women do receive some credit for papers that publish well, suggesting that employers believe that there might be some assortative matching. Finally, I provide evidence that even when women tend to work with men who are slightly higher ability than themselves this unequal match does not explain the gender gap in tenure.

4.1.1 Survey Evidence on Knowledge of Returns to Coauthoring

If women know that their returns to coauthoring with men are low, it is plausible that high ability women would choose to solo-author or only work with other women. Here I test whether women anticipate receiving less credit for collaborative work. However, it is first worth noting that the results presented in Section 3.1.3 show that women have a nearly 0% return to coauthoring with a man. If women know the true returns to coauthoring, *any* woman, regardless of ability, should be hesitant to collaborate (see Appendix B for details). The fact that we see women coauthoring with men already implies that women misjudge the true returns to coauthoring.

I test whether women know the true returns to coauthoring using a survey conducted with economists currently working at the top 35 U.S. economics departments. The survey was sent to all professors, regardless of rank, at these institutions and received an 32% response rate. The gender composition of the sample is representative of the profession today, with 89 respondents being female and 300 being male. In the survey, economists were asked the following question:

Suppose a solo-authored AER increases your chance of receiving tenure by 15%. For each of the following, please give an estimate of how much you think the described paper would increase your chance of receiving tenure.

Respondents then go through five types of papers (coauthored AER, coauthored AER with senior faculty, coauthored AER with junior faculty, solo-authored top field, and coauthored top field) and record their beliefs about the returns to these papers⁶.

⁶I did not ask respondents about paper coauthored with men/women so that they would not be primed to think about gender

In Table 7, I test the difference in the mean beliefs of men and women⁷. There is no statistically significant difference in the beliefs of men and women for any type of paper. Men believe that a coauthored AER will increase their chance of receiving tenure by 12.1%, and women by 12.2%. Women believe that there are slightly lower returns to AER papers coauthored with senior faculty (8.8% versus 9.1% for men), but the difference is not statistically significant. These results suggest that, in this context, women are unaware of the true returns to coauthoring.

4.1.2 Evidence on Sorting by Ability

A second test of whether women know that they will receive less credit for papers and sort accordingly is to look at the correlation between propensity to coauthor and ability. I first test whether high ability women are less likely to coauthor than low ability women and then test for assortative matching among coauthors. I proxy for ability using the quality of journal that an individual's job market paper was published in. I assume that the job market paper is the first solo-authored paper an individual publishes after he or she graduates.

If women anticipate discrimination, ability and the fraction of one's papers that are coauthored will be negatively correlated. High ability women should be less likely to coauthor. In Figure 5.A I plot the coefficients $\hat{\beta}_1$ and $\hat{\beta}_2$ from estimating

$$FracCA_{ifst} = \beta_1 a_i + \beta_2 (fem_i \times a_i) + \beta_3 fem_i + \beta_4 TotPapers_i + \theta_f + \theta_s + \theta_t + \epsilon_{ifst} \quad (4)$$

where $FracCA_{ifst}$ is the fraction of person i 's papers that are coauthored and a_i is person i 's ability (job market paper rank). If high ability women anticipate receiving less credit, we expect $\hat{\beta}_2 < 0$. In Figure 5.A, however, we see that ability is uncorrelated with the fraction of papers that are coauthored for both men and women: both estimates are precise zeros. There is no evidence that women along the ability distribution act strategically in their choice to coauthor versus solo author.

I also find no evidence that high ability women strategically coauthor with other women rather than men. Figure 5.B plots the results from equation 4 using the fraction of papers that are coauthored with women as the dependent variable. Women are more likely to coauthor with other women than men are but there is no sorting by ability.

While women do not seem to be sorting according to ability, it is possible that women tend to work with higher-ability coauthors who then receive more credit for a paper. I can

⁷Because the survey was anonymous, the answers can not be linked to the CV data. I can therefore only test for differences in means without controls.

test for this by correlating a person's ability with that of his or her coauthors. While I do not have the job market paper information for all coauthors in the dataset, I can see where the coauthors were working at the time the individual went up for tenure. As a measure of average coauthor ability, I take the average school rank of all of an individual's pre-tenure coauthors. For example, if i coauthors with j and k and j works at the 5th-ranked institution and k works at the 15th-ranked institution, the average ability of i 's coauthors is 10. I correlate i 's ability with the average ability of her coauthors in Figure 6. The line of best fit is plotted controlling for number of coauthored and solo-authored publications, time until tenure, and field, institution, and tenure year fixed effects.

Men and women both sort positively on ability but women are more likely to collaborate with individuals at more highly-ranked institutions than men are. To see whether this can explain the results, I estimate

$$\begin{aligned}
T_{ifst} = & \beta_1 S_i + \beta_2 (fem_i \times S_i) + \beta_3 CA_i + \beta_4 (fem_i \times CA_i) + \beta_5 rank_{iJ} \\
& + \beta_6 (CA_i \times rank_{iJ}) + \beta_7 (fem_i \times CA_i \times rank_{iJ}) + \beta_8 (fem_i \times rank_{iJ}) \\
& + \beta_9 fem_i + \gamma' Z_i + \theta_f + \theta_s + \theta_t + \epsilon_{ifst}
\end{aligned} \tag{5}$$

where $rank_{iJ}$ is the average institution rank of i 's coauthors and all other variables are defined as before. The results are reported in Table 8. If men receive more credit because they are coauthoring with lower ability women, $\hat{\beta}_7$ should be negative. However, $\hat{\beta}_7$ is close to zero, indicating that the ability of one's coauthor is not driving the tenure gap for coauthoring women.

4.1.3 Returns to Top Papers

For high ability women to receive no credit for their coauthored papers, employers would have to believe that there is no assortative matching by ability. Otherwise, employers would receive a signal that women who coauthor with high ability men are also high ability, and be more likely to promote them (see Appendix B for details). Figure 6 shows that assortative matching does occur, but it is possible that employers do not recognize this. I test for this by looking at how credit for top 5 publications is allocated. If employers know that there is assortative matching, they should believe that women coauthoring with high-ability men are also likely to be high ability.

Table 10 shows the results from estimating

$$\begin{aligned}
T_{ifst} = & \beta_1 TopS_i + \beta_2 (fem_i \times TopS_i) + \beta_3 TopCA_i + \beta_4 (fem_i \times TopCA_i) + \beta_5 NonTopS_i \\
& + \beta_6 NonTopCA_i + \beta_7 (fem_i \times NonTopS_i) + \beta_8 (fem_i \times NonTopCA_i) + \beta_9 fem_i + \gamma' Z_i \\
& + \theta_f + \theta_s + \theta_t + \epsilon_{ifst}
\end{aligned} \tag{6}$$

The female interaction terms are presented in the second column. $TopS_i$ and $TopCA_i$ are the number of solo and coauthored papers that individual i has published in a top 5 journal. Similarly, $NonTopS_i$ and $NonTopCA_i$ are the number of solo and coauthored papers the individual has published in non-top 5 journals. Note that power becomes an issue as (1) there are relatively few people publishing in the top 5 journals, and (2) cutting by gender means that there are even fewer women in each category. Still, Table 10 shows that coauthored papers published in a top 5 journal help women but still by less than they help men. The point estimate on the interaction term is negative and insignificant due to large standard errors, but it suggests that a coauthored publication in a top journal is associated with a 10% increase in tenure probability for women and a 15% increase for men. Non-top 5 coauthored papers do not have any positive influence on women's tenure probability. It seems that employers receive some signal when a woman publishes her coauthored papers in top journals which is at odds with the hypothesis that only low ability women coauthor with men.

Overall, there is little evidence that ability-based sorting is driving the results. If anything, employers seem to recognize that high ability men and women might work together and are therefore more likely to grant these women tenure. However, their tenure rate is still lower than that of high ability men.

4.2 Preference-Based Sorting

If women prefer to coauthor with senior faculty, we could reasonably expect that women would have lower tenure rates. Assuming senior faculty are more likely to be credited for a paper, the fact that most senior faculty are men would drive the correlation between coauthoring with a man and tenure. That is, women receive less credit because they enjoy coauthoring with senior faculty and these senior faculty are predominantly male.

To test whether women are more likely to coauthor with senior faculty and whether this can explain the results, I first estimate

$$MaleSr_{ifst} = \beta_1 fem_i + \beta_2 TotCA_i + \beta_3 CA_i + \beta_4 S_i + \gamma' Z_i + \theta_f + \theta_s + \theta_t + \epsilon_{ifst} \tag{7}$$

where $MaleSr_{ifst}$ is either the number of fraction of male senior coauthors an individual has. The independent variables are defined as before with $TotCA_i$ being the number of coauthors an individual has worked with by the time s/he goes up for tenure. The results are presented in Column 1 of Table 9. Women are not more likely to coauthor with senior men: the point estimate on fem_i in Column 1 is positive but small and insignificant.

As an additional check, I reestimate equation 2 but control for the fraction of a person's coauthors who are senior. The results are presented in Column 2 of Table 9. The seniority of women's coauthors does not explain the results. Controlling for coauthor composition, an additional coauthored paper increases a man's probability of tenure by 8 percentage points but a woman's by only 2 percentage points.

4.3 Women Not Claiming Credit for Papers

Women might be given less credit for their work if they are less likely to claim it as their own. For example, if women present less frequently than men, people might associate a paper with the male coauthor who presents it more. The survey discussed in Section 4.1.1 also asked individuals how many times per year they present their work and whether they are more or less likely to present their coauthored papers than their coauthor. Panel B of Table 7 shows that women do not report presenting their coauthored papers less frequently than their coauthors. Interestingly, though, women present their solo-authored papers fewer times per year than men do. It is possible that women do not "advertise" their work as much as men do and this leads to women receiving less recognition for their work in general. If this were true, though, women who solo author should also be less likely to receive tenure.

4.4 Taste-Based Discrimination

If some employers have a distaste for tenuring women, as in Becker (1971), we should see women who write solo-authored papers being denied tenure as well. If employers cannot plausibly deny a woman who solo-authored several well-published papers, however, they might be constrained to deny tenure only to those for whom they can make a reasonable case. If it can be argued that a woman who coauthors did little of the work, taste-based discrimination could help to explain the results as employers have an excuse for denying tenure to coauthoring women. However, as shown in Table 3, only women who coauthor with men have lower tenure rates. This would imply that employers have a particular distaste for tenuring women who coauthor with men, which seems unlikely.

5 Further Discussion: Are Things Improving and Where?

As more women enter the economics profession, we would hope that any bias against women would begin to dissipate. As there are more examples of women doing high quality research, people might be less prone to innate biases. In Table 11, I reestimate equation 2 but interact the publication count variables with a linear time trend for the year an individual is expected to go up for tenure. The interaction coefficients are presented in column 2.

Women continue to receive less credit for coauthored work throughout the time period but the interaction on $Fem_i \times Coauthored_i \times TimeTrend$ is positive although insignificant. This provides some evidence that as more women enter the profession, they may be starting to receive more credit for joint work. Interestingly, the coefficient on the interaction term on $Coauthored_i \times TimeTrend$ is negative (but again insignificant), meaning that men might begin to suffer a coauthor penalty in later years.

An additional question is whether some institutions are better than others. For example, women in the top schools might be viewed more favourably if people think that anyone who makes it to a top school must be good. On the other hand, if people think that there is affirmative action for women, especially at the top schools, women in such institutions might be viewed less favourably.

In Table 12, I report the results from estimating equation 2 interacting all paper count and gender variables with an individual's tenure institution ranking. I have inverted the rankings so that 30 is the highest rank and 1 the lowest. The interaction terms in column 2 show that women in higher-ranked schools receive slightly more credit for their coauthored papers while men receive slightly less credit. For women, moving up one spot in rankings improves the correlation between coauthoring and tenure by 0.001 percentage points. Moving from the lowest to the highest-ranked school is not enough to eliminate the negative correlation between coauthoring and tenure for women, but it does reduce the gap. These results could suggest that women at high-ranking schools are viewed more favourably and given more credit for joint work. Of course, I can not rule out the possibility that there is less gender bias at high-ranking schools, etc.

The results also show that men at lower-ranking schools benefit immensely from coauthoring: an additional coauthored paper is correlated with a 17.2 percentage point increase in tenure. This is in line with Ginther and Kahn's (2004) finding that men have many more publications, often coauthored, in lower ranked journals that they receive credit for. These publications are unlikely to count for much at the top schools.

6 Conclusion

Women receive tenure at significantly lower rates than men in many academic fields. As discussed in the introduction, this phenomenon is not exclusive to academia. Several explanations have been put forward for the gap, but it persists even after accounting for observable characteristics such as fertility preferences and productivity.

This paper proposes an alternative explanation. I argue that women receive less credit for group work when employers can not perfectly observe their contribution. When signals are noisy, employers have to infer each worker's ability or productivity. Coauthored papers provide employers with a noisy signal. The fact that women who work specifically with men receive tenure at lower rates than comparable women who work alone or with other women suggests that gender enters into the employer's inference process. However, when employers receive clear signals, men and women are treated similarly. For example, men and women receive the same amount of credit for solo-authored papers, which provide a clear signal of ability. Furthermore, when the uncertainty in a coauthored paper is resolved, as in sociology, women and men again receive the same amount of credit for joint work. I show that these results are not explained by sorting or women presenting their work less. I also argue that it is not due to blatant taste-based discrimination.

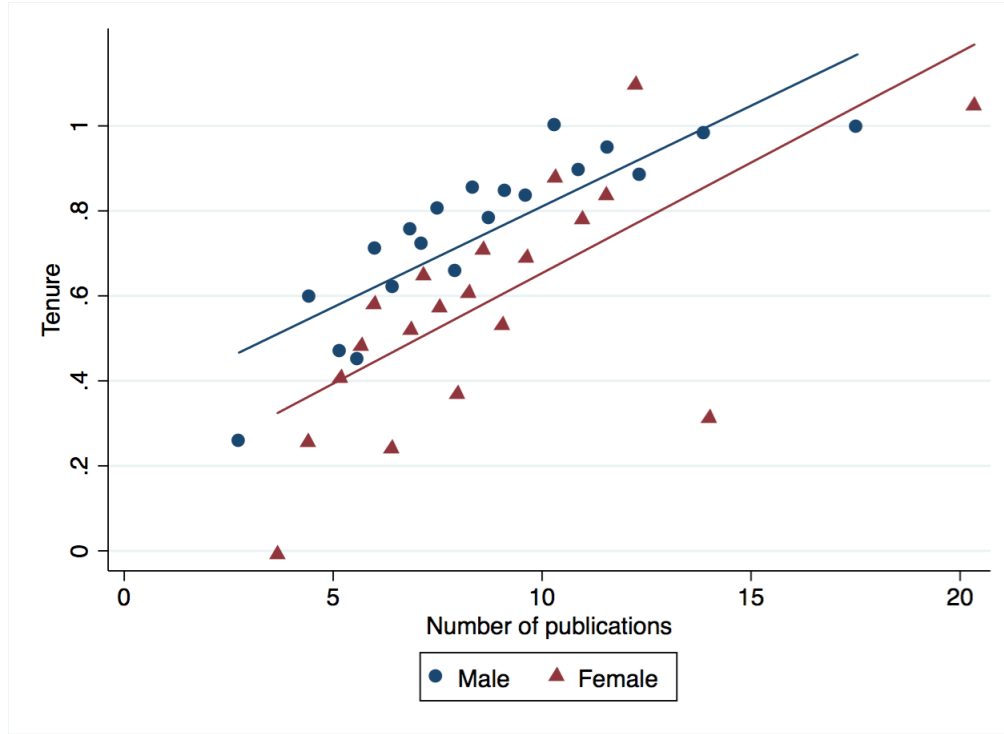
While a specific channel cannot be established with these data, being aware of this phenomenon is important in a world that is increasingly relying on group work for production. The tech industry, for example, prides itself on collaboration. In such male-dominated fields, however, group work could result in fewer women moving up the career ladder if credit is not properly attributed. Further work is needed to determine why women seem to receive less credit for group work.

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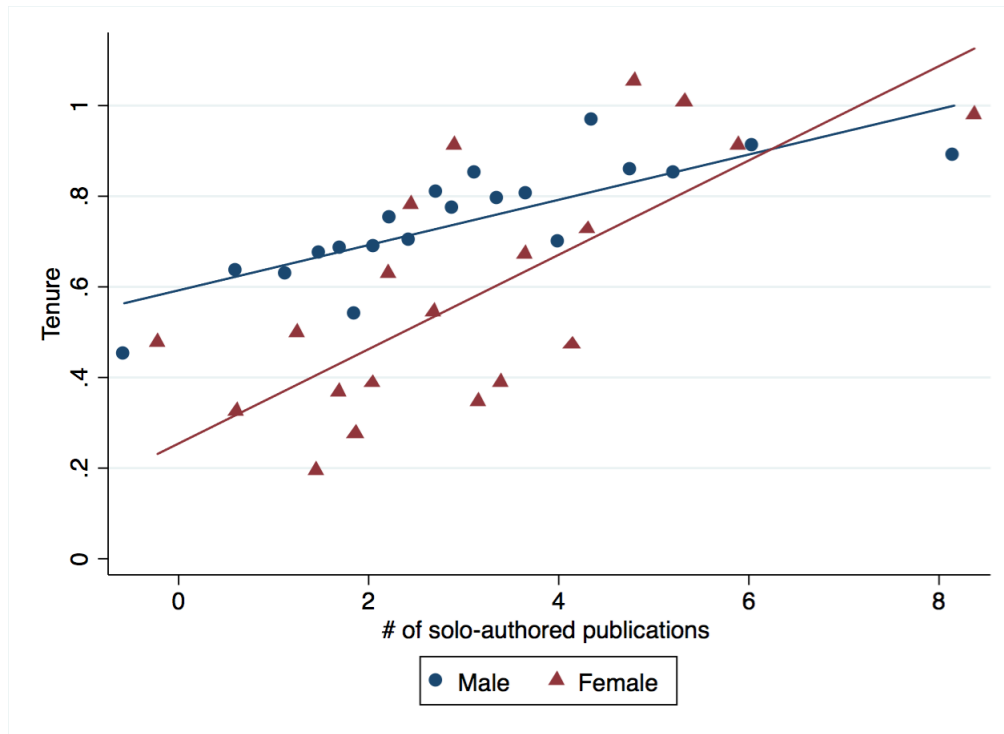
Figures

FIGURE 1: TOTAL PAPERS AND TENURE



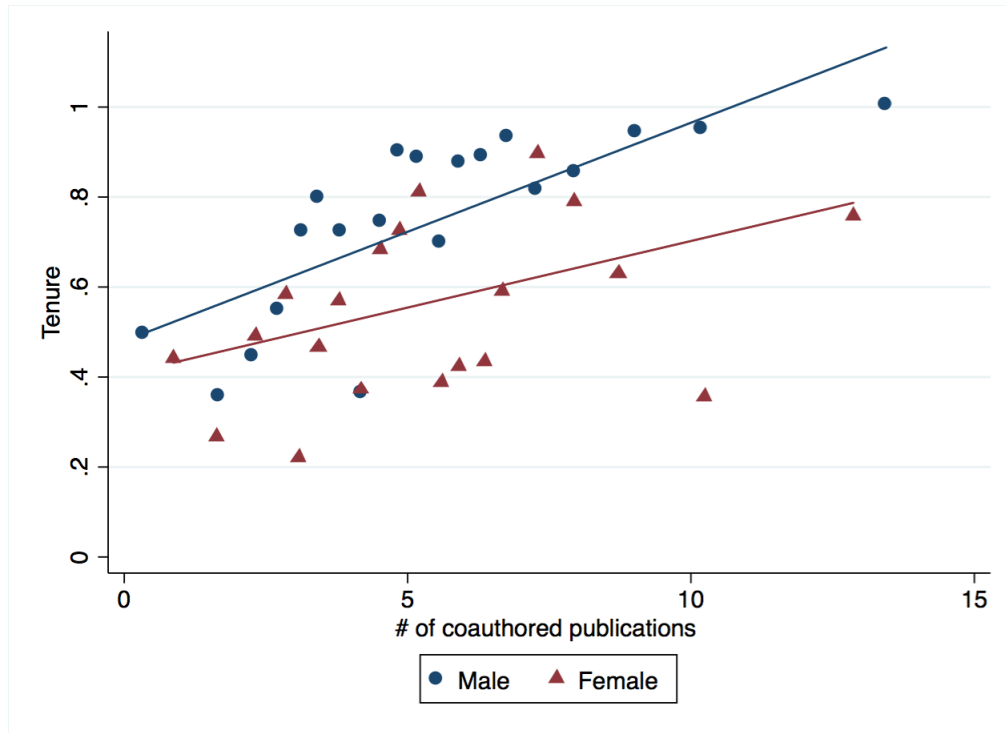
Notes: This figure is a binned scatterplot of the correlation between the total number of publications an individual has at the time they go up for tenure and the probability of receiving tenure. Both variables are residualized on the following controls before plotting: number of years it took to go up for tenure, average journal rank of pre-tenure publications, log citations, total coauthors, and tenure school, tenure year, and field fixed effects. The line of best fit using OLS is shown separately for men and women. The lines of best fit are estimated using the full sample ($N=587$) and have slopes of $\beta = 0.050$ (s.e. = 0.014) for women and $\beta = 0.047$ (s.e. = 0.005) for men. The y-variable is a binary variable indicating whether an individual received tenure. Each dot represents the mean of approximately 30 observations along both dimensions.

FIGURE 2: SOLO AUTHORED PAPERS AND TENURE



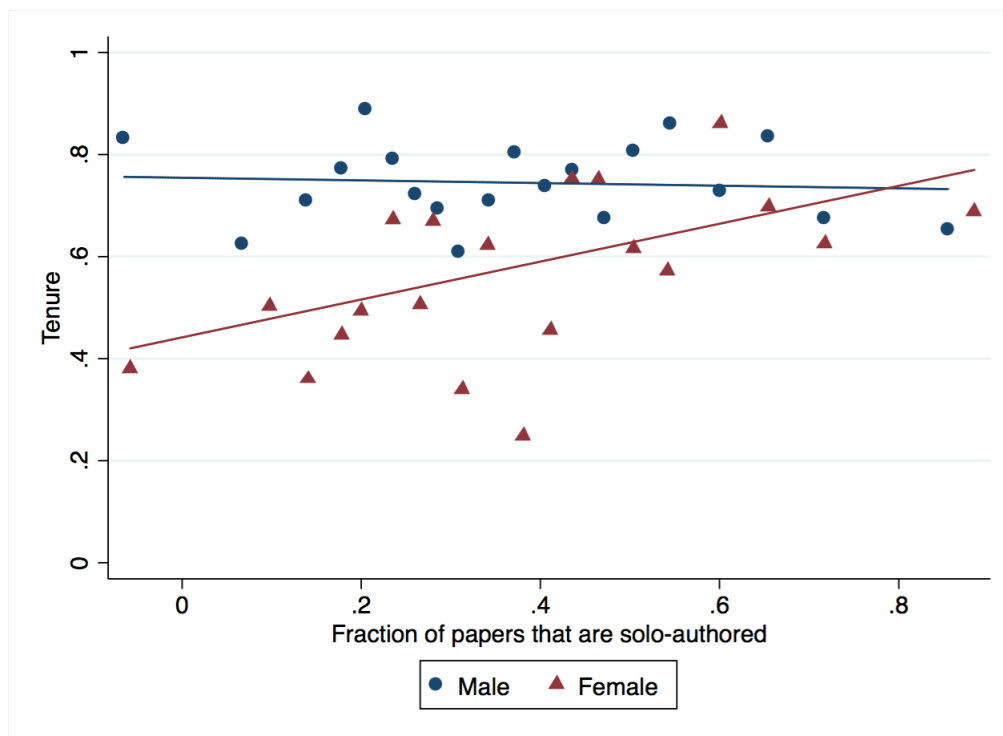
Notes: This figure is a binned scatterplot of the correlation between the number of solo-authored publications an individual has at the time they go up for tenure and the probability of receiving tenure. Both variables are residualized on the same controls in Figure 1. The lines of best fit are estimated using the sample of individuals who have at least one solo-authored publication ($N=534$) and have slopes of $\beta = 0.106$ (s.e. = 0.020) for women and $\beta = 0.050$ (s.e. = 0.009) for men. Each dot represents the mean of approximately 27 observations.

FIGURE 3: COAUTHORED PAPERS AND TENURE



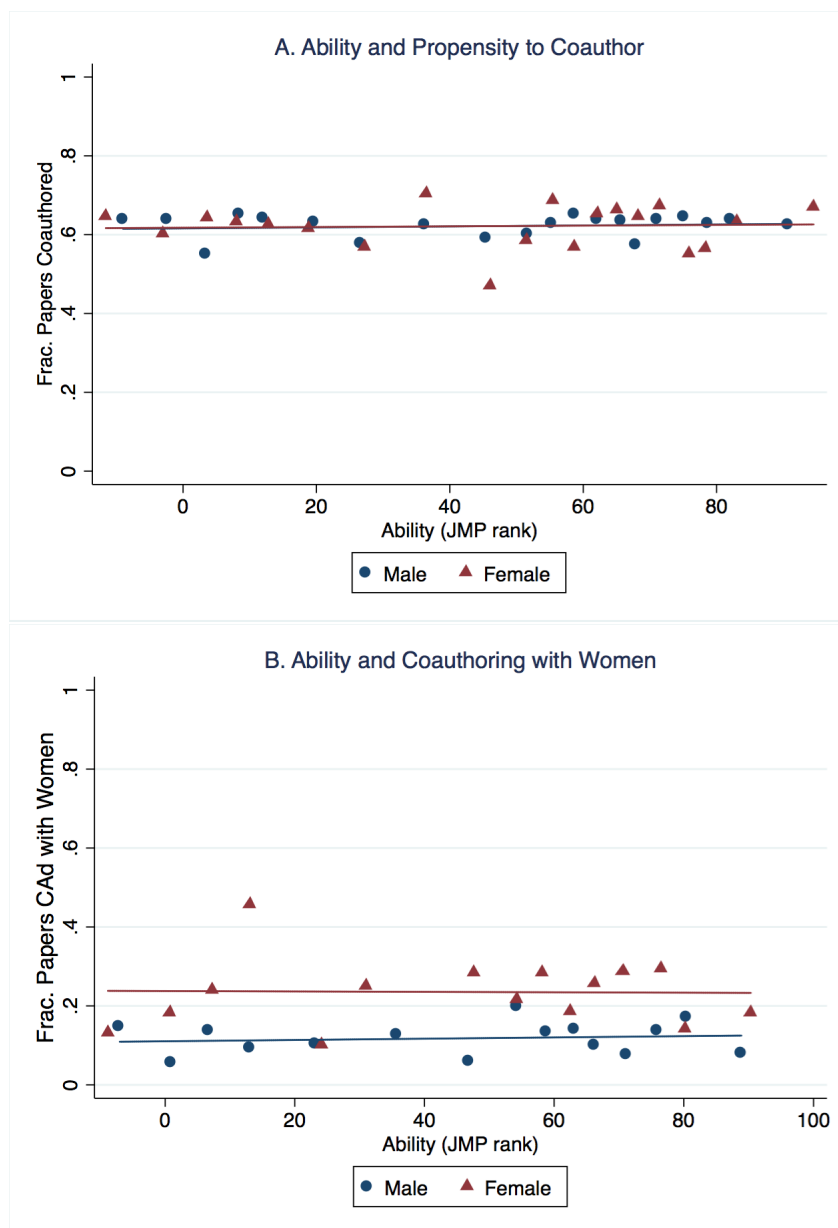
Notes: This is a binned scatterplot of the correlation between the number of coauthored publications an individual has at the time they go up for tenure and the probability of receiving tenure. Both variables are residualized on the same controls in Figure 1. The lines of best fit are estimated using the sample of individuals who have at least one solo-authored publication ($N=529$) and have slopes of $\beta = 0.358$ (s.e. = 0.014) for women and $\beta = 0.050$ (s.e. = 0.006) for men. Each dot represents the mean of approximately 26 observations.

FIGURE 4: RELATIONSHIP BETWEEN PAPER COMPOSITION AND TENURE



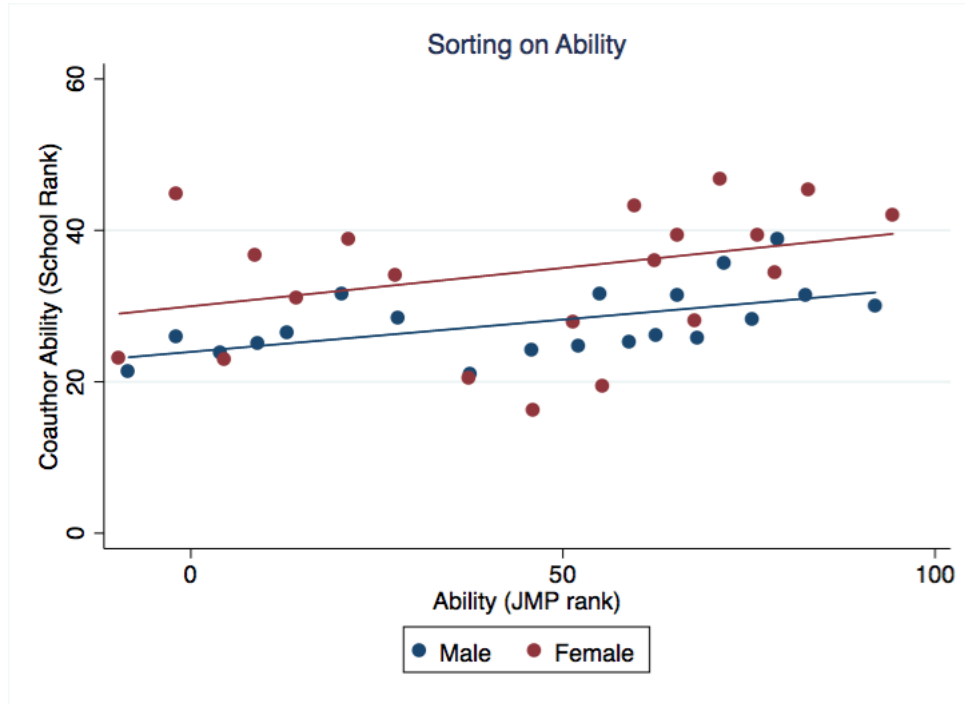
Notes: This figure is a binned scatterplot of the correlation between tenure and the fraction of an individual's papers that are solo-authored, split by gender. Both variables are residualized on the same controls in Figure 1. The line of best fit using OLS is shown separately for men and women. The lines of best fit are estimated using the full sample ($N=587$) and have slopes of $\beta = 0.036$ (s.e. = 0.167) for women and $\beta = -0.028$ (s.e. = 0.078) for men. The y-variable is a binary variable indicating whether an individual received tenure. Each dot represents the mean of approximately 30 observations along both dimensions.

FIGURE 5: ABILITY AND SORTING



Notes: This binned scatterplot shows the correlation between an individual's ability and the propensity to coauthor (Fig. 5A) and the propensity to coauthor with women (Fig. 5B). I proxy for an individual's ability using the journal in which his or her job market paper is published in. Both variables are residualized on the following controls before plotting: total solo and coauthored papers, the number of years it took to go up for tenure, log citations, and tenure school, tenure year, and field fixed effects. The lines of best fit using OLS are shown separately for men and women. The estimates for Fig. 5A are $\beta = 0.00002$ (s.e. = 0.0003) for women and $\beta = -0.0001$ (s.e. = 0.0002) for men. The estimates for Fig. 5B are $\beta = -0.00005$ (s.e. = 0.0008) for women and $\beta = 0.00016$ (s.e. = 0.0003) for men.

FIGURE 6: ASSORTATIVE MATCHING



Notes: This binned scatterplot shows the correlation between an individual's ability, proxied by the journal in which their job market paper is published in, and their coauthor's ability, proxied by the average school rank of their coauthors. Both variables are residualized on the following controls before plotting: total solo and coauthored papers, the number of years it took to go up for tenure, log citations, and tenure school, tenure year, and field fixed effects. The line of best fit using OLS is shown separately for men and women. The lines of best fit are estimated on the full sample and have slopes of $\beta = -0.00005$ (s.e. = 0.0008) for women and $\beta = 0.0002$ (s.e. = 0.0003) for men.

Tables

TABLE 1: SUMMARY STATISTICS

	Full	Male	Female	p-value
<i>Panel A:</i>				
Tenure	0.70 (0.46)	0.75 (0.43)	0.53 (0.50)	0.001
Years to tenure	6.8 (1.9)	6.6 (1.6)	7.1 (1.8)	0.002
Total papers	8.5 (4.0)	8.6 (4.1)	8.1 (3.4)	0.192
Solo-authored	3.0 (2.3)	3.0 (2.3)	3.1 (2.3)	0.901
Coauthored	5.5 (3.6)	5.6 (3.8)	5.1 (3.2)	0.132
<i>Panel B:</i>				
Top 5 Solo	0.68 (0.98)	0.68 (0.99)	0.70 (0.96)	0.788
Top 5 Coauthored	1.4 (1.5)	1.4 (1.5)	1.2 (1.5)	0.176
<i>Avg. Journal Rank:</i>				
All Pubs.	45.5 (17.2)	46.3 (17.2)	42.8 (17.3)	0.037
Solo Pubs.	467.2 (23.4)	47.8 (23.5)	45.5 (23.1)	0.348
Coauthored Pubs.	45.1 (20.2)	46.0 (20.3)	42.0 (19.5)	0.052
<i>Panel C</i>				
Total Unique CAs	5.0 (3.1)	5.0 (3.0)	4.9 (3.2)	0.607
Frac. Sr Coauthors	0.30 (0.32)	0.30 (0.30)	0.31 (0.32)	0.567
Frac. Fem Coauthors	0.14 (0.23)	0.11 (0.19)	0.26 (0.30)	0.001
Observations	574	441	133	

This table presents summary statistics for the full sample and separately for men and women. All paper count variables (*Total Papers*, *Solo-authored*, *Coauthored*, and *Top 5s*) are the number of papers an individual had published at the time of tenure.

TABLE 2: RELATIONSHIP BETWEEN PAPERS & TENURE

Dep. Variable: Tenure	(1)	(2)	(3)
	Probit	Probit	Probit
Total papers	0.058*** (0.005)		
Solo-authored		0.080*** (0.011)	0.075*** (0.010)
Fem x Solo		0.009 (0.017)	0.013 (0.016)
Coauthored		0.082*** (0.009)	0.077*** (0.014)
Fem x Coauthored		-0.065*** (0.014)	-0.057*** (0.014)
Avg Journal Rank	0.003 (0.001)	0.004 (0.001)	0.004 (0.001)
Total coauthors			0.002 (0.011)
Log Citations			-0.003 (0.022)
Female	-0.172*** (0.039)	0.100 (0.105)	0.051 (0.101)
School FE	Yes	Yes	Yes
Tenure Year FE	Yes	Yes	Yes
Field FE	Yes	Yes	Yes
Observations	579	579	549
Pseudo R2	0.307	0.349	0.362

This table shows the relationship between the number and types of papers an individual publishes and tenure. The dependent variable is a binary variable indicating whether the individual received tenure 6-7 years after being hired at the initial tenure institution. Total papers is the number of papers an individual had published by the time s/he went up for tenure. Solo-authored and Coauthored are the number of solo or coauthored papers s/he had published at the time of tenure. Avg. Journal Rank is the average journal rank of these pre-tenure publications, measured using the RePEc/IDEAS ranking. Tenure length is the number of years it took the individual to go up for tenure. Citations are from Google Scholar and measured at present. The equations are estimated using a probit model and the marginal probabilities calculated at the mean are displayed. Standard errors, reported in parentheses, are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 3: COAUTHOR GENDER

Dep Var: Tenure	(1)	
	Probit	Probit x Female
Solo-authored	0.064*** (0.009)	0.010 (0.014)
Pubs. with only Fem CAs	0.092*** (0.026)	0.001 (0.027)
Pubs. with only Male CAs	0.067*** (0.013)	-0.066*** (0.018)
Pubs. with M and F CAs	0.084** (0.031)	-0.048 (0.035)
Avg Journal Rank	0.004 (0.001)	
Total coauthors	-0.001 (0.009)	
Log Citations	-0.001 (0.018)	
Female	0.058 (0.096)	
Observations	548	

This table presents the results of one regression where the interaction terms are displayed in the right-hand column. *Pubs. with only Fem CAs* is the number of publications an individual has in which all coauthors are female. Similarly, *Pubs with only Male CAs* and *Pubs with M and F CAs* are the number of publications with only male coauthors and with a mix of male and female coauthors respectively. The equations is estimated using a probit model and the marginal probabilities calculated at the mean are displayed. Standard errors, reported in parentheses, are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 4: SOCIOLOGY SUMMARY STATISTICS

	Men	Women	p-value
Tenure	0.752 (0.433)	0.776 (0.419)	0.547
Total papers	12.15 (7.808)	10.18 (5.726)	0.033
Total coauthored	6.409 (6.641)	5.959 (4.999)	0.567
Solo papers	5.745 (4.451)	4.224 (2.892)	0.003
Time to tenure	7.584 (1.607)	7.520 (1.724)	0.686
Books	0.779 (1.185)	0.571 (0.799)	0.139
Observations	150	100	

This table presents summary statistics for the full sample of sociologists and separately for men and women. All paper and book count variables (*Total Papers*, *Solo-authored*, *Coauthored*, and *Top 5s*) are the number of papers or books an individual had published at the time of tenure.

TABLE 5: SOCIOLOGY: PAPERS AND TENURE

Dep Var: Tenure	Probit (1)	Probit (2)
Total first author	0.050** (0.017)	
Fem x First Author	0.026 (0.040)	
Fraction first author		0.403*** (0.043)
Fem x Frac. First Author		-0.042 (0.172)
Solo papers	0.008 (0.006)	0.000 (0.006)
Fem x Total Solo	0.002 (0.011)	0.007 (0.011)
Total Coauthored	-0.010* (0.004)	0.009 (0.007)
Fem x Total CA	-0.020 (0.017)	0.001 (0.015)
Books	0.063* (0.032)	0.058 (0.035)
Book chapters	0.007 (0.013)	0.005 (0.012)
Female	0.026 (0.114)	0.010 (0.163)
School FE	Yes	Yes
Tenure Year FE	Yes	Yes
Observations	237	209

This table shows the relationship between the number and types of papers an individual publishes and tenure for a sample of sociologists. The dependent variable is a binary variable indicating whether the individual received tenure 6-7 years after being hired at the initial tenure institution. *Total first author* is the number of papers an individual is first author on while *Fraction first author* is the fraction of an individual's papers that s/he was first author on. The equations are estimated using a probit model and the marginal probabilities calculated at the mean are displayed. Standard errors, reported in parentheses, are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 6: ROBUSTNESS CHECKS

	Attrition Fac. List Sample (1)	Journal Rankings AER Equiv. (2)	Over Time (3)	Publication Count Tenure +1 (4)	Tenure +2 (5)
Solo-authored	0.058*** (0.011)	0.057*** (0.010)	0.072*** (0.010)	0.070*** (0.010)	0.069*** (0.011)
Coauthored	0.056** (0.017)	0.059*** (0.013)	0.077*** (0.014)	0.063*** (0.010)	0.053*** (0.008)
Fem x Coauthored	-0.047*** (0.010)	-0.060*** (0.013)	-0.055*** (0.014)	-0.052*** (0.013)	-0.045** (0.014)
Fem x Solo	0.019 (0.015)	0.015 (0.013)	0.011 (0.015)	0.009 (0.014)	0.016 (0.014)
Years to tenure	-0.019* (0.008)	-0.053*** (0.012)	-0.053*** (0.010)	-0.050*** (0.011)	-0.050*** (0.011)
Total coauthors	0.005 (0.011)	0.009 (0.010)	0.002 (0.011)	0.011 (0.009)	0.016* (0.008)
Log Citations	-0.012 (0.015)	0.004 (0.019)	0.007 (0.021)	-0.004 (0.021)	-0.006 (0.022)
Avg Journal Rank	0.002* (0.001)		0.005** (0.001)	0.004** (0.001)	0.004** (0.001)
AER Equiv. Solo		0.028 (0.063)			
AER Equiv. CA		0.298** (0.111)			
Female	0.058 (0.067)	0.088 (0.104)	0.056 (0.100)	0.087 (0.106)	0.040 (0.122)
School FE	Yes	Yes	Yes	Yes	Yes
Tenure Year FE	Yes	Yes	Yes	Yes	Yes
Field FE	Yes	Yes	Yes	Yes	Yes
Observations	278	467	551	549	543

The dependent variable is an indicator for receiving tenure. Column 1 restricts the sample to those schools I received a historical faculty list from. Column 2 uses the number of AER-equivalents as individual has as the paper quality measure. This is broken up into the number of solo-authored AER-equivalents and coauthored AER-equivalents. Column 3 uses historical journal rankings to allow for rankings to change over time and to account for new journals entering. In Columns 4 and 5, I include papers that were published one and two years after an individual went up for tenure in the paper counts. Standard errors are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 7: SURVEY RESULTS

	(1) Men	(2) Women	(3) p-value
<i>Panel A: Beliefs about Returns to Papers</i>			
Coauthored AER	12.1	12.2	0.939
Coauthored AER, Sr. Faculty	9.1	8.8	0.528
Coauthored AER, Jr. Faculty	13.3	13.4	0.796
Solo Top Field	8.0	8.2	0.669
Coauthored Top Field	6.3	6.8	0.223
<i>Panel B: Frequency of Presenting Papers</i>			
Times Presented	3.1	2.2	0.07
Present More Freq. than CA	0.37	0.44	0.20
Observations	300	89	

This table presents the mean responses for men and women to the following survey questions: Panel A: "Suppose a solo authored AER increases your chance of receiving tenure by 15 percent. By how much do you think each of the following increases your change of receiving tenure?" Panel B: "How many times per year do you typically present your solo-authored papers? Are you more or less likely than your coauthors to present a joint paper?" The survey was conducted with a sample of academic economists currently working at a top 35 U.S. economics department.

TABLE 8: ACCOUNTING FOR SORTING ON ABILITY

Dep Var: Tenure	(1)	(2)
	x Avg Coauthor Rank	
Solo-authored	0.081*** (0.015)	
Fem x Solo	0.012 (0.019)	
Coauthored	0.093*** (0.017)	-0.0003 (0.0002)
Fem x Coauthored	-0.053* (0.021)	-0.0003 (0.0002)
Female	0.108 (0.128)	
Avg Journal Rank	0.004** (0.001)	
Tenure Length	-0.056*** (0.012)	
Log Citations	-0.031 (0.024)	
Constant		0.001 (0.001)
School FE	Yes	
Tenure Year FE	Yes	
Field FE	Yes	
Observations	415	

This table presents the results of one regression where the coefficients on the interaction terms (with *Avg. Coauthor Rank*) are displayed in Column 2. *Avg Coauthor Rank* is calculated by taking the mean of the school rank that an individual's coauthors are at when they wrote their joint paper. For example, if a person has two coauthors, one who is at the 5th-ranked school and one who is at the 10th-ranked school, *Avg Coauthor Rank* would be 7.5. Individuals who have no coauthored papers are not included in the sample. Standard errors are clustered by tenure institution. (*= $p < 0.10$, **= $p < 0.05$, ***= $p < 0.01$)

TABLE 9: COAUTHOR SENIORITY

Dep. Variable:	Frac. Sr Coauthors	Tenure
	(1)	(2)
	OLS	Probit
Female	0.043 (0.040)	0.112 (0.124)
Coauthored	0.019 (0.014)	0.078*** (0.015)
Solo-authored	-0.023** (0.008)	0.070*** (0.010)
Fem x Solo		0.005 (0.018)
Fem x Coauthored		-0.059*** (0.014)
Frac. Sr Coauthors		-0.131 (0.072)
Fem x Frac. Sr Coauthors		0.040 (0.102)
Total coauthors	-0.014 (0.011)	0.005 (0.012)
Years to tenure	0.005 (0.009)	-0.038*** (0.010)
Avg Journal Rank	0.001 (0.001)	0.005*** (0.001)
Log Citations	-0.016 (0.013)	-0.010 (0.022)
School FE	Yes	Yes
Tenure Year FE	Yes	Yes
Field FE	Yes	Yes
Observations	507	531

The dependent variable in Column 1 is the fraction of an individual's coauthors that are senior (full professors). The dependent variable in Column 2 is the binary tenure outcome. Column 1 is estimated using OLS and Column 2 uses probit. Standard errors are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 10: PAPER SPLIT BY TOP 5

Dep Var: Tenure		
	(1)	
	Top 5	Non-Top 5
Solo	0.135*** (0.027)	0.057*** (0.011)
Coauthored	0.127*** (0.025)	0.055*** (0.013)
Female x Solo	-0.033 (0.039)	0.028 (0.023)
Female x Coauthored	-0.036 (0.032)	-0.063*** (0.015)
Female	0.047 (0.111)	
Total coauthors	0.008 (0.010)	
Log Citations	-0.010 (0.017)	
Years to tenure	-0.052*** (0.010)	
School FE	Yes	
Tenure Year FE	Yes	
Field FE	Yes	
Observations	535	

This table presents the results of one regression where Column 1 shows the coefficients on the number of top 5 solo and coauthored papers and Column 2 shows the coefficients on the number of non-top 5 solo and coauthored papers. Top 5 papers are those published in the American Economic Review, Econometrica, the Journal of Political Economy, Quarterly Journal of Economics, or the Review of Economic Studies. Standard errors are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 11: RESULTS OVER TIME

	(1)	(2) x Time Trend
Solo-authored	0.099** (0.037)	-0.001 (0.001)
Fem x Solo	0.066 (0.066)	-0.001 (0.002)
Coauthored	0.130*** (0.032)	-0.002 (0.001)
Fem x Coauthored	-0.118* (0.051)	0.002 (0.001)
Female	-0.003 (0.100)	
Total Coauthors	0.001 (0.009)	
Log Citations	0.017 (0.023)	
Constant		0.009 (0.006)
Observations	553	

This table shows the results from one regression where solo and coauthored papers are interacted with a linear time trend in the year an individual is expected to go up for tenure. The coefficients in Column 2 show are the interactions between paper types, author gender, and the time trend. Standard errors are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

TABLE 12: INTERACTION W/ SCHOOL RANK

		(1) Probit x School Rank
Solo-authored	0.091* (0.042)	-0.0002 (0.001)
Coauthored	0.172*** (0.041)	-0.001* (0.001)
Fem x Solo	0.070 (0.063)	-0.001 (0.001)
Fem x Coauthored	-0.154** (0.048)	0.001* (0.001)
Avg Journal Rank	0.003** (0.001)	
Female	0.112 (0.106)	
Years to tenure	-0.048*** (0.010)	
Total coauthors	0.004 (0.010)	
Log Citations	0.001 (0.022)	
Constant	-0.001 (0.003)	
Observations	523	

This table shows the results from one regression where solo and coauthored papers are interacted with the ranking of an individual's tenure institution. *SchoolRank* is defined such that 30 is the highest-ranked school and 1 is the lowest-ranked. The coefficients in Column 2 show are the interactions between paper types, author gender, and school rank. Standard errors are clustered by tenure institution. (*=p<0.10, **=p<0.05, ***=p<0.01)

Appendix A

List of institutions included in analysis

Received faculty list: Brown, Columbia, Duke, Michigan State University, NYU, Northwestern, Ohio State University, Penn State, UC Berkeley, UC San Diego, UCLA, University of Virginia, University of Maryland, University of Michigan, University of Minnesota, University of Pennsylvania, University of Wisconsin-Madison

No faculty list: Boston College, Boston University, California Institute of Technology, Cornell, Harvard, MIT, Princeton, Stanford, University of Southern California, University of Chicago, University of Texas - Austin, University of Rochester, Yale

Appendix B

This simple matching example illustrates how women’s knowledge of the returns to coauthoring affects their authorship decisions. It describes the contexts in which we would (1) expect high ability men and women to collaborate, making the decision not to promote collaborating women sub-optimal, and (2) expect low ability women and high ability men to collaborate, making the decision not to tenure collaborating women optimal. The model abstracts from the employer’s problem, assuming that employers want to promote anyone who is high ability and not promote anyone who is low ability, and focuses on how knowledge of the true returns to coauthoring could lead to sorting among workers.

Setup

There are two types of agents: employers and workers. Workers produce papers and can choose whether to work alone or to collaborate. The quality of the paper depends on the worker’s ability, as well as that of the collaborator if the worker collaborates. The employer uses the quality of the paper as a signal to infer the worker’s type so the worker wants to maximize the quality of the paper subject to production costs.

Workers are either high or low ability, ($a_i \in \{h, l\}$), and belong to an identifiable group, men or women ($g_i \in \{m, w\}$). I make the simplifying assumption that workers know each other’s ability but the employer does not. As mentioned earlier, workers choose whether to work alone or collaborate, $c_i \in \{S, CA\}$, and are trying to maximize the quality of the paper. Paper quality is a function of each collaborator’s type: $f(a_{i,g})$ if $c = S$ and

$f(a_{i,g}, a_{j,g})$ if $c = CA$. I assume that high ability men and women produce the same quality of papers ($f(h_w) = f(h_m)$) as do low ability men and women.

The payoffs to producing solo and coauthored papers respectively are

$$\pi_{i,S} = f(a_{i,g}) - \kappa_S \quad (8)$$

$$\pi_{i,CA} = f(a_{i,g}, a_{j,g}) - \kappa_{CA} \quad (9)$$

where the costs of producing solo and coauthored papers, κ_S and κ_{CA} , are assumed to be constants with $\kappa_S \neq \kappa_{CA}$.

Assortative Matching with Equal Credit for Papers

Consider a woman's final payoff to producing a solo-authored paper and a paper coauthored with a man:

$$\pi_S = f(a_w) - \kappa_S$$

$$\pi_{CA} = f(a_w, a_m) - \kappa_{CA}$$

If types are complimentary, the quality of a paper is higher when high ability women work with high ability men:

$$f(h_w, h_m) - f(l_w, h_m) > f(h_w, l_m) - f(l_w, l_m) \quad (10)$$

In this case, a high ability woman is willing to offer a high ability man $f(h_w, h_m) - f(h_w, l_m)$ to collaborate, while a low ability woman is willing to offer $f(l_w, h_m) - f(l_w, l_m)$. Inequality (10) states that $f(l_w, h_m) - f(l_w, l_m) < f(h_w, h_m) - f(h_w, l_m)$, meaning that high ability women can outbid low types. Therefore, high types will coauthor and low types will coauthor as long as the costs of coauthoring do not outweigh the benefits. For high types to work together, the following conditions must be true for both men and women:

$$f(h_w, h_m) - f(h_w) \geq \kappa_{CA} - \kappa_S \quad (11)$$

$$f(h_w, h_m) - f(h_m) \geq \kappa_{CA} - \kappa_S \quad (12)$$

If at least one of (11) or (12) does not hold, there will be no coauthoring between men and women. Because we assume that $f(h_w) = f(h_m)$, if (11) does not hold, neither does (12) and vice versa. Since $f(h_w, h_m) > f(h_w, l_m) = f(l_w, h_m)$, high ability workers who do not want to collaborate with other high ability workers will not want to collaborate with low

ability workers either.

Thus, in the case of assortative matching in which men and women have the same returns to papers, men and women will only coauthor with the same ability type. A woman coauthoring with a high ability man thus provides the employer with a signal that she too is a high type, and women who coauthor with men should be no less likely to receive tenure than high ability men. Note that this would also be the case if women received less credit for papers but did not know it. That is, if $f_w(h_w, h_m) < f_m(h_w, h_m)$ but women believe these to be equal.

Assortative Matching with Unequal Credit for Papers

Now assume that women receive less credit for their collaborative work and that they know this. Specifically, let the payoff to a woman who coauthors with a man be $\hat{\pi}_{CA} = \beta f(m_a, w_a) - \kappa_{CA}$ where $\beta < 1$. The payoffs to coauthoring for high types are now

$$\text{Woman} : \beta f(h_w, h_m) - f(h_w) > \kappa_{CA} - \kappa_S \quad (13)$$

$$\text{Man} : f(h_w, h_m) - f(h_m) > \kappa_{CA} - \kappa_S \quad (14)$$

If both ((13)) and (14)) hold, we are back in the case of assortative matching. Both groups are willing to collaborate and high type women are able to outbid low type women. However, if β is sufficiently small, ((13)) becomes less likely to hold and high ability women will choose to solo author.

Since payoffs between men and women are now different, there are some cases in which high-ability men and low-ability women might collaborate. In particular, high-ability men will be willing to coauthor with low-ability women if

$$f(l_w, h_m) - f(m_h) > \kappa_{CA} - \kappa_S \quad (15)$$

and low-ability women will coauthor if

$$\beta f(l_w, h_m) - f(w_l) > \kappa_{CA} - \kappa_S \quad (16)$$

Note that $\beta f(h_w, h_m) - f(h_w) < \kappa_{CA} - \kappa_S$ does not imply that $\beta f(l_w, h_m) - f(l_w) < \kappa_{CA} - \kappa_S$ since $f(h_w) > f(l_w)$. Therefore, if $\beta f(l_w, h_m)$ is sufficiently larger than $f(l_w)$ for low-ability women (that is, the paper is greatly improved with the help of a coauthor), then we might still see low-type women wanting to coauthor with men. If the cost savings of coauthoring are large enough and if coauthoring with a low type does not reduce the

quality of the paper, men will still be willing to coauthor with low ability women. Of course, many high-ability men will choose to coauthor with other high-ability men rather than a low-ability woman. The purpose of this example is to illustrate the circumstances under which we would see women sorting into solo and coauthoring by ability. For this, we need to assume that at least some high-ability men must coauthor with a woman.

Overall, if women do not know that they have lower returns to coauthoring, we will see assortative matching. In this case, employers who believe a man to be high ability should also believe his female collaborator is high ability. Denial of tenure in this case is sub-optimal. However, if women know the returns to coauthoring, high ability women will solo-author or work with other high-ability women and tenure denial is rational.

This example only considered two types of workers, high and low ability. Extending it to more types does not change the results. Assortative matching will ensure that workers will always match with workers of their type. When women know the true returns to coauthoring, the highest ability women will work alone and any male/female matching will require that the woman is slightly lower ability than the man.

Diversity in economics: a gender analysis of Italian academic production

Giulia Zacchia¹

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ABSTRACT

Economists' infamous failure at predicting the recent financial crisis has brought new impetus to studies on diversity in the economics profession. Such studies have underlined how diversity plays a prominent role in enriching economic analyses. The main purpose of this article is to provide new insights into the degree of gender diversity: rather than looking at women's presence in academia only, we extend our focus to the research production by academic economists in the last few decades. The tendency to identify research quality with standardised bibliometric indicators –i.e. impact factor or h index – had consequences in term of heterogeneity of researchers within institutions (at all levels), and, most of all, in terms of pluralism of research interests. Our new data uncovers a double convergence path: i) a progressive reduction in the variety of research interests of women and men economists; ii) a tendency to “homologate” with international standards of perceived research ‘excellence’.

As a consequence of such an impoverishment of pluralism in research, the academic production of both men and women has been drifting away from non-mainstream fields, and, in particular, from heterodox approaches and from the history of economic thought. Since women's academic careers remain markedly characterized by a strong vertical segregation, we find that for women this effect is even stronger since they are more subject to homologating their research activities with respect to that of their male colleagues.

¹ Sapienza University of Rome; giulia.zacchia@uniroma1.it.

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“(...) there are not enough women within economics to provide a good statistical evidence. The only reason to research gender differences in economics should be to learn about economic profession (...)” (Kahn, 1995, p. 203)

1 Introduction

In a recent article published in the *Journal of Economic Perspectives*, Bayer and Rouse (2016) redrew attention to the importance of increasing diversity in the economics profession. With this in mind, they proposed a new approach to investigate, disseminate and discover data, analyses, and prescriptions. They concluded that: “the field of economics is behind others in its progress on diversity concerns” (p. 238) and described “institutional discrimination” as the adverse treatment of members of minority groups due to explicit or implicit behavioural rules.

In this work, we argue that the concept of diversity in the economics profession is two-dimensional, including not only heterogeneity (in terms of gender, ethnicity, and so on) of researchers within institutions (at all levels), but also pluralism of research interests. In order to combine those two dimensions, our analysis focuses on detecting gender differences in publication topics of Italian academic economists in the last two decades. We consider Italy as case study because, from the 2010 reform of university system, bibliometric indexes have been increasingly used for the purpose of personnel selection, in particular in economics. Those new rules for recruitment of academic staff are creating a more competitive environment heavily founded on rigid standardised indexes of perceive “scientific” excellence. Therefore, we have the opportunity to analyze how social context, mainly in terms of institutional changes, can affect the development of economic thought within the economic profession and if women tend to be more exposed to those phenomena.

The first crucial step consists in the identification of men and women economists’ research interests. From this point of view, our work builds on a small but growing literature that departs from Backhouse et al. (1997), which provides a quantitative analysis of economists’ output. More recently, the same type of analysis has been carried out by Kelly and Bruestle (2011), Kosnik (2015), and Rath and Wohlrabe (2016). All these studies investigate the changes in general research interests of economists over time. Specific quantitative analyses to isolate trends in single sub-fields in economics, such as the field that focuses on the history of economic thought, have been carried out by Marcuzzo and Zacchia (2017) and Duarte and Giraud (2016) but not much work exists that maps publication trends from a gender perspective. Among the few contributions, Forget (1995) considers the differences between the subject of PhD dissertations in economics and articles published by women in academic journals from 1912 to 1940 in the US. She identifies four

different survival strategies pursued by women economists to compete in academic career paths with their male colleagues.²

Inspired by Forget's (1995) analysis, this article concentrates on gender differences in the evolution of academic production mainly in terms of research fields to describe recent trends among economists and also across generations.

In line with the recent tendency to move to mainstream fields of research in economics, detected in the Anglo-Saxon world by Lee et al. (2013) as well as in France by Chavance and Labrousse (2016) and in Italy by Corsi et al. (2010, forthcoming), we found that women are following a "homologation"³ strategy: they are gradually changing their main research areas to fields where they had been traditionally under-represented (i.e. industrial organisation and microeconomics).

Moreover, they decreased, more than their male colleagues, the production of research in heterodox approaches and history of economic thought, which are usually less visible and therefore characterized by lower bibliometric indexes. Analysing the PhD dissertations, we find that the degree of gender convergence in research increases along the hierarchical structure of the academic career path: homologation is stronger for full and associate professors than it is for PhD students.

The paper is organized as follows: section 2 presents a literature review on gender differences in scientific production in economics and introduces the Italian context. In the process we provide evidence of the under-representation of women in academia and of the gender differences in the career paths in economics in such context. Section 3 describes the data and methodology used for the identification of trends in academic production. In section 4, we present the results of the analysis, focusing mainly on non-mainstream fields (such as heterodox approaches and history of economic thought) while in section 5 we analyze differences across generations by studying gender differences in PhD dissertation topics. Finally, we draw some conclusions providing research policy recommendations and some directions for future research.

² The four strategies identified by Forget (1995) are: (i) separatism, or better, concentration of women's publications in research fields where there is a comparative advantage and less male competition; (ii) subordination, defined as women's willingness to remain in second-class role positions or second-rate institutions; (iii) super performance, in the sense of the effort to out-perform male colleagues; (iv) and finally innovation meant as research and work outside the traditional standards of success.

³ We use here the term "homologation" following Pottage's perspective that embodies also the gender dimension since homologation deny the possibility of a specific feminine culture. According to Pottage (1994), in fact, "homologation (...) preserves the reproduction of culture in the image of a masculine morphology - a morphology sculpted and sustained through techniques of identification and attachment, which institute a self-predicated upon the denigration of otherness; or, specifically, an otherness, which has been attributed a feminine gender".

2 Background

The chronic underrepresentation of women researchers across the European Union (EU) has been reported by the League of European Research Universities (LERU)⁴, which underlines how “academia in Europe is still losing a considerable amount of its female intellectual capacity. Whereas the ratio between men and women is relatively balanced up to the doctorate, there is a significant decrease afterwards”.⁵ This triggers a ‘leaky pipeline’ phenomenon, whereby an increase in the number of women graduates does not lead to an increase in the proportion of women amongst researchers (Jensen, 2005) and especially at the top levels of the academic career.

In fact, women and men have different career paths in research: at a lower grade (among researchers) gender differences in terms of presence stand at 10 percentage points, while at career top – full professor level - it reaches 58 percentage points. According to the last data available (She Figures 2015⁶) in Europe women count for only 20.9% of full professors, showing very limited progress compared to 2010 (19.5%). There are, of course, notable country and research field-specific variations. For example, in the social science fields in US universities, Ginther and Khan (2004; 2006) report that gender gaps in tenure and promotion rates in economics are higher than in other areas. Ceci et al. (2014) also find evidence of larger gender gaps in tenure rates, salaries, and job satisfaction in economics than in any other math-intensive field.

In the literature the causes of this disparity remain controversial. Different methods are used to investigate the main determinants of gender imbalance in academic positions: qualitative research based on interviews (Bagilhole, 1993), quantitative research based on surveys and questionnaires (McGuire et al., 2004; Wright et al., 2003), as well as analyses of selection procedures within academic departments and faculties (Bagues et al., 2017; Ceci et al., 2014; De Paola, 2016) or public selection procedures (Bosquet et al., 2013; Pautasso, 2015). Researchers have attempted to explain gender differences in promotion rates by looking at discrepancies in productivity (Bettio and Rosselli, 2001; Ginther and Khan, 2004; Sarsons, 2015; Baccini et al., 2014), in task allocations at work (Vesterlund et al., 2013), and at the effect of child-bearing and motherhood on women’s career (Ceci et al., 2014; Ginther and Khan, 2006). Recent behavioural and experimental studies stress the relevance of gender differences in competitive environments and highlight the impact of the gender composition of selection committees on the likelihood of obtaining tenure (Bagues et al., 2017; De Paola et al., 2016; Checchi et al., 2015). Many studies, supporting the idea of a male homophily bias, point out that gender inequalities in universities are driven by mostly male-dominated networks, or, as in the case of Italy, by male-dominated networks in Italian economic journals’ editorial boards (Addis and

⁴ LERU is an association of 21 leading research-intensive universities in the EU created to define concrete recommendations for policymakers, universities, researchers and other stakeholders for an inclusive and innovative academic environment.

⁵ Maes et al. (2012, p. 5).

⁶ The She Figures report is a complete report about gender differences in careers and decision-making in Science.

Villa, 2003). Studying networks, Blau et al. (2010) and, for economics, Hale and Regev (2014) report that the lack of role models in more senior positions in academia is a key factor that can affect young researchers' choices and their career path. In this sense, women students may expect less discrimination and better outcomes when they study under women's instructors or work with women mentors (Carrell et al., 2010). Even if the results of these studies lead to heterogeneous conclusions, what clearly emerges is the reduced probability of women achieving promotion or tenure, a lower probability of obtaining leadership roles, such as division head or department head, as well as lower salaries with respect to their male counterparts.

Focusing on gender psychological differences in self-confidence, risk aversion, and competitiveness, a new strand of literature (Abramo et al., 2016; Bagues et al., 2017; De Paola et al., 2016) investigates if, in Italian academia, the number of women present in search committees for promotion to associate and full professorship has an impact on the number of women candidates and their probability of success. As far as Italy is concerned, most of the literature⁷ reveals that the introduction in 2012 of the new recruitment and promotion system⁸ has not increased women's probability of being effectively promoted both for associate and full professorship. According to De Paola et al. (2016) the probability of women of being promoted is, *ceteris paribus*, 12% and 20% less than that of their men colleagues, respectively.

The new promotion mechanism, while bringing higher transparency both in committee selection and evaluation procedures, has not mitigated the 'leaky pipeline' effect in Italy. It is still significantly more difficult for women to access Italian academia, as it is to progress in their career. The analysis of recent data⁹ reveals that women represent 36.5% of Italian academic staff. In economics, the share of women is even lower (30.3%); women account for 16% of full professors and 32% of associate professors, while in the lower ranks they represent 46% of researchers.¹⁰

⁷ In table A of the Appendix, we provide a detailed review of studies about gender differences in the economics profession in Italy.

⁸ In Italy, from a gender perspective, it is possible to identify two main turning points in the recruitment and promotion system in universities: (i) In 2008 (Decree-Law no. 180), a new system of selection for commissioners was introduced. It involves a random drawing (by lottery) of four external commissioners (to be added to an internal commissioner appointed by the Faculty that holds the competition) out of a pool of previously elected professors of the same research field. This procedure aims to avoid the creation of ad hoc committees and to expand the circle of 'gate keepers'. The mechanism of random selection of the members of the committees had a significant effect: in 2008, there was the highest percentage of competitions with at least one women commissioner (from 34.7% of all pre-2008 competitions in economics to 44.4% in 2008). (ii) In 2012 the rules governing competitions for associate and full professors have undergone a significant change (Decree Law no. 76). Since 2012, researchers who wish to be promoted to full and associate professorship must be eligible for National Scientific Qualification (Abilitazione Scientifica Nazionale, ASN). For each research area, candidates are evaluated by a committee made up of 5 members; only those who meet the minimum requirements, in terms of research production, fixed at the national level by the National Agency for the Evaluation of University and Research (Agenzia Nazionale per la Valutazione dell'Università e Ricerca, ANVUR) may be eligible to compete for promotion to a higher academic rank.

⁹ Data by the Ministry of Research and University, updated to 12/31/2015, available at:

<http://cercauniversita.cineca.it/php5/docenti/cerca.php>

¹⁰ I consider the subfield of Economics named SECS-P01.

The gender gap in academic promotion in economics is evident in the persistent gender differences in the hierarchical structure: for women, there is a classic pyramid structure with only 19% of women full professors at the top, followed by associate professors (27%) and researchers at the base of the pyramid (54%). By contrast, for men, the hierarchical structure assumes the form of a reverse pyramid with the largest percentage represented by full professors (41%), followed by associate professors (30%) and finally by researchers (29%). Since 2000, the pyramidal structure has remained the same for women, even if the share of full professors has moved from 15% to 19% (Fig. 1).

Looking at PhD students, on the other hand, the picture is completely different; even though the number of courses in economics offered by Italian universities has been rather stable in the last decade (43 courses, on average), the number of students has more than doubled (45 students in 2002 and 108 in 2014). From 2002 to 2014 (last data available),¹¹ the share of women pursuing PhDs in economics increased from 41.8% in 2002 to 42.5% in 2014. In order to account for the difficulties faced by women in gaining access to top positions we compute the Glass Ceiling Index (GCI) for Italian academic economists¹². The GCI amounts to 1.85 in 2015 compared to 2.55 in 2000, indicating that there has been some progress towards reducing the glass ceiling effect, although women continue to be less represented in full professorship than in general academia.

The under-representation of women in economics is not only an Italian phenomenon; in the UK, for example, women account for only less than 27% of academic staff.¹³ By academic position, only 14.1% of full professors are women, while at the bottom of the pyramid (considering full time and part time lecturers and researchers altogether) women are more numerous (60%) than their male colleagues. Despite this, women at the top of the academic profession passed from only 7% in 2000 to 14% in 2014. Instead, for men, the inversed-funnel-shaped hierarchical structure observed in 2000, with the largest number represented by researchers, followed by associate and full professors equally distributed, has turned into a hourglass-shaped structure thanks to the increase in the share of full professors (from 24.8% to 33%).

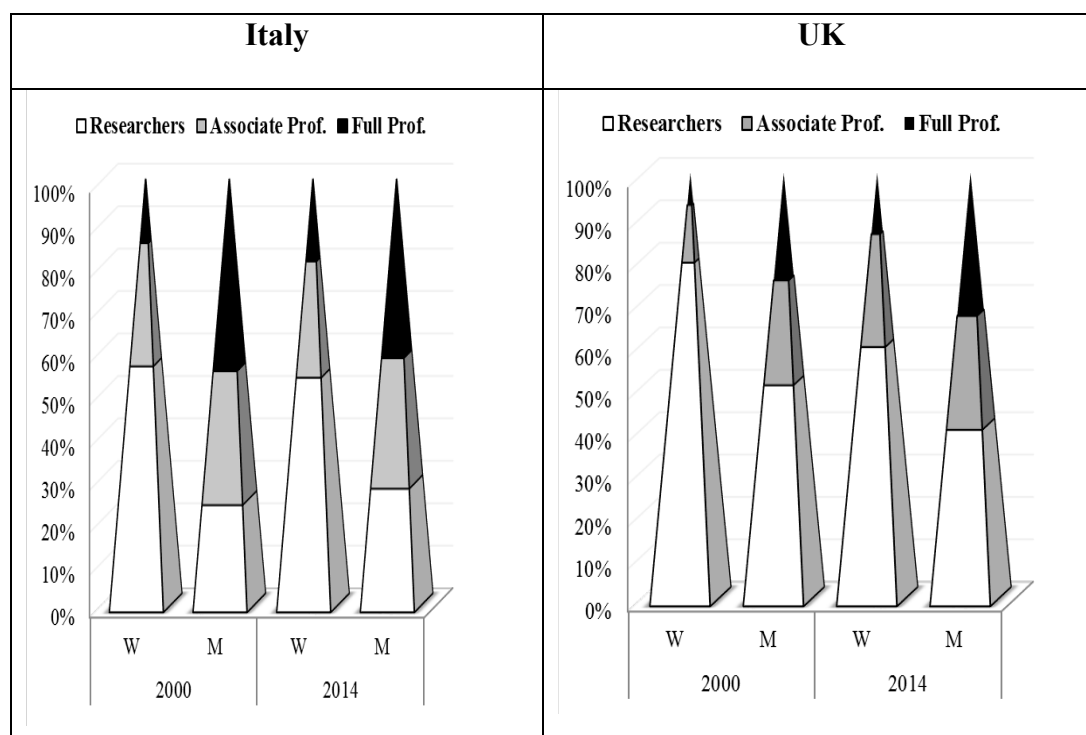
¹¹Data by the Ministry of Research and University, available at:

<http://statistica.miur.it/scripts/postlaurea/vpostlaurea.asp>

¹² The Glass Ceiling Index (GCI) is elaborated by the European Commission in the She Figures report. The index compares the proportion of women in academia to the proportion of women in top academic positions (full professors). The GCI can range from 0 to infinity. A GCI of 1 indicates that there is no difference between women and men in terms of their chances of being promoted. A score of less than 1 means that women are more represented at the top level than in general academia and a GCI score of more than 1 indicates the presence of a glass ceiling effect, meaning that women are less represented in full-professorship positions than in general academia. In other words, the interpretation of the GCI is that the higher the value, the stronger the glass ceiling effect and the more difficult it is for women to move into a higher position.

¹³Mitka et al. (2015).

Fig. 1 Hierarchical structure for academic economists by sex: Italy and the UK



The definition of heterogeneity in research activity in economics from a gender perspective is more complex. Albelda (1997) finds that male economists who are members of the American Economic Association (AEA) are much less interested with respect to women in topics such as women's participation in the labor force, the impact of fiscal and monetary policies on women and family structures, wage discrimination, and the economic status of minority women. Boschini and Sjögren (2007) also find large differences in the share of women across research fields, as "female presence is roughly three times higher in Health, Education, and Welfare than in Macroeconomics and Monetary Economics" (p. 328). Moreover, both Hale and Regev (2014) and Dolado et al. (2008) report that women's interests are concentrated in fewer research fields, influenced by a path-dependence effect: the higher the share of women in a given research field, the higher the percentage of women academic economists who write about that specific research field. However, Dolado et al. (2008) underline that this effect is less evident for new generations, since younger women researchers increasingly seek to access research areas in which women were previously under-represented. All of the above-mentioned studies focus on 'excellence': Hale and Regev (2014) analyze members of the AEA in ten of the top economics departments in the US, Boschini and Sjögren (2007) study co-authorship of articles published in three top economics journals, and Dolado et al. (2008) consider authors in distinguished

economics departments. Here we prefer to abandon the dimension of ‘excellence’ and study, from a gender perspective, the scientific production of tenured economists, in order to detect the status quo in diversity in economics in Italy and how it has evolved in the last decades.

We believe that the case of Italy, beside its intrinsic interest, can be paradigmatic because of some significant changes in the evolution of diversity in the economic thought probably driven by recent institutional changes, mainly in terms of the abuse of bibliometrics for personnel selection and for the allocation of public resources to universities and public research institutions. Since World War II, pluralism has been a key element of economic thought in Italy. As reported by Pasinetti and Roncaglia (2006), the plurality of schools of economic thought can be considered a reaction to Fascism, which forced many economists to emigrate. Consequently, there has been a simultaneous development, after the war, of different schools of economic thought, particularly studies outside the mainstream, mainly close to post-Keynesian, neo-Ricardian and Sraffian economics, and to evolutionary economics and the history of economic thought. However things are changing; as reported by Corsi et al. (2010, 2017), pluralism could be at risk because the current Italian evaluation assessment, implicitly based on criteria of closeness to mainstream economics, could be determining a change in research interests, in the middle- or long-run. Such a change is expected to induce a homologation towards mainstream economics and the progressive disappearance of heterodox economics, as described by Lee et al. (2013) for the UK as a consequence of the Research Assessment Exercise (RAE)¹⁴.

3 Data sources and research design

To explore the evolution of gender differences in economics, we used *Econlit* as a database. The choice of *Econlit* with respect to other similar databases was dictated by the fact that it includes journals that are selected for having peer-reviewed economic content¹⁵ and detailed information about the articles’ sub-field classification.

We follow the methodology reported by Dolado et al. (2008) for identifying research fields using the JEL codes recorded in *Econlit*. JEL codes are alphanumerical codes made up of three levels used by authors or editors to classify scholarly literature in the field of economics. The first level of a JEL code, that is the information analysed in this paper, is a letter. The letter points to a broad classification made up of 20 classes (there are 19 codes plus one residual category). The second level (128 classes) consists of a single letter followed by a single digit. At the third level, the code consists of a single letter followed by two digits. The

¹⁴Lee et al. (2013) empirically test the progressive decline in variability in approaches and pluralism in research since 1992 in UK in the context of the RAE (for the public resources allocation to Universities) and local department decision making.

¹⁵ This is not the case of RePEc, where journals are not selected, even if they are now creating a committee on quality control for journals admitted to be indexed in RePEc (see <https://blog.repec.org/2016/06/13/quality-control-committee-looking-for-volunteer/>).

current classification of research areas in *Econlit* was introduced in 1991.¹⁶ Our analysis focuses on JEL codes rather than publications. This means that we double-counted an article with two JEL codes, since it belongs to two different fields. We could not weigh the JEL codes to account for their importance in a single article because *Econlit* mainly records them in an alphabetical order rather than in order of priority as reported by the authors.

Thanks to a careful data collection activity and scrupulous data cleaning aimed at limiting problems of homonymy as much as possible, we have created two databases. Those are used to analyze the scientific production of economists by gender both within the same cohort (we refer to academic position rather than age, since this information is not available) and among different cohorts (structured professors and PhD students).

The first database refers to the time span 1991-2014.¹⁷ It contains the academic production of permanent faculty in economics that were associate or full professors in Italian universities in the period 2004-2014. Such information has been gathered from the Italian Ministry of Research and University. This enables us to perform a panel analysis of the publications of 804 full and associate professors. Women account for 24% of the sample. The total number of publications analysed is 12,931, 18% of which are written by women (see Table B in appendix for a description of the sample). We decided to analyze the evolution of academic production by creating five sub-periods (1=1991-1995; 2=1996-2000; 3=2001-2005; 4=2006-2010; 5=2011-2014) of five years each.¹⁸

With the purpose of analysing gender differences among Italian economists, we compute the evolution of the Duncan (1955) segregation index across the different research fields in the five identified sub-periods. The index is defined as:

$$S = \frac{1}{2} \sum_{i=1}^n |m_i - w_i|$$

where w_i (m_i) is the proportion of women (men) who wrote in the research field i in the considered sub-period. This index computes the proportion of women (men) who have to swap fields with a man (woman) for both sexes to be represented in all fields in a way that reflects their proportion in the whole system. It describes the extent to which women and men are unevenly distributed over the 19 research fields in

¹⁶ For a complete review of the history of JEL code system see Cherrier (forthcoming).

¹⁷ We consider publications only from 1991 in order to avoid conversion problems with earlier JEL codes classifications.

¹⁸ These coincide with those used by the Italian National Scientific Qualification (Abilitazione Scientifica Nazionale) in order to evaluate the overall number of articles published in scientific journals and book chapters written by researchers applying for a promotion to associate professorship. Moreover, Björk and Solomon (2013) report that economics journals typically have average review-times (submission to publication) close to two years, so a five-year period seems appropriate to allow us to detect changes in trends.

economics (JEL codes¹⁹), so it measures the distance (in percentage) from an equal distribution of women and men across JEL codes, under the hypothesis that homologation implies an identical distribution of women and men over all areas. In particular, 0% indicates equal distribution across fields, while 100% indicates that women and men are interested in completely different research fields.

We also propose a different index of segregation under the hypothesis that homologation implies a distribution of women (or men) across fields identical to the distribution of research fields in the top 10 economic journals,²⁰ according to the following formula:

$$S_g = \frac{1}{2} \sum_{i=1}^n |g_i - t_i|$$

where g_i is the proportion of women or men that wrote in the JEL code i and t_i the share of JEL code i in the 10 top journals. The evolution of the index over years is used as a proxy of the convergence rate to a univocal profile of ‘top economist’. The new segregation index has been computed, separately for women and men, in the five sub-periods.

The second dataset enables an analysis of gender gaps in research fields at different stages of the academic career that reflects the situation among younger Italian economists. The identification of younger generations of economists is connected to the academic position rather than age. We consider the award of a PhD as the first step of an academic career that may culminate with full professorship, following the analysis of Italian PhDs in economics by Baccini and Marcuzzo (2009).²¹ For this purpose, we created a database containing information about PhD dissertations, gathering data from OPAC. This is a data set created and managed by the National Central Library of Florence, which, in accordance with the Presidential Decree 382/80 and Ministerial Decree 224/99, collects PhD theses from all Italian universities. For economics, by now, the most detailed information is available from 44 Italian universities from 2003 to 2006. The research fields of the PhD theses are identified according to the JEL codes in *Econlit*. For those not recorded in *Econlit*, we assigned JEL codes by looking at the title of the dissertation and the information reported in the OPAC database. We also collected the number of publications of their authors in the five years after the thesis defence and their academic position, if any, in the Italian universities after 10 years from the end of their studies. We analysed 536 PhD theses in economics; women represent 43.5% of the PhD candidates considered.

¹⁹ We do not consider the miscellaneous JEL code (Y) because it is a residual category created to include unclassifiable objects in the classification system, mainly for editorial convenience. It includes table and charts, introductory material or book reviews that do not give any information about the research field preferences.

²⁰ We consider the first 10 economic journals ranked in Kalaitzidakis et al. (2011): American Economic Review; Quarterly Journal of Economics; Journal of Political Economy; Econometrica; Review of Economic Studies; Journal of Monetary Economics; Review of Economics and Statistics; Journal of Economic Perspectives; Journal of Economic Theory; The Economic Journal.

²¹ Baccini and Marcuzzo (2009) find that in Italy PhD students, after they have defended their thesis, are mainly employed in Italian universities (38.9% as research fellows and 23.7% as full-time academic staff).

4 Main results: *Econlit* database

We analysed the aggregate JEL codes of all publications authored by men and women economists from 1991 to 2014, and we find two main trends in the production of Italian academic economists: (i) a decrease in specialization, more evident for women, that is in the tendency, common to both men and women, to concentrate publications in few research areas; (ii) an increase in authors' visibility, in terms of number of publications recorded in *Econlit*, in particular in the 2006-2010 period.²² It is worth noting that the first national three-year research evaluation exercise (VTR 2001-2003), introduced in Italy in 2006 by Decree N. 2206 of 16 December 2003, has raised a harsh debate about bibliometric criteria.

In the VTR 2001-2003, it was explicitly stated that 'quality', 'relevance', 'originality' and 'internationalization' of research products were central to the allocation of public funds. In this scenario, women academic economists seem to quickly adapt to the new rules of the game, by being more productive and visible in their scientific communities. In fact, women's visibility has increased from 14% in 1991-1995 to 20% in 2011-2014. For all the different types of publications recorded in *Econlit* (book, collective volume articles, journal articles and working papers) the share of women authors eventually increased. From a gender perspective, in the last time span considered, we find a substantial change in the share of women in different research fields. In particular, women have begun writing more in research fields where they had been previously under-represented, such as economic history (N) (their visibility in this field has grown from 7% in 1991-1995 to 40% in 2011-2014)²³ and mathematical and quantitative methods (C) (their presence has increased from 7% to 21%). In public economics (H) alone women have reduced their visibility as compared to the 1991-1995 period. In order to trace some tendencies in the research preferences of Italian economists, we calculate the JEL codes' mean frequencies by periods and sex. We performed a χ^2 test to confirm whether there are significant differences in the distribution of men and women across research fields by period. The results (see Tab. 1) indicate that the difference is significant in all the five periods considered.

There are mainly three common trends both for men and women:

- (i) a sharp reduction in publications on the history of economic thought (HET), in line with the international contraction of the share of HET articles;²⁴
- (ii) a decreased interest in international economics (F), economic system (P) and macroeconomics (E);
- (iii) an increase in output examining financial economics (G), economic development and growth (Q) mainly pulled by the international economic crisis and publications about environmental and ecological economics (R).

²² For the 2011-2014 period the reduction in the number of publications is due to a delay in updating *Econlit* database, since the 2013-2014 production is under-represented.

²³ An increased share of women in economic history from 2000 has been detected also by Casalena (2016) in her study about trends in the historical profession from World War II.

²⁴ For a complete analysis of international trends in HET see Marcuzzo, Zacchia (2017).

There are indeed some important gender differences in the direction of the changes in research preferences for public economics (H) and labor and demographic economics (J); in fact, while women tend to reduce their specialization in these research fields, in recent years men have increased their publications. For microeconomics (D), instead, we observe the opposite phenomenon: women have increased their interest by 2.4 percentage points since the 90s, while men's interest has decreased by almost 1.2 percentage points.

Tab. 1. Research preferences by sex (%): mean period frequencies

	1991-1995		1996-2000		2001-2005		2006-2010		2011-2014	
	W	M	W	M	W	M	W	M	W	M
A. General Economics and Teaching	1.1%	1.1%	0.2%	0.8%	0.3%	0.7%	0.5%	0.7%	0.5%	0.4%
B. History of Economic Thought, Methodology, and Heterodox Approaches	16.0%	9.2%	4.6%	6.6%	4.9%	6.1%	3.0%	4.8%	3.5%	2.2%
C. Mathematical and Quantitative Methods	1.4%	3.3%	4%	3.6%	2.1%	2.5%	2.4%	4.1%	3.8%	3.8%
D. Microeconomics	10.4%	13.9%	11.2%	14.6%	9.9%	13.1%	10.3%	12.9%	12.8%	12.7%
E. Macroeconomics and Monetary Economics	7.3%	21.0%	11.1%	16.9%	8.6%	13.9%	7.8%	12.1%	5.4%	13.1%
F. International Economics	7.6%	9%	10.9%	8.9%	8.6%	8.4%	6.3%	6.4%	4.6%	4.9%
G. Financial Economics	6.2%	5.2%	4.7%	4.7%	5.8%	6.7%	6.8%	6.5%	6%	8.1%
H. Public Economics	10.9%	4.9%	7.5%	4.7%	7.6%	5.8%	7%	5.4%	6.5%	6.3%
I. Health, Education, and Welfare	0.8%	0.8%	1.6%	1.6%	2.2%	2.0%	5%	2.8%	7.4%	3%
J. Labor and Demographic Economics	14.3%	8.8%	15.2%	9.1%	13.4%	8.8%	10.3%	8.3%	12.3%	9.6%
K. Law and Economics	0.8%	0.6%	0.5%	1.1%	1%	1.4%	1%	1.5%	1.6%	1.3%
L. Industrial Organization	8.7%	6.6%	9.3%	7.7%	10.9%	11.3%	12.9%	12%	10.6%	11.4%
M. Business Administration and Business Economics, Marketing, Accounting, Personnel Economics	0.3%	0.5%	0.2%	0.4%	1.7%	0.9%	1.6%	1.5%	1.8%	1.3%
N. Economic History	0.6%	1.4%	1.1%	0.8%	0.4%	0.8%	1%	0.7%	1.3%	0.6%
O. Economic Development, Innovation, Technological Change, and Growth	5.9%	7.9%	8.1%	10.8%	9.3%	8.7%	8.3%	8.8%	8.5%	9.3%
P. Economic Systems	3.1%	3.1%	1.9%	2.8%	3.6%	2.1%	2.4%	1.7%	1.2%	1.6%
Q. Agricultural and Natural Resource Economics, Environmental and Ecological Economics	1.4%	1.4%	1.3%	1.9%	2.4%	1.9%	2.7%	3.3%	4.3%	5.1%
R. Urban, Rural, Regional, Real Estate, Transportation Economics	3.4%	1.3%	6.2%	2.9%	6.5%	4.5%	9.2%	5.3%	6.3%	4%
Z. Other Special Topics	0.0%	0.2%	0.3%	0.2%	0.9%	0.6%	1.8%	1.2%	1.7%	1.4%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Test χ^2 H ₀ : distribution of men = distribution of women	χ^2 (18)=93.9***		χ^2 (18)=125.7***		χ^2 (18)= 150.5***		χ^2 (18) =208.3***		χ^2 (18)= 125.7***	
Test χ^2 H ₀ : distribution of women is the same in the five periods	χ^2 (72) = 464.8***									
Test χ^2 H ₀ : distribution of men is the same in the five periods	χ^2 (72) = 998.5***									

Note: main research fields per period in bold
asterisks denote level of significance *** 1%

Nevertheless, the main evidence emerging from the data is the following: while for men, the main research fields considered (macroeconomics, monetary economics -E- and microeconomics -D) have been the same in all periods, for women economists, main research fields have gradually shifted from history of economic thought (B) and labor and demographic economics (J) to industrial organization (L) and microeconomics

(D), fields where they had been traditionally under-represented. This evidence is in contrast with the results by Hale and Regev (2014), which suggest that academic disciplines with very few women attract fewer women. It would be interesting to keep analyzing this phenomenon in order to identify whether it is an outlier or a new trend to be studied.

We also examined the evolution of the Duncan segregation index to identify how gender differences in research fields' publications changed in the last period. As reported in Fig. 2.a, there is a clear trend towards a reduction in gender segregation among different fields; homology is higher in 2001-2005, which means that women and men progressively tend to undertake research in the same areas, and their publications tend to converge towards the same research fields. From then on, the index has experienced only small variations. It is important here to stress that changes in the Duncan segregation index are only due to changes in preferences of researchers and not to changes in the sample (such as an increase in the number of women entering the academic profession), because we follow the evolution of the academic production of the same authors (804 tenured Italian economists see table B in appendix for details) throughout the years.

Since the Duncan index is bidirectional, it only provides us with information about the convergence process of publications by sex but not its direction (that is, whether women's publication topics are converging towards men's or vice versa). Hence, for a better insight on the level of diversity in the economics profession in terms of pluralism of research interests, we recalculated the Duncan segregation index separately for women and men considering the distribution of JEL codes within the articles published in the 10 top economic journals. The evolution of this index describes the rhythm of convergence/divergence to an international univocal profile of economist, characterized by the highest visibility and standard bibliometric indexes of quality (i.e. Impact Factor by Thomson Reuters and the Scimago Journal Indicator by Scopus). We focus on the articles published in the 10 top economic journals because they are characterized by a high segregation into few research areas (in all the five sub-periods more than 30% of all articles are concentrated in only two JEL codes) and less heterogeneity, since the variance among different JEL codes by period is on average higher than that calculated by Italian economists. Kosnik (2015), in her analysis of over 20,000 academic articles published in seven top research journals²⁵ from 1960–2010, finds that the targeted research categories (JEL codes) have remained relatively stable throughout the years.

As Fig. 2.b clearly displays, there is a common trend towards conformity, even if women Italian economists still tend to be more diverse in their research interests with respect to the top journals' JEL codes distribution than their male colleagues. Therefore, we have detected a double convergence path for Italian academic economists in the last decade: women and men tend to converge towards the same research interests and concurrently men tend to conform at a faster pace to a univocal concept of excellence in research.

²⁵ American Economic Review, Econometrica, Journal of Economic Literature, Journal of Economic Perspectives, Journal of Political Economy, Quarterly Journal of Economics and Review of Economic Studies.

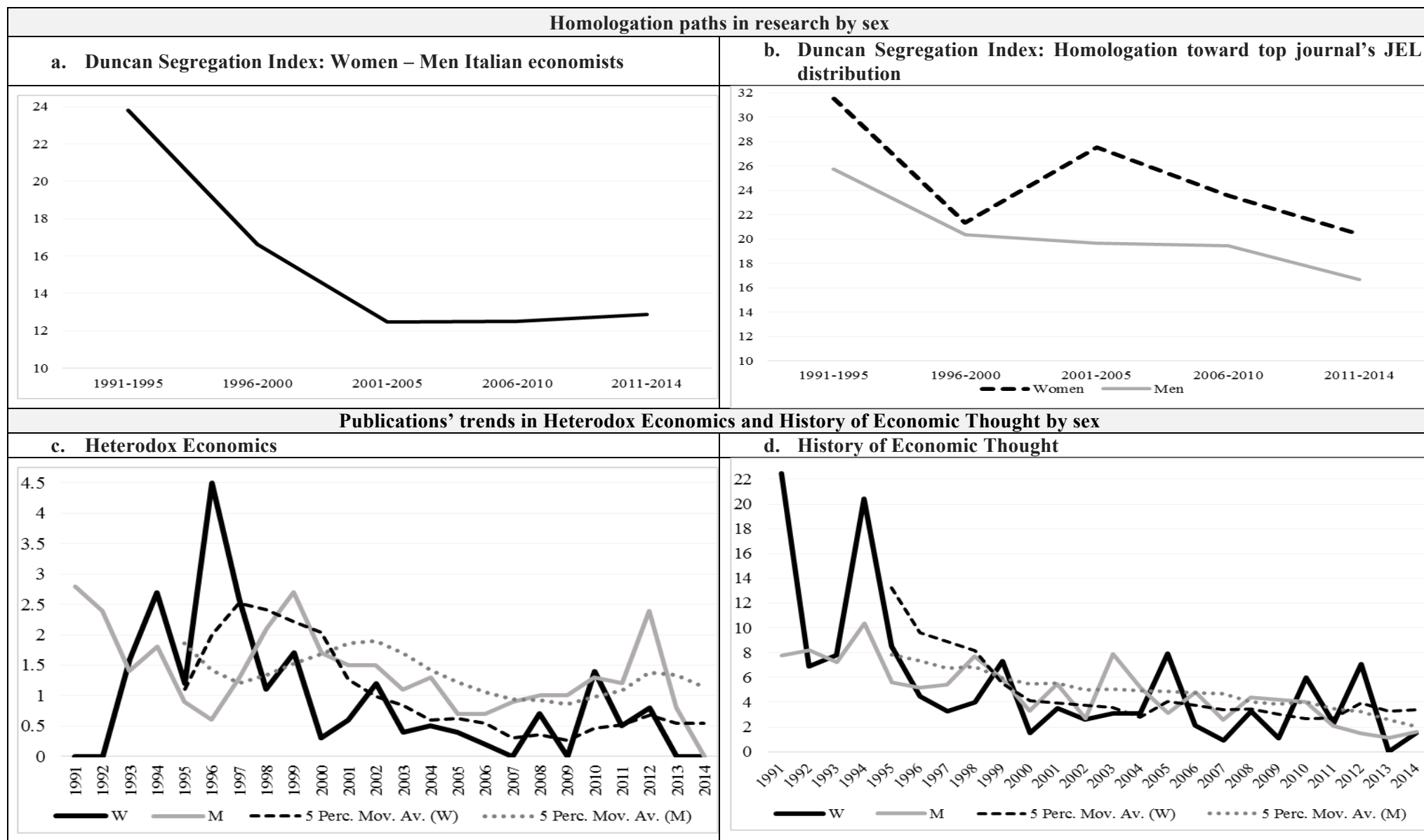
The double convergence path just described implies a consistent reduction in diversity in economics, fundamentally connected to the concept of pluralism of research. This phenomenon becomes evident when studying how the scientific production in less mainstream fields, mainly heterodox economics and history of economic thought, has changed in the last decades.

To classify a product as heterodox, we use the same classification reported by Corsi et al. (2010),²⁶ while for HET we consider all the articles reporting at least one of the following JEL codes: (i) B1- History of Economic Thought through 1925 (ii) B2- History of Economic Thought since 1925 and (iii) B3- History of Economic Thought: Individuals. For heterodox studies, there has been a strong contraction in academic output since 1996, especially by women (see Fig. 2.c). In fact, there has been a real collapse of the scientific production on these issues authored by women: about 0.5% of the total scientific production in 2011 and 2012 and 0% in 2013 and 2014. The same declining trend is observed for publications in HET (see Fig. 2.d), although in this case gender differences are even more pronounced; their share has decreased from 22% in 1991 to 1.8% in 2014.

Both in heterodox economics and history of economic thought, from the mid-90s, there is a clear tendency among women to reduce their publications in these fields at a faster pace than their male colleagues, therefore to contribute less to the evolution of these research areas.

²⁶ Heterodox publications generally have the following JEL codes: B5 - Current Heterodox Approaches, B50 - General, B51 - Socialist; Marxian; Sraffian, B52 - Institutional; Evolutionary, B53 - Austrian, B54 - Feminist Economics, B59 - Other, E1 - General Aggregative Models, E11 - Marxian; Sraffian; Institutional; Evolutionary; E12 - Keynes; Keynesian; Post-Keynesian.

Fig. 2. Gender trends in academic production of Italian academic economists 1991-2014



5 Diversity in PhD dissertation topics in economics

Finally, we study gender differences between younger economists, by analysing 536 PhD theses in economics presented in 44 Italian universities from 2003 to 2006, 43.5% of which written by women.

The first gender difference concerns dissertation supervisors: only 16.8% of all students are supervised by a woman.²⁷ For women students the percentage is higher: 21.1% have at least one woman supervisor, while this percentage falls to 13.4% for men. Only 4.7% of students have two women supervisors, with low gender differences (5.5% of women students compared to 4.1% of men students).

What emerges from the research is that half of the PhD theses (presented between 2003 and 2006) on labor economics, history of economic thought and public economics were written by women. On the contrary, women are significantly under-represented in economic history, macroeconomics, and monetary economics. Focusing on preferences in research fields by gender, instead of gender distribution among research areas, women seem to concentrate more on international economics, while their male colleagues prefer microeconomic issues (see Tab. 2).

Tab. 2 PhD theses: Research preferences by sex: mean period frequencies (2003-2006)

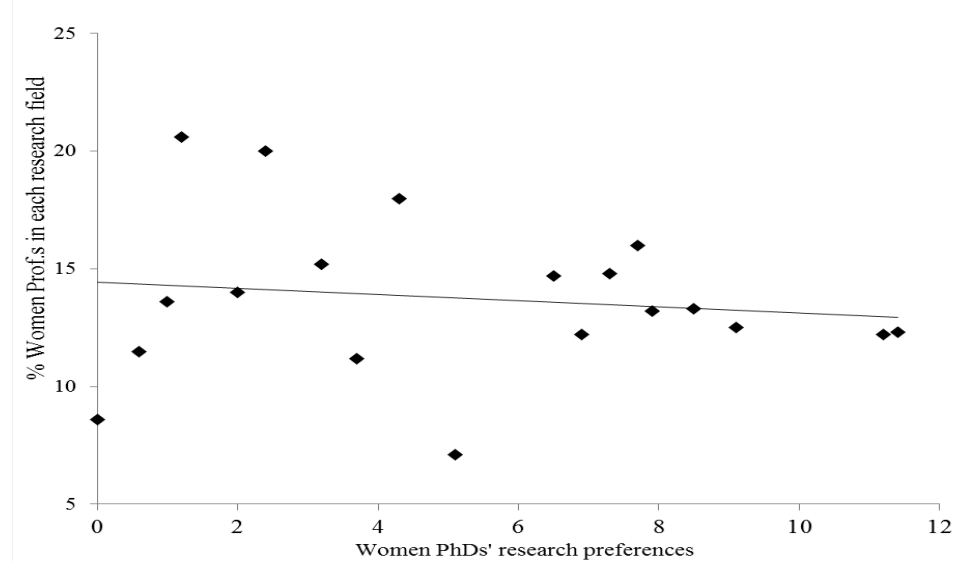
	W	M
A - General Economics and Teaching	0%	1%
B - History of Economic Thought	3.7%	2.5%
C - Mathematical and Quantitative	7.7%	7.8%
D - Microeconomics	7.9%	10%
E - Macroeconomics and Monetary Economics	5.1%	10%
F - International Economics	9.1%	6.9%
G - Financial Economics	6.9%	5.9%
H - Public Economics	7.3%	5%
I - Health, Education, and Welfare	3.2%	1.8%
J - Labor and Demographic Economics	6.5%	3.7%
K - Law and Economics	1%	1.8%
L - Industrial Organization	11.2%	10.6%
M - BA Marketing; Accounting	1.2%	1.5%
N - Economic History	0.6%	3%
O - Economic Development Growth	11.4%	14.3%
P - Economic Systems	2%	1.7%
Q - Agricultural and Natural Resource Economics	8.5%	5.6%
R - Urban, Rural, Regional	4.3%	5%
Z - Other Special Topics	2.4%	1.9%
Test χ^2 H_0 : distribution of men = distribution of women	45.3***	

In order to identify ‘generational’ differences in research fields, we compare the PhD theses with the articles written by 654 full and associate professors (117 women, for details see Table B in Appendix) published in 2003-2006. Tenured women are more visible in fields like business administration, business economics, and local and regional economics, completely different areas with respect to those chosen by younger women economists. The results are similar to those reported by Forget (1995, p. 31), in that we also find that women tend to “concentrate on a smaller range of topics in the journal literature than they did in their selection dissertation topics”. Once more, our findings indicate a sharp contrast with Hale and Regev (2014) since we

²⁷ PhD students can have up to two supervisors (in Italian *relatore* and *correlatore*).

find no evidence of a ‘path dependence’ effect in women’s choice of research field. As is clearly visible in the scatter plot reported in Fig. 3, a higher share of women professors in a certain area of research does not seem to affect young researchers’ choice of PhD theses fields.

Fig. 3 Lack of path dependence effect: women professors’ presence in research fields and women PhD’s preferences



There are gender differences in terms of academic careers among younger economists as well. Ten years after their thesis defence, 46% of PhDs, 52.5% of whom are women, are employed in Italian universities. For men, there is a temporal linearity: the greater the number of years since PhD graduation, the higher the share of people employed in Italian universities. For women, instead, this is an irregular trend. Those who obtained a PhD in 2003 and in 2005 have the highest rate of university employment. For younger women, geographic mobility is higher than for men: the share of those employed in the same university they obtained their PhD in is higher for men (38.3%) than for women (34.18%). By academic status, 76.9% of those employed in Italian universities work as full-time researchers, 7.5% as fixed-term researchers and 10.2% as associate professors, while only one PhD student has reached full professorship within eight years. Disaggregating the data by sex, differences in career paths are evident even in younger generations. Only 3.8% of the women are associate professors, while the share is higher for men (15%).

There are also important gender differences in productivity since the beginning of academic careers. We analyze publications by younger economists in the 5 years following PhD graduation²⁸ and use their h-index as a measure of impact.²⁹ The h-index summarizes in a single number two relevant pieces of information: the number of publications and the number of citations of each author.

²⁸ We prefer here to use Google Scholar rather than *Econlit* because it considers a greater number of publications in Italian.

²⁹ We calculate the h-index using the software Publish or Perish, from the publications in Google Scholar, in the five years following PhD thesis defence. For a detailed analysis of the strengths and weaknesses of the h-index see Rousseau and Leuven (2008).

The 2003-2006 PhDs employed by Italian universities have a median number of 9 publications in the five years following the achievement of the title. Men are more productive and visible; their median number of publications is 13 and the median h-index is 3, while for women, the median number of publications is 8 and the h-index is 2.

Looking at mentors, supervisors of the same sex as the candidate seems to have a positive effect on PhDs' productivity: the median number of publications within 5 years from PhD graduation is higher for women who have chosen women supervisors. The same occurs for men; those who have had only men PhD supervisors show a higher productivity. On the other hand, the h-index is higher, both for men and women, for those who chose only men supervisors (see Tab. 3). This means that the number of citations (and not the number of publications) is higher for the researchers who had only men supervisors.

Since citation count is one of the metrics used in the research assessment for defining hiring, tenure, and salary, it imposes a reflection on bibliometric indices and how corrective action (such as the activation of stronger citational networks) should be introduced, in which a continuous monitoring on research using a gender perspective is also provided.

Tab. 3 Mentoring effect by gender

		<i>Younger Italian economists: PhDs</i>					
		Women			Men		
		%	<i>Productivity</i>		%	<i>Productivity</i>	
			Median no. of publ.	Median h-index		Median no. of publ.	Median h-index
<i>PhD Supervisors</i>	Only women	9.5	10	2	3.2	2	2
	Mixed	10.8	8.5	2	10.5	5.5	1
	Only men	79.7	8	3	86.3	14	3

6. Concluding remarks

This article contributes to the analysis of diversity in the economic profession by combining two different dimensions: heterogeneity of researchers and pluralism of research interests.

Concerning the former, we find that the 'leaky pipeline' effect is evident in Italy: it is still significantly more difficult for women economists to access Italian academia and progress in it. We find evidence of gender differences among younger generations as well, both in terms of career access (progress) and production. In the latter case, effective mentoring of young women economists could help provide them with the know-how and networks that could boost their careers and reduce gender inequalities at the first stages of the path.

As far as diversity in research interests is concerned, this work is a first attempt at identifying and quantifying trends related to research interests that are connected with gender differences. In line with the recent tendency to prefer mainstream fields of research in economics, as detected in the Anglo-Saxon world by Lee et al. (2013) as well as in Italy by Corsi et al. (2010), we find a double convergence path: a

progressive reduction in diversity in research interests between women and men economists and a common conformity trend towards an international standard of perceived research ‘excellence’, characterised by high visibility and concentration in few research fields. Moreover, among Italian economists, we find a sharper decrease in women researchers in non-mainstream fields, in particular heterodox approaches and history of economic thought, over the last years.

Many interesting questions remain. Is there also a convergence in the quality of publications by men and women? Is the double homologation path an international trend or an Italian peculiarity? Is the choice of research fields driven by institutional characteristics such as different national research evaluation systems?

The last question is of particular interest for Italy, because a bibliometric approach is increasingly prevailing in economics, in contrast with the tendency that can be seen on an international level to redefine ‘responsible’ metrics for research assessments.³⁰ Considering the increasing popularity of bibliometric indexes in Italy, it is important to raise a debate over what is the best way to account for diversity, using a range of indicators that reflect and support plurality in research and in researchers’ career paths, and trying to anticipate the systemic and researchers’ potential reaction to the adoption of every indicator. In this sense, as a way to preserve diversity in economics, it would be useful to monitor future trends also from a gender perspective.

³⁰ See the San Francisco Declaration on Research Assessment (DORA -<http://www.ascb.org/dora/>) and the 2015 Independent Review of the Role of Metrics in Research Assessment and Management (<http://www.hefce.ac.uk/pubs/rereports/Year/2015/metricide/Title,104463,en.html>)

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Appendix

Table A

Author(s)	Object of investigation	Research field(s)	No. of observations	Main Findings:
Bettio, Rosselli 2001	1999-2000 competitions for assistant, associate, full professor	Economics	432 candidates	(i) with the new promotion rules the number of women in the academic staff on average increased; (ii) a non-continuous recruitment mechanism is more gender equal: the probability to pass the competition for women is higher in a competition that has a higher number of opened tenure positions (the probability to win a competition is higher for 4 women on a competition for 20 positions than for 1 woman in a competition for 5 positions)
Addis, Villa 2003	Editorial boards of Italian academic economics journals	Economics	36 journals 1970-1996	(i) women are perceived as not suitable to be editorial board members, whatever their scientific accomplishments; (ii) this process of selection based on gender stereotypes keeps women at the margin of professional networks, hinders their professional development, and prevents them from achieving their full potential as scholars.
Lissoni et al. 2011	2004-2005 promotions of French and Italian academic physicists	Physics	1,816 Academic Staff	(i) checking for publications, the probability of promotion for academic physics is significantly lower for women; (ii) There is a generational effect: women at the early stage of their careers are penalized in their publication activity, but then in order to be promoted to higher ranks they publish as much as their men colleagues.
Baccini et al. 2014	2008-2011 scientific production of profs	All fields	942 Prof in U. of Siena	(i) negative gender effect in all research production indexes (no. of publications, h index); (ii) Women face ceteris paribus more difficulties than man in publishing.
Bagues et al. 2017	competition to associate and full prof Italy -ASN 2012; Spain - Habilitacion 2002 – 2006	All fields	69,020 ASN candidates	(i) no empirical support to suggest that the presence of (a few) women in evaluation committees has a statistically or economically significant positive effect on the chances of success of women candidates; (ii) on average there a small but significant negative role of women's presence in the commission in promoting the hiring of women candidates, with respect to committees composed only by men evaluators. An extra woman in a committee of five members lowers the success rate of women candidates by approximately 1.8 pp with respect to men.
Checchi et al. 2015	2009-2011 recruitment in Italian research institute (FBK)	Hard Sciences	664 candidates	Positive role of women's presence in the commission in promoting the hiring of women researchers, in particular for non-tenure-track positions
De Paola, Scoppa 2015a	competition to associate and full professorship before ASN 2012	Economics and Chemistry	1,007 candidates Economics	(i) positive role of women's presence in the commission in promoting women candidates: women are less likely to be promoted when the committee is composed exclusively of men, while the gender gap disappears when the candidates are evaluated by a mixed-sex committee; (ii) committees composed exclusively of men discriminate against women, reducing their probability of success by about 6.4 pp. However, gender discrimination disappears when a mixed-sex committee judges candidates.
De Paola et al. 2015b	competition to associate and full prof Italy -ASN 2012	All fields	8,523 candidates	(i) women have a lower probability of entering the competition of about 4 percentage points, both for competitions to associate and to full professor positions; (ii) the gender gap reduces considerably for individuals with average productivity and vanishes completely for individuals with a high level of scientific productivity; (iii) the gender gaps in competitiveness could be explained almost entirely by the fact that women are reluctant to apply because of their expectation of being discriminated against.
Pautasso 2015	competition to associate and full prof Italy -ASN 2012	All fields	59,150 candidates	(i) evidence of a generally lower success rate of women's vs. men's applications; (ii) generally no significant correlation between the number of women members of the judging commissions and women's success rates
Abramo et al. 2016	competitions to associate professor in 2008	All fields	1,300 candidates	(i) no gender-related differences occur among the candidates who benefit from positive bias, while among those candidates affected by negative bias, the incidence of women is lower than that of men; (ii) same gender as the committee president is a factor that assumes greater weight for men applicants than for women;
De Paola et al. 2016	Probability of being promoted for individuals who have obtained the ASN	All fields	13,967 candidates	(i) for associate professors differences between men and women are of about 12 p.p. ceteris paribus; (ii) for full professors gender differences are 20 p.p. When the number of available slots is un-limited they find no gender gaps; when a limited number of positions are available, women suffer a particular kind of discrimination.

Table B. Data description

1- Sample of tenured Italian economists					2- Sample of younger Italian economists												
Associate and full professors 2003-2014 (with at least 1 <i>Econlit</i> output 1991-2014)					PhDs in economics 2003-2006 – Opac database												
tot		% women			tot		% women										
804		24%			536		43.5%										
<i>Academic production - Econlit 1991-2014</i>					<i>tenured 10 years after thesis defence</i>												
tot		% women			tot		% women										
191		41.4%			<i>Productivity Google Scholar 5 years after PhD</i>												
publications		JEL codes			tot		W		M								
tot		% w		tot		% w		mean		4		3		5			
1991-1995		1285		14%		2260		16%		median		7.8		6.2		9.1	
1996-2000		2399		17%		5537		19%		<i>Impact - H index 5 years after thesis defence</i>							
2001-2005		3332		19%		9275		23%		mean		1		1		1	
2006-2010		4154		19%		12347		23%		median		1.9		1.6		1.9	
2011-2014		1761		20%		5156		21%		3- Full and associate prof. 2003-2006							
<i>Women visibility per type of publication</i>					tot		% women										
Book		CVA		JA		WP		654		18%							
1991-1995		13%		12%		17%		3%		<i>Production- Econlit 2003-2006</i>							
1996-2000		15%		15%		18%		15%		tot		% women					
2001-2005		18%		17%		20%		15%		2040		13%					
2006-2010		17%		19%		19%		16%									
2011-2014		27%		21%		20%		19%									

Table C JEL codes mean period frequencies in top journals

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Z
1991-1995	1.8	1.1	9.3	21.8	10.1	5.9	6.0	3.9	4.7	10.9	1.3	7.6	1.5	2.0	6.7	1.7	2.1	1.5	0.1
1996-2000	1.1	1.0	8.4	18.1	11.4	5.5	6.5	5.8	4.2	12.6	1.2	5.9	1.1	2.4	8.9	2.1	2.1	1.5	0.3
2001-2005	1.0	0.1	7.9	19.0	13.0	6.2	7.8	4.9	5.2	9.9	1.5	6.7	1.6	2.5	7.6	0.9	1.3	2.0	0.8
2006-2010	0.7	0.4	6.6	19.7	14.2	5.4	8.0	4.6	5.1	10.0	1.4	6.2	2.1	2.1	7.3	1.0	1.6	1.9	1.8
2011-2014	0.5	0.5	6.6	20.5	11.3	4.3	8.8	5.9	5.2	9.9	1.8	7.2	1.4	2.2	6.5	0.7	2.6	2.2	1.8

Note: main research fields per period in bold; we consider top journals the first 10 economic journals ranked in Kalaitzidakis et al. (2011): American Economic Review; Quarterly Journal of Economics; Journal of Political Economy; Econometrica; Review of Economic Studies; Journal of Monetary Economics; Review of Economics and Statistics; Journal of Economic Perspectives; Journal of Economic Theory; The Economic Journal.

Diversity in the Economics Profession: A New Attack on an Old Problem

Amanda Bayer and Cecilia Elena Rouse

The economics profession includes disproportionately few women and members of historically underrepresented racial and ethnic minority groups, relative both to the overall population and to other academic disciplines. In the United States, of 500 doctorate degrees awarded in economics to US citizens and permanent residents in 2014, only 42 were awarded to African Americans, Hispanics, and Native Americans and 157 to women (although this double-counts the 11 minority women who earned economics doctorates in 2014). This underrepresentation within the field of economics is present at the undergraduate level, continues into the ranks of the academy, and is barely improving over time. It likely hampers the discipline, constraining the range of issues addressed and limiting our collective ability to understand familiar issues from new and innovative perspectives.

In this paper, we first present data on the numbers of women and underrepresented minority groups in the profession. We then offer an overview of current research on the reasons for the underrepresentation, highlighting evidence that may be less familiar to economists. We argue that implicit attitudes and institutional practices may be contributing to the underrepresentation of women and minorities at all stages of the pipeline, calling for new types of research and initiatives to

■ *Amanda Bayer is Professor of Economics, Swarthmore College, Swarthmore, Pennsylvania. Cecilia Elena Rouse is Lawrence and Shirley Katzman and Lewis and Anna Ernst Professor in the Economics of Education and Dean of the Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, New Jersey. Their email addresses are abayer1@swarthmore.edu and rouse@princeton.edu.*

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attack the problem. We then review evidence on how diversity affects productivity and propose remedial interventions as well as findings on effectiveness. We identify several promising practices, programs, and areas for future research. The *Journal of Economic Perspectives* last addressed underrepresentation by women and racial and ethnic minorities in the economics profession over ten years ago (Ginther and Kahn 2004; in this journal, see also Leeds 1992; Kahn 1995; Collins 2000). Given the growing evidence that diversity matters, it is time for a renewed focus on increasing the diversity of the economics profession.

The Gender and Racial/Ethnic Composition of the Economics Profession

We focus on groups that have been historically underrepresented in the economics profession and in the United States: women, African Americans, Hispanics/Latinos, and Native Americans. Underrepresentation in the economics profession by these groups is longstanding and there is a growing literature addressing its scope and possible remedies. Of course, this list does not encompass all dimensions of diversity, and the problems facing various underrepresented groups differ in some ways. But as we learn about barriers faced by members of these groups and interventions to address them, we hope to develop insights that are transferrable to facilitating the inclusion of the best people and ideas from all groups.¹

According to the most recent survey conducted by the American Economic Association, 23.5 percent of tenured and tenure-track faculty in economics are women.² As such, gender diversity in the academic economics profession is as poor as both the male-dominated tech industry and the Academy Awards nominating committee, where only 30 percent of the Silicon Valley workforce and 24 percent of Oscar voters are female. By rank, women represent 15 percent of full professors in economics departments and 31 percent of economics faculty at the assistant level.

The gender gaps in tenure and promotion rates in economics are much greater than those in the social sciences overall: specifically, Ginther and Kahn (2014) report a 20 percent gender gap in achieving tenure and a 50 percent gap

¹This paper examines disparities by race/ethnicity and gender, but independently. We acknowledge, but do not examine here, the complicated intersectionality of race, ethnicity, and gender (Brewer, Conrad, and King 2002).

²Statistics on economics faculty are authors' calculations from the *Universal Academic Questionnaire*, a survey conducted annually by the American Economic Association (Scott and Siegfried 2016). The questionnaire asks respondents to report gender for all faculty members and race/ethnicity only for US citizens and permanent residents. The data must be interpreted with caution due to a low response rate (about 50 percent) and missing data. Nevertheless, the magnitudes are consistent with those produced in other years and in other surveys. The survey likely mismeasures gender, race, and ethnicity, because it does not use self-identification (department chairs list the gender and race of department members) and because the AEA survey relies on a gender binary (in contrast, for example, to the American Sociological Association's six gender response options).

in promotion to full professor among economists compared to 12 percent and 25 percent, respectively, in the social sciences overall. More sobering, economics boasts the largest (or only) gender gaps in tenure rates, salaries, and job satisfaction compared to other math-intensive fields (Ceci, Ginther, Kahn, and Williams 2014). Moreover, Ceci, Ginther, Kahn, and Williams (2014) find that female full professor salaries in economics as a proportion of male salaries dropped from 95 percent in 1995 to less than 75 percent in 2010. In an analysis of published scholarly research across 21 academic disciplines, women accounted for 13.7 percent of authorships in economics since 1990, barely above the 12.0 percent in philosophy and well below the overall average of 27.2 percent (West, Jacquet, King, Correll, and Bergstrom 2013).

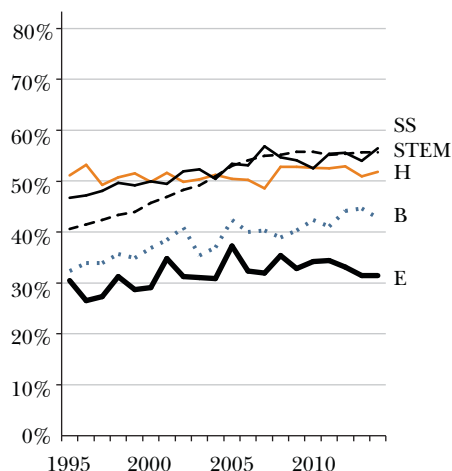
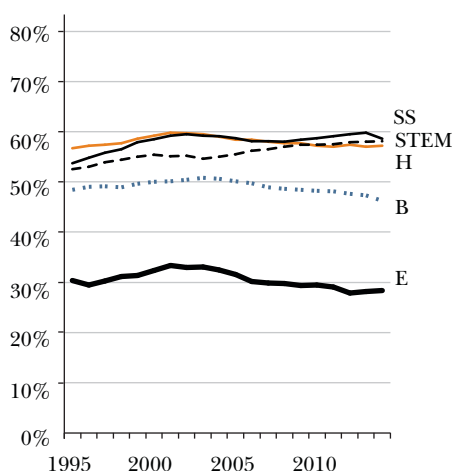
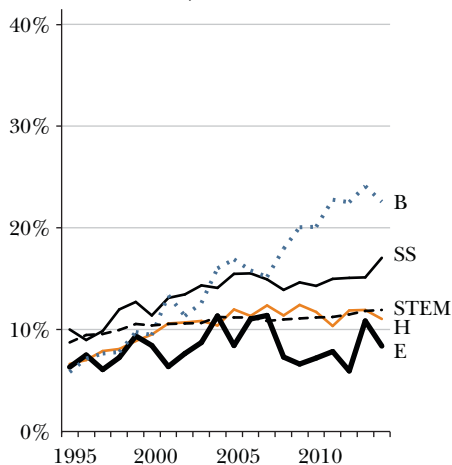
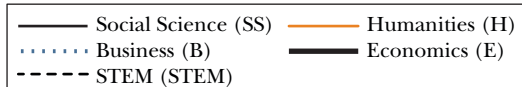
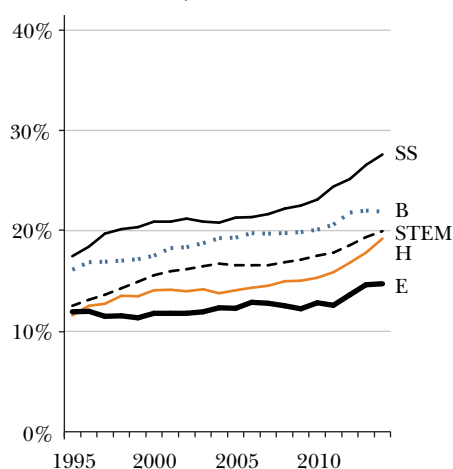
Minority academic economists are even rarer. While about 30 percent of the US population is black or Hispanic, only 6.3 percent of tenured and tenure-track economics faculty is identified as such (only 4.0 percent of full professors and 8.1 percent of assistants).³ Price (2009) reports that in 2006, only 44 black economists were on the faculties of the 106 PhD-granting economics departments ranked by the National Research Council, and six of those black economists were employed at Howard University, a historically black university.

The pool from which economics departments pull new faculty members is not much different. Figure 1 shows the percentage of doctorate degrees awarded to women (panel A) and to minorities (panel C) between 1995 and 2014, using data on US citizens and permanent residents only, as collected by the National Center for Education Statistics. Figure 1A shows that while there was some progress in the representation of women between 1995 (when women represented 30.5 percent of new PhDs) and 2005 (when women represented 37.2 percent of new PhDs), some ground has been lost as just 31.4 percent of doctorates in economics were awarded to women in 2014. Even when including temporary-resident students, the percentage of doctorate degrees awarded to women, regardless of citizenship status, is only slightly greater (34.2 percent in 2014) and varies considerably across institutions. (For example, within the top ten programs, the percentage of doctorates awarded to women over the last three years ranges from a high of 40.8 percent to a low of 4.9 percent.) Figure 1A also shows that the percentage of women earning doctorates has stagnated in economics, while it has increased in other social science fields, humanities, business and management, and also in STEM (science, technology, engineering, and math) fields.

Figure 1C shows that the story is mostly similar when we look at the percentage of doctorates awarded to minorities (meaning black, Hispanic, or Native American) between 1995 and 2014. Between 1995 and 2007, there was steady improvement in the percentage of new doctorates in economics awarded to minorities, from 6.3 percent in 1995 to 11.4 percent in 2007. Since then, the percentage of new doctorates awarded to minorities has dropped substantially to only about 7 percent,

³Another 13 percent of tenured and tenure-track faculty is identified as US citizens or permanent residents of Asian ethnicity. About 5 percent of the general population in the United States is Asian.

Figure 1

Degrees Awarded to Women and Underrepresented Minorities**A: Percentage of Doctorate Degrees Awarded to Women****B: Percentage of Bachelor's Degrees Awarded to Women****C: Percentage of Doctorate Degrees Awarded to Minority Students****D: Percentage of Bachelor's Degrees Awarded to Minority Students**

Note: Data are authors' calculations from the Integrated Postsecondary Education Data System (IPEDS) at the National Center for Education Statistics, using data on US citizens and permanent residents only. Economics degrees are classified as those with IPEDS Classification of Instructional Program codes for "Economics, General," "Agricultural Economics," "Applied Economics," "Econometrics and Quantitative Economics," "Development Economics and International Development," "International Economics," and "Economics, Other." We use the National Science Foundation definition of STEM (Science, Technology, Engineering, and Math) subjects, but exclude the social sciences to present that series separately. "Social Science" indicates social science fields but excludes degrees in economics. "Business" denotes business and management disciplines. Minority students are those who self identify as Hispanic or Latino, American Indian or Alaska Native, or Black or African American.

although in 2014, 8.4 percent of new doctorates were awarded to minorities. (When including temporary-resident students, US minorities earned 3.5 percent of all economics PhDs awarded in the United States in 2014.) Further, Figure 1C shows that progress in increasing racial and ethnic diversity has been faster in other fields.

These disparities are evident at earlier stages in the pipeline as well. Figures 1B and 1D show the percentage of bachelor's degrees awarded to women and to minorities in various fields between 1995 and 2014. Again, there is little progress in increasing the percentage of female students graduating with bachelor's degrees in economics over the past two decades, with 28.4 percent (30.9 percent when including temporary residents) of degrees awarded to women in 2014. While there has been progress in other fields—including STEM—business and management displays the same lack of progress seen in economics.

Finally, while there has been some improvement in the percentage of minority students graduating with a major in economics, from 12 percent in 1995 to 14.7 percent in 2014, this rate is still far below the prevalence of this population among college students (22 percent of bachelor's degrees were awarded to minorities in 2014) and also below the 20 percent of bachelor's degrees awarded in STEM fields.

Overall, the economics profession has made little progress in the last two decades in diversifying the profession in key dimensions of gender, race, and ethnicity. These patterns stand in contrast to the robust and increasing representation of foreign-born individuals in US departments of economics. For example, the percentage of all US economics doctorate degrees awarded to temporary visa holders increased from 49 percent in 1995 to 59 percent in 2014, with half of these degrees going to temporary visa holders self-reporting Asian ethnicity on the NSF Survey of Earned Doctorates. (Simultaneously, the percentage of all US economics doctorate degrees awarded to non-Hispanic Asian citizens and permanent residents decreased from 6.6 percent in 1995 to 5.0 percent in 2014.) Though many of these students do not stay in the country after graduation, about one-third of new PhDs holding temporary visas have definite employment commitments in the United States (NSF Survey of Earned Doctorates, Table 51). So while the profession may not have made progress in all dimensions of diversity, it has in some. Nevertheless, concern with racial and ethnic diversity is inextricably linked to the history of race and ethnicity in the United States and to the pervasive and persistent barriers faced by African Americans, Hispanics, and Native Americans in this country. While students and faculty who come to the United States from abroad explicitly to study or teach economics have certainly faced challenges of their own and will face many more here as well, their experiences are fundamentally different from those of people who have lived a good portion of their lives in the country.

The relative absence of women and members of racial and ethnic minority groups in economics begins at the undergraduate level and then continues through doctoral education and beyond. The lethargic trends, along with the significant disparities that continue to exist throughout the pipeline from economics majors to economics professors, suggest that change is unlikely to be sustained—or perhaps to occur at all—without purposeful action.

Barriers to Diversity

Why are there relatively few women and certain racial/ethnic minorities in the economics profession? We start by summarizing the literature on factors that affect the supply of individuals choosing economics as a field of study or profession, such as mathematics preparation and prior exposure to the field. We then turn to a review of evidence, some of it newer and less familiar, on the role of the demand side. We emphasize that by “demand side,” we refer to the behavior of economists at all points along the pipeline, not only when hiring new PhDs but also at points before, such as attracting undergraduates to the major, and after, as careers are advanced or not.

Supply-Side Factors

The evidence in the previous section makes a *prima facie* case that the reason for the underrepresentation of women and minorities among PhD economists traces back to decisions made at the undergraduate level. Thus, a small, but growing, number of articles attempt to understand the factors that affect the decision to study economics, particularly by undergraduates. Common hypotheses focus on the effects of math preparation or aptitude, prior exposure to economics, performance in economics relative to other courses, and instructor race or gender. Most of this literature is based on correlational regression analysis of surveys or administrative data, either from an individual college or from a subset of colleges for which data were available. This research suggests that some explanations are more likely than others, without reaching a definitive conclusion.

For example, the level of math preparation does not seem to explain the underrepresentation within economics. The research generally finds that prior math preparation (as proxied by SAT/ACT scores or by questions that ask about comfort level with math), while affecting the decision by any student to take a class or major in economics, explains, at best, a small part of the underrepresentation in economics by women and minority students. In one study, Emerson, McGoldrick, and Mumford (2012) analyze a database with extensive information on undergraduate courses for 11 large state universities and find that gender differences in taking economics courses after the introductory course are not accounted for by measures of aptitude, or by an array of other variables. This conclusion is consistent with Integrated Postsecondary Education Data System (IPEDS) data showing that in 2014 women earned 42.6 percent of bachelor’s degrees in mathematics and statistics, far beyond their 28.4 percent share in economics.

Several studies consider the role of prior exposure to economics in the decision to pursue further study. Dynan and Rouse (1997) find that women in their junior and senior years of college were more than twice as likely as men to report that they did not take economics in their first year because they “did not think that economics was interesting.” This result is consistent with the findings of Calkins and Welki (2006) who report that perceived interest in the subject is a key factor in determining the choice of undergraduate major. Of course, such research

raises questions of how perceptions of economics vary across undergraduates from different groups, which, if any, are accurate, and how we might provide better information about what economics is and the range of topics economists study.

Performance in early economics courses—such as introductory courses—and especially relative to performance in other courses may also be related to the decision to persist in economics. Rask and Tiefenthaler (2008), using 16 years of data from a liberal arts college where economics is a prominent major, find that women are more responsive to their relative grades in economics than are men. Of course, if this response exists across economics departments, it is likely related to the specific context of economics, including advising practices: if women were universally more responsive to relative grades, then they would also be more averse to majoring in math and science, where grades tend to be low (for example, see Butcher, McEwan, and Weerapana 2014, in this journal), but where female representation is higher than in economics.

Many point to the lack of role models in the profession as deterring both women and minorities from further consideration of economics. Instructor identity could affect student performance through a variety of possible mechanisms. Perhaps students are inspired by the role model or less subject to stereotype threat (Steele and Aronson 1995) in the presence of a stereotype-defying economist.⁴ Alternatively, professors with different life experiences may talk about different economic issues and in ways that resonate with different students. While earlier evidence on the effects of same-gender and same-race instructors had been mixed, more recent studies find that instructor identity makes some difference. For example, Dynan and Rouse (1997) look at data from Harvard University and report that having a female teacher at the introductory economics level had only a small impact on the decision to subsequently major in economics. In contrast, Hale and Regev (2014) conclude that a larger share of women on the economics faculty of top universities leads to more female students entering economics PhD programs, using the number of resignations of male faculty members as an instrumental variable to capture exogenous variation in the share of women in the faculty. Carrell, Page, and West (2010) analyze data from the US Air Force Academy, where students are randomly assigned to professors, and find female students perform significantly better in introductory math and science courses if taught by female faculty, and they are more likely to pursue majors in science, technology, engineering, or math. Fairlie, Hoffmann, and Oreopoulos (2014) find similar effects for underrepresented minority college students at a large and diverse community college, whose short and longer-term outcomes improve from taking courses with underrepresented minority instructors.

⁴ “Stereotype threat” is a robust and widely replicated phenomenon. A considerable body of research shows that “performance in academic contexts can be harmed by the awareness that one’s behavior might be viewed through the lens of racial stereotypes” (Steele and Aronson 1995). Stereotype threat has been documented to diminish the academic performance of members of groups subject to negative stereotypes, including African Americans, Latinos, and women (Gonzales, Blanton, and Williams 2002; Inzlicht and Schmader 2012). White men are subject to stereotype threat on a math test when led to believe the test is being used to examine Asian superiority at math (Aronson et al. 1999).

Because these last two studies do not focus on economics, future research might investigate the effects within economics specifically, as well as how to reproduce the benefits of faculty role models before having sufficient numbers of women and minority economists in place.

Demand-Side Factors

Most academic institutions have policies that officially encourage diversity in outreach, hiring, and promotion, and most academics have sat in numerous meetings where such concerns were expressed. Thus, claims that explicitly discriminatory attitudes on the demand side of academia play a role are often met with skepticism. Explicitly discriminatory behavior and attitudes may occur less frequently than in the past, but that does not mean they no longer exist. Perhaps more importantly, researchers in the last 30 years have been investigating implicit bias, a form of discrimination based on unconscious attitudes or associations, which can produce behavior that diverges from the individual's own endorsed beliefs or principles. A common method for exploring unconscious attitudes is an "Implicit Association Test" (Greenwald, McGhee, and Schwartz 1998), in which subjects are instructed to make associations between various words or images very quickly and then see what patterns and connections emerge.⁵ In contrast, most investigations by economists of demand-side causes of disparities—like models of taste-based discrimination and statistical discrimination—focus on situations in which the discriminator makes an explicit decision (for reviews, see Darity and Mason 1998 in this journal; Lang and Lehmann 2012). While much of the work on implicit associations and discrimination has not involved economists as subjects or as researchers, we believe the evidence has implications for the economics profession and for future economic research.

A substantial body of evidence documents the pervasiveness of implicit biases reflecting social stereotypes (for surveys of the evidence, see Greenwald and Banaji 1995; Greenwald and Krieger 2006). This work is consistent with the research in economics by Bertrand and Mullainathan (2004), which involved responding to newspaper help-wanted ads with fictitious resumes showing similar credentials but a mixture of names that potential employers were likely to associate with African Americans or with whites. White-sounding names were much more likely to get callbacks. Bertrand, Chugh, and Mullainathan (2005) discuss how such findings can result from implicit discrimination.

Implicit biases have been shown to affect professional judgment across a range of professions. For example, Schulman et al. (1999) describes a study in which

⁵Researchers hypothesize that the human brain uses implicit association to deal with bottlenecks in information processing; in the visual system, for instance, the retina receives information at an estimated rate of 109 bits per second (Kelly 1962), far beyond the 30 to 50 bits per second processing capacity of deep layers of the visual pathway (Sziklai 1956). Response latency tests, priming studies, and direct measurement of physiological and neurological reactions indicate that race, gender, and other perceived group affiliations operate as heuristics, with powerful, unconscious effects on judgments and actions. Try taking a test yourself at <https://implicit.harvard.edu/implicit/education.html>.

720 doctors watched videos of “patients” describing chest pain symptoms. Although the actors were scripted to convey a very similar range of information, the doctors were more likely to refer whites and men for cardiac catheterization than blacks and women. In an Internet-based study of the responses of 287 physicians at four medical centers to a hypothetical patient presenting with acute coronary symptoms, Green et al. (2007) find that physicians with greater pro-white implicit bias, as measured by an array of implicit association tests, were less likely to treat black patients with thrombolysis (an immediate treatment to dissolve blood-clots) relative to whites with the same symptoms, despite reporting no explicit bias in a survey about prejudice.

Research suggests that implicit bias affects interactions at all stages of the academic pipeline, in formal decisions, such as promotion and admission, and in routine interactions, such as advising students on courses to take or responding to questions and ideas from colleagues. In a study by Milkman, Akinola, and Chugh (2015), 6,500 professors in 89 disciplines across 259 US universities received an email with a request from a fictional prospective student, asking for a 10-minute meeting to discuss research opportunities prior to applying to a doctoral program. The student’s name was randomly assigned to signal gender and race (Caucasian, Black, Hispanic, Indian, Chinese), but messages were otherwise identical. Across almost all disciplines, faculty ignored requests from women and minorities at higher rates than requests from Caucasian males, with large and statistically significant regression-estimated discriminatory gaps. In business, the discipline with the largest gap, 87 percent of Caucasian males received a response, compared to 62 percent of women and minorities. In the social sciences, which in this study pools economics with 18 other disciplines including sociology, communication, and gender and area studies, 75 percent of Caucasian males received a response, compared with 68 percent of women and minorities. Follow-up analyses revealed that discriminatory gaps were particularly acute in higher-paying disciplines and in private institutions. Moreover, there was no evidence that women benefited from contacting female faculty, nor that black or Hispanic students benefited from contacting same-race faculty.⁶

A variety of studies suggest bias in academic hiring. Specifically, a sample of 127 science faculty in research universities rated a male applicant for a lab manager position as significantly more competent and hireable than an identical female applicant based on looking at a job application from a hypothetical job candidate who was randomly assigned to be male or female. They also selected a 15 percent higher starting salary and offered more career mentoring to male applicants (Moss-Racusin et al. 2012). Male and female faculty members were equally likely to exhibit bias. Similarly, after evaluating a curriculum vitae that was randomly assigned a male or female name, a sample of 238 male and female academic psychologists

⁶Implicit bias also affects the experience of enrolled students. Dee, John, Baker, and Evans (2015) find that instructors of massive open online courses (MOOCs) are more likely to respond to forum posts by ostensibly white male students.

were more likely to hire the male applicant for a tenure-track job and had more positive evaluations of the male applicant's teaching, research, and service records (Steinpreis, Anders, and Ritzke 1999). In a study of high-achieving male professors in life sciences, Sheltzer and Smith (2014) find that they train 10–40 percent fewer women in their laboratories relative to others. Trix and Psenka (2003) analyze the content of 300 letters of recommendation for prospective faculty members at a large medical school in the 1990s, finding that letters for women are shorter, are more likely to use language that raises doubts, and reinforce gender stereotypes of women as teachers and men as researchers (for example, the phrases “her teaching” and “his research” are commonly used).

While we know of no experiments directly testing for bias amongst economists, a recent working paper by Sarsons (2015) provides evidence suggesting implicit bias in economics. Using data from the curricula vitae of economists who were up for tenure between 1975 and 2014 at the top 30 PhD-granting US universities, she documents that, while an additional coauthored paper for a man has the same effect on the likelihood of tenure as a solo-authored paper, women suffer a significant penalty for coauthoring, especially when their coauthors are men.

Women and minority faculty members can be subject to unconscious bias from evaluators other than colleagues, as well. Students rate instructors of online classes significantly higher when the instructors use a male identity than when they use a female identity, regardless of the instructors' actual gender (MacNell, Driscoll, and Hunt 2015; Boring, Ottoboni, and Stark 2016), and write gendered online reviews, using the word “brilliant” more often to describe male faculty and the word “annoying” to describe females, even in economics (see <http://benschmidt.org/profGender>). In a study of referee recommendations using a large sample of articles submitted to one economics journal, Abrevaya and Hamermesh (2012) find no evidence of relative favoritism by referees towards authors of their own gender. It is important to note, however, that regression analyses that assess discrimination using same-gender interaction terms cannot actually detect bias to the extent that both male and female evaluators are influenced by social stereotypes about women, as other studies have repeatedly shown.

Finally, there is a possibility of “institutional discrimination,” which occurs when the rules, practices, or “nonconscious understandings of appropriate conduct” systematically advantage or disadvantage members of particular groups (Haney-López 2000). We use this phrase to describe the (not explicitly intended) discrimination that occurs when facially neutral policies and routines of an academic department or instructor have, in practice, a disparate impact by gender or race. For example, a *de facto* practice to hire candidates only from elite PhD programs (or to admit PhD applicants only from elite undergraduate institutions) may produce systematic disadvantage. Indeed, economists do in fact display a high propensity to hire from top ten graduate programs as compared to other disciplines (Wu 2005). Alternatively, the use of a decision rule eliminating all junior job candidates who took more than six years to complete their PhD would disproportionately impact members of racial and ethnic minority groups,

and to some extent women, for whom longer times to PhD completion are more likely. More generally, a narrow vision of the appropriate route to excellence as an economist undervalues the alternative pathways taken by women and minorities towards academic careers (Turner and Myers 2000; Husbands Fealing, Lai, and Myers 2015).

Institutional policies can cause unplanned, but ultimately unsurprising, disadvantage. An analysis of data on all assistant professors hired at top-50 economics departments from 1985 to 2004 found that gender-neutral policies to stop the tenure clock for new parents substantially reduce female tenure rates while substantially increasing male tenure rates (Antecol, Bedard, and Stearns 2016). As another example, desire to have women and minority representation on committees may help explain why women faculty are asked to provide more service, as a survey of 1,399 members of US political science departments found (Mitchell and Hesli 2013). Indeed, women associate professors spend far more time on service than do male associates, with estimates of the differential ranging from two to five hours a week, in studies of faculty in science and engineering at top research universities (Link, Swann, and Bozeman 2008) and in various disciplines at a large public university (Misra, Lundquist, and Templer 2011).

As a broader example of unintended disparate effects, perhaps economists are not in the habit of implementing undergraduate curricula and teaching techniques that would make economics more inclusive and meaningful for groups traditionally underrepresented in our profession. To the extent that economists are ineffective teachers, whether due to competing priorities or to lack of training, we end up with a self-selected sample of student majors who come to our classes with prior interest, background, and encouragement in economics.

Of course, posing these demand-side explanations raises the question of whether they can help explain why economics has been slower to diversify than other fields. The existing evidence on this point is not conclusive. However, it is concerning that those who, like economists, are used to framing choices in terms of individual objective decision-making may also be less vigilant against discrimination. Stephens and Levine (2011) look at attitudes about gender discrimination in the labor force in a sample of stay-at-home mothers and undergraduate students, and find that framing actions in terms of individual choice increases expressed belief that society provides equal opportunities and that discrimination no longer exists. Uhlmann and Cohen (2007) analyze a group of 65 men who role-played a game about hiring a factory manager, in which they rated a job applicant who could randomly be male or female. Some of the men were “primed” in advance by being asked to answer a survey about whether they viewed themselves as objective and logical. Those who were “primed” in this way were more likely to favor male applicants.

Overall, the potential importance of demand-side considerations in economics is suggested by one of the findings in Ceci, Ginther, Kahn, and Williams (2014), who find that across most fields with a heavy focus on math skills, “the research indicates no significant sex differences in promotion to tenure and full professor.” However,

they also write: “Economics is an outlier, with a persistent sex gap in promotion that cannot be readily explained by productivity differences.”⁷

Why Economists Should Care about Diversity

Why should economists care about the underrepresentation of women and members of minority groups in their profession? Broadening the pool from which professional economists are drawn is not just about fairness, important though this is. Two strands of recent research suggest that it is also necessary to ensure the profession produces robust and relevant knowledge.

First, opinions among economists about policy are not the same across different groups. In a survey of 143 AEA members with doctoral degrees from US institutions, May, McGarvey, and Whaples (2014) find that male and female economists have different views on economic outcomes and policies, even after controlling for vintage of PhD and type of employment. For example, relative to male economists, women economists are 21 percentage points more likely to disagree that the United States has excessive government regulation of economic activity; 32 percentage points more likely to agree with making the distribution of income more equal; 30 percentage points more likely to agree that the United States should link import openness to labor standards; and 42 percentage points more likely to disagree that labor market opportunities are equal for men and women. The prevailing range of views among economists is likely to be biased by the relative lack of women and minority economists.

Second, diversity changes group dynamics and decision-making, and the behavior of individual members changes with the mix of the group. A body of laboratory experiments on this point has been done with a wide range of players and tasks. In studies focusing on the effects of gender diversity, Woolley et al. (2010) recruited 699 people in Boston and Pittsburgh and put them to work in groups ranging in size from two to five on a series of problem-solving tasks. They find that the more successful groups display a “collective intelligence” that is based not on the intelligence of individual members, but on the social sensitivity of the group, in taking turns in conversation, and on the proportion of females in the group. Hoogendoorn, Oosterbeek, and van Praag (2013) randomly assign 550 undergraduate business students in Amsterdam to course project groups and find that mixed-gender groups display more intense mutual monitoring and produce better outcomes in a business-oriented scenario. Kamas, Preston, and Baum (2008) look at a group of 164 undergraduate students playing a “dictator”

⁷It is also worth noting that regression analyses attributing differences in outcomes to productivity-related factors likely underestimate discriminatory gaps, given the pervasive effects of gender and racial/ethnic biases. For example, in regressions explaining the likelihood of promotion to full professor, unconscious bias likely affects control variables such as course evaluations and publication record as well as the estimated coefficients on gender and race variables.

game in which they must split a sum of money between themselves and the American Red Cross. Women tend to give more than men, and a two-person male-female team gives more than the expected sum of what they would give playing alone.

In examples of studies looking at ethnic and cultural diversity, Phillips, Northcraft, and Neale (2006) show in an experimental setting with 216 undergraduate business students that racially diverse groups significantly outperform other groups in solving complex problems, as homogeneous groups perceive their information to be less unique and spend less time on the task. In a study with 200 jury-eligible Michigan community members, Sommers (2006) found that participants on racially diverse mock juries exchange more information, make fewer errors, deliberate longer, and consider a wider range of perspectives. Levine et al. (2014) conduct a laboratory experiment involving a scenario with potential price bubbles using groups of real world traders in two locations, one in Southeast Asia and one in North America. They find that traders in ethnically homogeneous markets place undue confidence in the reasonableness of others' decisions, which leads to price bubbles, while ethnic diversity can promote deliberation and disrupt conformity. Leung, Maddux, Galinsky, and Chiu (2008) offer a review of the evidence from the psychology literature that exposure to multiple cultures can enhance creativity.

The commonality of findings about diversity in many contexts is notable, but of course these studies are not directly about decision-making in academia. In a study that suggests that the creativity and productivity of mixed groups may also benefit academic research, Freeman and Huang (2015) examine 2.5 million research papers written from 1985 to 2008 in which all of the authors had US addresses. They find that papers written by ethnically diverse research teams receive more citations and are higher impact than papers written by authors from the same ethnic group. Although noncausal explanations of this pattern are possible, it suggests that greater diversity of authorship may lead to higher quality research.

If the ultimate goal of economic research is to develop and communicate lasting insights, this evidence suggests that the value and impact of the economics profession suffer from the lack of diversity in its ranks.

Moving Forward

We believe there are several promising directions for future initiatives and research.

Revise How We Present Economics to Undergraduates

The economics profession needs to attract a larger share of women and minorities into economics at the undergraduate level. We highlight several recommended approaches here. Much of the evidence behind these approaches comes from randomized control trial studies in science, technology, engineering, and math

fields. We encourage economists to use and expand the body of research on best teaching practices in economics.⁸

Undergraduate economics continues to be taught primarily in a lecture format. Watts and Schaur (2011), for instance, show in survey data with about 400 academic economists as respondents that traditional lecturing, a practice that has been shown repeatedly to be inferior to other available methods, remains the dominant undergraduate teaching method among economists. The survey also shows that references to “gender, race, and ethnic issues” in undergraduate economics courses are rare. The alternative to a lecture format is active learning, in which instructors ask rather than tell, and students answer questions in discussions or with clickers, clarify concepts to each other via peer instruction, and discover principles through classroom experiments and labs. Freeman et al. (2014) carries out a meta-analysis of 225 studies comparing the effects of active and passive learning techniques in science, technology, engineering, and mathematics. They find that active learning increases exam scores and decreases failure rates relative to traditional lecturing, with particular benefit for students from disadvantaged backgrounds and for women in male-dominated fields.

Instructors can reduce stereotype threat with an array of empirically validated strategies, many of which suggest that what may seem like relatively small changes can have substantial effects. For example, Murphy, Steele, and Gross (2007) had 47 Stanford University undergraduates watch one of two videos about a math, science, and engineering conference. Some viewed a video in which men outnumbered women in a ratio of 3 to 1, while others observed gender balance in an otherwise identical video. Women who saw the gender-balanced conference felt more sense of belonging and desire to participate than those who saw the gender-imbalanced version. Purdie-Vaughns et al. (2008), in experiments involving African American professionals, show that cues conveying that diversity is valued, rather than a colorblind philosophy, can help reduce identity-related threat in low minority representation environments. Miyake et al. (2010) carry out a “values affirmation” exercise with 399 college students in an introductory physics class and confirm that the treatment group, which selected and wrote about values important to them in two 15-minute exercises, ended up with a lower male-female performance gap for the course as a whole. Such exercises, although unrelated to course content, have been shown to reduce the effects of stereotype threat for racial minorities, too. With these examples in mind, sharing the new AEA video on careers in economics (at http://www.aeaweb.org/video/career_in_economics.php) may be a useful step toward encouraging women and minority students in economics.

Good teachers remind students that intelligence is not a fixed trait and that economic ability can be developed through hard work, making mistakes, and perseverance. For example, in an experimental study Aronson, Fried, and Good (2002)

⁸For a review of studies about undergraduate teaching in economics, although with little attention to the diversity issues that are the focus here, a useful starting point is Allgood, Walstad, and Siegfried (2015). For more guidance on the design of undergraduate economics curricula, see Allgood and Bayer (2016).

ask African American and white Stanford undergraduates to write to younger pen pals to emphasize, among other things, that intelligence is malleable, and they find that the treatment increases academic enjoyment, engagement, and performance for undergraduates in both racial groups, but particularly for African Americans. Departments making comprehensive changes can impact participation rates significantly. The Grinnell Science Project, the computer science program at Harvey Mudd College, and Princeton's Diversity Programs in Molecular Biology and Quantitative and Computational Biology use arrays of interventions to produce significant changes at the undergraduate and doctoral levels. Components include curricular reform, community building, student-faculty research, recruitment, holistic candidate review, and/or pre-orientation. At Harvey Mudd, the number of women computer science graduates quadrupled in six years (Alvarado, Dodds, and Libeskind-Hadas 2012).

There are a number of current projects to develop and evaluate best practices within economics. The AEA's Committee on the Status of Minority Groups in the Economics Profession sponsors an online resource, *Diversifying Economic Quality* at DiversifyingEcon.org, to help economics instructors and departments adopt inclusive, innovative, and evidence-based teaching practices (Bayer 2011). Another initiative is "The Undergraduate Women in Economics Challenge," directed by Claudia Goldin and funded by the Alfred P. Sloan Foundation, which provides guidance and significant funds to 20 treatment departments to explore and implement interventions designed to increase the number of women economics majors, while simultaneously tracking outcomes in a set of unfunded control departments. Other projects are using field experiments to evaluate the effectiveness of specific interventions intended to broaden participation in undergraduate economics. Through projects with rigorous experimental designs, we learn what works and what does not work in increasing the representation of women and minorities in economics, while also gaining greater insight into causal mechanisms and generating additional hypotheses to support future research and initiatives.

Support Early-Career Pipeline and Mentoring Programs

Pipeline programs help participants develop skills and networks critical to staying and moving forward in a field of study. The AEA supports several programs, and there now exists some credible evidence of their effectiveness. For example, the AEA's Committee on the Status of Women in the Economics Profession (CSWEP) sponsors a mentoring program for young female economists (CeMENT Mentoring Workshops) during which participants are placed into small groups based on their teaching and research and matched with a senior mentor to address issues such as effective teaching, navigating the journal publication process, balancing work and "life," and the tenure process. Blau, Currie, Croson, and Ginther (2010) conducted a randomized study of its effectiveness and report that the mentoring program had a positive effect on a number of professional outcomes, such as the number of top-tier publications, the total number of publications, and the number of successful federal grants earned by individuals randomly assigned a mentor compared to those randomly assigned to the control group.

Since 1974, the AEA's Committee on the Status of Minority Groups in the Economics Profession (CSMGEP) has sponsored a Summer Training Program aimed at improving diversity in the economics profession. The program, which has been hosted at a number of universities over time, runs about 7–8 weeks during which undergraduates take classes in microeconomic theory, math, and econometrics, and more recently have written research papers. The program has averaged about 25 students per year. Becker, Rouse, and Chen (2016) compared the outcomes of participants to those of unsuccessful applicants and find that Summer Program participants were significantly more likely to apply to and attend an economics PhD program, complete a PhD, and ever work in an economics-related academic job.

Both CSWEP and CSMGEP have other programs aimed at providing women and underrepresented minorities with greater mentorship (such as CSWEP's Mentoring Breakfast and CSMGEP's Mentoring Program) or opportunities to conduct guided research (such as the CSWEP/CSMGEP Summer Fellows Program). Another mentoring program currently housed at Duke University is the Diversity Initiative for Tenure in Economics (DITE), which aims to help untenured professors and economists outside of the academy to strengthen their research in order to attain tenure. Other recent efforts for early-stage economists include one-year pre-doctoral and master's programs, which are designed to enrich students' skills in math, economic theory, and econometrics to increase their likelihood of graduate program acceptance and success; the University of Wisconsin, the University of Texas at Austin, Duke University, Tufts University, the University of California at Los Angeles, Washington University, and Vanderbilt University currently offer such programs, to name a few. While these efforts have not yet been evaluated, well-designed bridge programs are used successfully in physics and other disciplines to increase the number of underrepresented minority students earning doctoral degrees (for example, Stassun et al. 2011). More generally, the economics profession would benefit greatly from additional studies with credible identification strategies to help estimate the effectiveness of these kinds of pipeline and mentoring programs.

Remove Implicit and Institutional Barriers

Research shows that implicit associations can be modified to produce outcomes more aligned with our values and intentions. In one prominent example, Pope, Price, and Wolfers (2014) show that racial patterns in personal foul calls by professional basketball referees disappeared following media attention to findings reported by Price and Wolfers (2010).

Laboratory experiments suggest that interventions can alter implicit attitudes. Devine, Forscher, Austin, and Cox (2012) study 91 nonblack undergraduate students who took a 12-week course to raise awareness of the existence and effects of implicit bias and to learn about an array of proven strategies for reducing bias. The students in the treatment group changed their scores on implicit bias tests about black-white associations, and the change persisted eight weeks after the end of the course. Research also suggests that altering decision-making procedures can

limit the opportunity for bias to influence evaluations and behavior. A well-known example is the study by Goldin and Rouse (2000), which found that when auditions for professional orchestras occurred behind a screen, so that musicians were judged only on what they sounded like, the chances rose for women to be hired. More broadly, Soll, Milkman, and Payne (2014) review a range of literature on ways to “debias” judgments, which apply not only to attitudes about women and minorities in economics but also to the full array of behavioral decision biases. For example, we can create conditions for making less-biased evaluations by: removing identifiers, minimizing time pressure and distractions, discrediting feelings of connection or chemistry, committing to fair and relevant admissions or hiring criteria before learning applicants’ race or gender, collecting more evidence on candidates’ competencies, creating accountability, and strategically setting default options and other nudges. Efforts along these lines deserve further study and documentation.

Certain institutional features and practices that can act as barriers to diversity should be reconsidered. Conventional hiring and admissions standards—such as hiring exclusively (or almost exclusively) from elite PhD programs, getting referrals from traditional networks, and using test score cutoffs—may be better indicators of past background than of future potential. Indeed, using a minimum GRE score below which graduate school applicants are rejected without consideration of other information violates the test developer’s guidelines (ETS 2015), and physicists are constructing alternative selection criteria more predictive of success in scientific research (for example, Miller and Stassun 2014). When developing criteria to evaluate candidates, colleagues, or students, the goal should be to set sufficiently broad and fundamental criteria to allow all types of candidates to reveal their strengths and potential. As colleagues, we can be allies to women and faculty of color by helping to relieve service burdens and making sure diverse types of work are valued. Using a combination of survey, field, and laboratory evidence, Vesterlund, Babcock, Recalde, and Weingart (2015) consider the allocation of “non-promotable tasks” (tasks irrelevant to advancement of an individual’s career but necessary to the wellbeing of the group) and find that women more often are asked to do these tasks, and accept, due to commonly held beliefs that men are relatively less inclined to do them. More generally, the possibility of bias in the impact of the policies, shortcuts, and habits of individuals, departments, and administrations should be recognized and addressed.

In some ways, efforts to reduce bias ask nothing more than for academics to listen to the better angels of their nature. Fair and specific feedback, delivered with both an invocation of high standards and an assurance of the person’s capacity to reach those standards, can counter stereotype threat and close racial gaps in perceived bias, motivation, and achievement, as Cohen, Steele, and Ross (1999) demonstrate in a study of 100 black and white Stanford undergraduates. A sensible, if untested, strategy to counter the everyday effects of unconscious bias is to crowd out micro-inequities with what Rowe (2008) calls “micro-affirmations,” defined as small acts that occur, consciously or unconsciously, wherever people wish to help others to succeed. In interactions with colleagues and students, give credit to others, open doors to opportunity, listen, include, support, and encourage.

Conclusion

We hope that these insights and results about diversity, drawn from bodies of research in multiple disciplines, help to suggest promising directions for future interventions and research, by economists and others. The evidence seems clear that the field of economics is behind others in its progress on diversity concerns, and our sense is that attending to what we have characterized as demand-side issues could have great payoffs. Recent methodological advances, especially in analyzing cognitive biases and in the use of laboratory and field experiments, provide new insights and opportunities for research into the benefits, barriers, and steps to a more diverse and inclusive profession.

The social science discipline of economics will be strengthened if it is built on a broader segment of the population. In October 2014, the Federal Reserve hosted a National Summit on Diversity in the Economics Profession, bringing together presidents and research directors of the Federal Reserve Banks and chairs of economics departments from around the country to open a professionwide dialogue about diversity. In her remarks at this event, Federal Reserve Chair Janet Yellen (2014) stated, “[W]hen economics is tested by future challenges, I hope that our profession will be able to say that we have done all we could to attract the best people and the best ideas.”

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Gender and Academics

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Authors: Donna K. Ginther, Shulamit Kahn & Jessica McCloskey

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Abstract

Although women have reached parity and surpassed men in the attainment of bachelor's degrees (Goldin et al. *J Econ Perspect* 20(4): 133–156, 2006; Ceci et al. *Psychol Sci Public Interest* 15(3): 75–141, 2014), their representation within academic departments and disciplines depends on the field and rank. Here, we review the literature about women in academia, focusing on the evidence from the economics literature, but supplementing it with notable studies from other disciplines. We also examine the special case of the economics profession, where – surprisingly – women's progress has stagnated. We start by describing the representation of women in science academia and its antecedents in higher education. Since, in mathematics-intensive sciences, the underrepresentation has its roots prior to the doctorate, we briefly summarise what is known about gender differences related to mathematics and science at earlier ages. In particular, we examine the impact of role models, bias and stereotype threat in explaining the differences. We then transition to research on gender differences in academic career outcomes, considering issues related to work–life balance and bias in the academic hiring process, in academic productivity, in promotion and in salaries. Finally, we discuss how policies influence the representation of women in academia. This chapter was originally published in *The New Palgrave Dictionary of Economics*, Online edition, 2016. Edited by Palgrave Macmillan

Doubly disadvantaged or an exception to the rules? Minority women in accounting academia

Margaret Lightbody, Amelia A. Baldwin, and Brad S. Trinkle

Working draft.

“Evidence suggests that, where women and people of colour are able to gain entrance to the professorate, they are more often than not penalized by reward and prestige systems that favor men over women and Whites over non-Whites... African American female faculty occupy the most disadvantaged position of the four faculty race/gender subgroups studied. To the extent that it is true... Black female faculty experience systematic, significant disadvantages, which can result in serious, persistent obstacles to their recruitment, retention, and success in US higher education.” (Allen et al. 2002, 214-5)

Introduction

Sexism and racism¹ have long been highlighted as primary causes of the lower participation rates and lower progress rates of women and minorities in US higher education, where the perception that “the perfect graduate student is a young white male” seems to hold sway (Viernes Turner and Thompson 1993, 364). Underpinning these arguments are significant bodies of literature on both the experiences of women in academia and on the experiences of minorities in academia. However, for minority women, the impacts of sexism and racism are argued to combine to create a type of discrimination that differs from that experienced by white women and minority males (see, for example, Viernes Turner and Thompson 1993, Ellis 2001, Gregory 1999, 2001, Allen et al. 2002, Myers 2002).

¹ Gregory (2001,124) argues that black women must battle “A tripartite or threefold shroud of oppression consisting of racism, classism and sexism.” While not denying the impact of classism, we will be focusing our study only on race and gender.

Much of the literature addressing minority women argues that important differences exist between minority women and their white counterparts (see, for example, Ellis 2001), and between minority women and minority men, suggesting that racism and sexism may combine to not only potentially doubly disadvantage minority women, but to create a different and even more challenging form of disadvantage for these women. The literature also suggests differences may exist between the experiences of women from differential racial or ethnic backgrounds. However, given the very small number of minority women in the current study, African Americans, Hispanics and Native Indian Americans have been grouped into a single minority category.

Historically, very few US doctorates were awarded to minority males and even fewer to minority females. However, the number of doctorates awarded to US minority women rose by 103% between 1996 and 2006, compared to an overall rise in total doctorates awarded in the US of only 33% (ACE 2009). In accounting, while minorities received only 2.6% of the doctorates awarded between 1987 and 1996, they were awarded 9.7% of the degrees granted between 1997 and 2006, giving an almost four-fold increase (Baldwin et al. 2010). Although a number of studies have considered the experiences of minority women doctorate students and doctoral graduates, none have explicitly investigated accounting graduates. Rather they have tended to select their study participants from those enrolled in doctorates more generally, and thus have focused almost exclusively on minority women undertaking degrees in education and the liberal arts, with a much smaller number in the sciences. Within accounting, a number of studies have considered gender differences in academia (see for example, Buchheit et al. 2000, Carolfi and Pillsbury 1996, Collins et al. 1998, Collins et al. 2000, Dwyer 1994, Norgaard 1989, Jordan et al. 2006, Lanier and Tanner 1999, Rama et al. 1997, Streuly and Maranto, 1994). However none have considered the intersection of gender and race. Likewise the handful of minority studies in accounting have not explicitly considered gender (Hammond 1995, Weisenfeld and Robinson-Backmon 2007, Blanco and de la Rosa 2008, Baldwin et al. 2012).

This paper explores the relative progress of minority women in accounting academia. While the previous studies have considered aspects of the qualifications, initial placement, and current rankings of accounting academics in terms of race and gender, they have not brought these together to examine whether minority women in accounting may, like their peers in other disciplines, be subject to a double disadvantage.

Literature review

The literature relevant to this study spans several areas, including research on doctoral education, initial placement, and continuing employment of minorities and women.

Doctoral programs

The academy has long noted that in order to increase the proportion of minority faculty, first the number of minorities graduating from doctoral programs must increase. Considerable research has explored the factors that both support and hinder the enrollment and progress of minority women in doctoral programs. At the same time such studies have recognized that merely graduating from a doctoral program is not sufficient to ensure equality of career opportunities for minority women.

The quality of the doctoral degree is considered the foundation of career success. In accounting, as in many disciplines, quality is determined first, by the prestige or rank of the degree granting institution, and second, by the relative rank of the graduate within their class. On the first measure, Fogarty and Ruhl (1997, 41) argue that

“Receiving a degree from a top doctoral program facilitates initial placement at a school where success in publishing is expected and often attained. Early publishing success, in turn, may create additional motivation to maintain or increase research output. In contrast, those emerging from lower-status programs may take initial faculty positions at lower-ranked schools where they will have greater difficulty publishing their work. Therefore, the career

paths of accounting academics begin to diverge at the time of admission to the doctoral program.”

Generally, graduates from higher ranked doctoral programs gain initial placements at higher ranked schools. While this may occur on average, considerable variance exists in the placements of graduates from similarly ranked programs, particularly from top schools. Smeets et al. (2006), for example, found that the bottom-of-the-class graduates from top-quartile doctoral programs in economics attained lower initial placements than top-of-the-class and middle-of-the-class students from middle-quartile programs. A number of studies have also suggested that the impact of doctoral program quality may be mediated by the extent of faculty support received by the graduate, with those graduates receiving considerable faculty support in terms of phone calls to potential employers and strong letters of recommendation, tending to place higher than graduates without such support (Stammerjohan et al. 2009, Smeets et al. 2006).

While the number of minority women with doctorates is rising, such graduates may not be receiving the best doctorates from their program in relation to their peers. Nettles (1990) found African-American students were less likely than non-minorities to have attended selective undergraduate institutions and were more likely to have lower SAT scores and undergraduate GPAs. Therefore, they may be less eligible to attend more prestigious doctoral programs and may enter doctoral programs less prepared for the rigors of graduate studies than their nonminority peers. This in turn may impact the quality of the resulting doctorate qualification. Studies have also indicated that minority students often have lower socio-economic status than nonminority students (Nettles 1990) and thus are more likely to need to work during their degree. Viernes Turner and Thompson (1993) found more minority women than majority women worked outside the university. This in turn can interfere with the candidate's time to study and the resultant GPA. Nettles (1990) found black graduates had lower average doctoral GPAs than their white peers.

While these factors might be considered outside the control of the doctoral programs, internal factors may also have a more negative impact on minority women than their peers. Ellis (2001) found minority and women students were more likely than white men to express dissatisfaction with their thesis advisors and other mentors. The minority women in her study “reported more confrontational relationships with their advisors” and “reported poorer relationships with their academic advisers than any other group” (Ellis 2001, 40). While Ellis did not provide any direct evidence of the cause of this, she did note that “When faculty members expressed interest in the students’ research topics, career goals, or teaching interests, the students reported feeling valued by their departments” (Ellis 2001, 37). Studies in humanities disciplines often argue black women may be interested in researching less mainstream topics, which may be of less interest to their mainstream supervisors, many of whom will be white males.

Considerable evidence also suggests that minority women receive less academic integration than their nonminority and male peers. Ellis (2001, 41) reports that African-American women often felt “on the outside of the departments.” Viernes Turner and Thompson (1993, 362) found minority women “typically reported feeling detached from [the academic] community.” However, while a trend of dissatisfaction amongst minority doctoral students is noted, some reported more positive findings. For example, Williams (2000) reported African-American respondents had a more positive perception of their academic environment and faculty advisors (i.e. faculty and courses) than other minority groups but a more negative perception of the social environment (peers, campus community). Nettles (1990) found African-American women were less often assigned to research teams.

In a study of women doctoral students, Viernes Turner and Thompson (1993, 359) found “minority women generally had few opportunities for professional socialization experiences” as “more majority women had [research and teaching] assistantships and mentoring experiences [and] more frequently they reported the presence of support networks inside their departments” (360).

Mentoring experiences more often experienced by majority women included help getting assistantships and “coauthoring papers with a faculty member [52% v 27%], making presentations at professional conferences [48% v 38%], and being introduced by faculty to a network of influential academics who could provide support for students seeking entry-level jobs [64% v 51%]” (Viernes Turner and Thompson 1993, 360). Thus, while a cohort of students may all have graduated from the same school, some may have much less developed vitas, less engagement with the most eminent faculty, and fewer research projects outside of their own dissertation (Ellis 2001).

Minority women have often been reported as relying heavily on their community and support networks outside of the university (e.g. Viernes Turner and Thompson 1993). While having such support may be a major contributor to their success in completing their doctorates, it may have negative ramifications for their being chosen by faculty to be mentored and supported. For example, Viernes Turner and Thompson (1993, 366) reported a faculty member as saying:

As a professor, when I look for a graduate student to fulfill these roles [as a teaching or research assistant], I look for the brightest, the most advanced, the easiest to work with, the ones who have a beginning of their own network, and who have a schedule compatible with mine... [Minorities and women in your study] ...are not around the university as much because they are working off campus, and may be more involved in their community outside the University than in the University... Few faculty, out of the goodness of their hearts are going to choose a woman, minority, or disabled graduate student... if there is a white male who is perceived as slightly better on these features, because faculty see their own productivity and future at stake...

If minority women have fewer opportunities to integrate within the academic community, they will be less likely to have teaching and research experience to bolster their vitas and may not have the advocacy of their school’s most eminent professors to write their letters of recommendation and make the introductions that lead to the best placements.

Studies also suggest that minority women may find their doctoral studies a more alienating experience than their nonminority peers. Minority women may feel under more pressure in a doctorate program. Jackson (1998) argued that “Black women may have a tougher time in the classroom because... they feel the pressure of proving to white students and faculty members that they were academically qualified to be at the institutions.” Overall they felt minority women were more reluctant than minority men to raise issues in the classroom. Many studies conclude that minority women experience less socialization in their doctoral programs than either minority men or nonminority students. Social support from within the academic community has long been associated with greater success in doctoral studies (see, for example, Williams 2000).

Ellis (2001, 38) found black women felt most alienated on campus compared to other groups – “Black females...expressed feeling little, if any, connection with their doctoral communities”. She attributed some of this as “Students who were part time, working professionals, married, or had small children did not, generally, spend much time with their [doctoral student and faculty] peers” (Ellis 2001, 38). Ellis found black students tended to socialize with other black students, but this was often attributed to the culture differences of being from the South. Nettles (1990) found that African-Americans tended to be somewhat older than other ethnic groups but only slightly older than whites. Interestingly, the negative impacts of socialization appeared to be more important for women minorities than males. Ellis (2001, 39) discovered that black men reported the highest satisfaction with their doctoral experiences while black women reported the lowest. She found black men approached doctoral studies from a functional perspective, wanting to complete it quickly to get out and gain employment, and were not concerned with social integration.

While the performance of minority women may be affected to a greater degree by limited opportunities for academic integration, socialization, work and family pressures, they are also more likely to experience outright discrimination on the grounds of both their race and also their gender. Nettles (1990, 507) found “black doctoral students were more likely to perceive that their graduate

institutions are racially discriminatory” than Hispanics and whites. A study of a Midwestern University by Viernes Turner and Thompson (1993, 360) found that while “minority women reported little racial discrimination... both minority and majority women overwhelmingly reported gender discrimination.” Some evidence of ageism was also seen, with one women respondent stating that, in her opinion, “The perfect graduate student is a young white male” while another argued that “male grad students tend to be the stars and females aren’t...” (Viernes Turner and Thompson 1993, 364).

Employing institutions

Gregory (2001, 124) found that in the mid 1990s, African American women were 6.23% of full time US faculty but “roughly half these women are employed in [HBCUs] and most of the remainder teach in community colleges.” Gregory further argued that, in common with nonminority women, “Black women too often reject positions in higher education because of family and community responsibilities” (2001, 124). Other studies have noted that very few minority women are in academic employment compared to even minority men (Allen et al. 2002).

Although an increasing number of minority women are now employed in academic institutions, they are more likely to be at less prestigious institutions (i.e. non doctoral granting institutions) and to hold non-tenure track positions (Gregory 2001, Carter and O’Brien 1993). Gregory (2001, 124) found that in the mid 1990s, African American women were 6.23% of full time US faculty but “Roughly half these women are employed in [HBCUs] and most of the remainder teach in community colleges.” Rather shockingly, many studies report a continued perception that women and minorities are generally only employed to fill affirmative action targets (e.g. Carter and O’Brien 1993).

Studies have also reported evidence that minorities and women, and thus more so minority women, are less likely to be promoted. Allen et al. (2002) also found African American men were more likely to be full professors than African American women (28% v 11%). They also noted that while 47% of white males in their sample were full professors, 28% of African American males held such titles

compared to 20% white women and only 11% of African American women. Carter and O'Brien (1993) report at one university over three intakes of assistant professors, only 9% of African American candidates were promoted to associate professor compared to 51% of white faculty. Gregory (2001) cites a study arguing that of all minority professors in the institutions that they studied, black women were 19% of full professors, 27% of associate professors, 33% of assistant professors, and 37% of other positions. Gregory (2001) referred to this low representation of minority women as *academic apartheid*.

A number of factors are identified in the literature as potentially contributing to minority women's slower progression through the academic ranks. Black women may have greater difficulty gaining tenure if their research focuses on minority issues, as tenure applications are usually evaluated by more mainstream researchers. (Gregory 2001, Allen et al. 2002). Minority women "are disproportionately involved in undergraduate teaching" (Allen et al. 2002 205). For example, Allen et al. (2002) found that 70% of black women were involved in undergraduate teaching compared with 40% of black males, 36% of white women, and 26% of white males. This could be at least partly due to the more junior status of minority women. Interestingly, while Allen et al. (2002) found black faculty in their study taught significantly more undergrad classes than white faculty, no gender significant differences were identified. However when race and gender were combined, the difference was highly significant.

Black women may have greater difficulty gaining tenure if they spend more time on administration and student support than their non-minority or male peers. This overload is attributed partially to the choice of the individuals (that they care about the students) but is also driven by the small numbers of minority faculty (Allen et al. 2002, Gregory 2001). Women minorities in turn "frequently... deal with overload by postponing or downshifting research and publication efforts" (Allen et al. 2002, 193). Interestingly, considerable evidence points to a catch-22 for minority women. While institutions would presumably punish minority faculty (e.g. by failing to give tenure or

promote) for spending more time mentoring and supporting students rather than researching, one of the main reasons stated by universities for needing more minority faculty was to attract and support minority students in the first place (see Gregory 2001, Allen et al. 2002).

The major factor driving promotion decisions is research output. Gregory (2001 126) found that African-American women “typically engaged in more teaching, advised greater numbers of students, and participated in more committee work than did their White male counterparts. They subsequently conducted less research and published fewer articles than did either White faculty men or women. They further tended not to be included in collaborative research projects with their peers... often lacked sponsorship for research, and rarely had access to resources for research that could lead to greater prestige, higher future economic gains, and enhanced job mobility.”

However, when Allen et al. (2002) looked at the number of hours spent by faculty on research. They found that men outperformed women and white faculty outperformed black faculty. “White men devote roughly half a day more per week to their research compared to other race/gender faculty subgroups...” (Allen et al. 2002, 212). One in five white males had five or more publications in the study period compared to one in eight white females, black men and black women. But the proportion of African-American women far exceeded any other group for having 10 or more publications in the study period. However, this study did not consider whether such publications were in the mainstream journals for the disciplines and thus whether they were valued by tenure and promotion committees.

Even where equivalency of rank exists, “Women and minority faculty are consistently paid less than White males at every faculty rank (Toutkoushian 1998).” A national study of doctoral graduates in the US (science and health) showed black women get lowest average pay out of all racial and gender groups (National Science Foundation 2006). Allen et al. (2002, 204) found “Black women professors (60 percent) express strong dissatisfaction with their salaries compared to 44 percent of Black men and White women and 37 percent of White men.”

Experience of outright discrimination unfortunately continues to be reported in the literature.

Gregory (2001, 130) cites Moore and Wagstaff's (1985) somewhat dated survey of "over 3,000 Black women scholars working with or in majority four-year institutions of higher education. They found that 95% of all their black women respondents reported having been the recipient of some form of discriminatory activity by persons within their institutions." However, more recent studies indicate that in accounting schools, women and minorities were far more likely than white men to perceive gender or racial discrimination (Weisenfeld and Robinson-Backmon 2007). In their four way study, Allen et al. (2002) found African American women faculty were the most dissatisfied with their institutions. "White male faculty are four times more likely than African American females to express the highest general satisfaction with their institutions (40 versus 10 percent)" (Allen et al. 2002, 204). For comparison, 31% of white females were highly satisfied as were 28% of black males.

Studies also found minorities were more likely to leave positions and were more likely to be seeking a new position (revolving door syndrome) (Weisenfeld and Robinson-Backmon 2007). Carter and O'Brien (1993) suggests this could be due to minorities and women "being granted tenure less often than white men," having to "contend with discriminatory and non-supportive work environments," and "seeking better employment opportunities with independent or out-of-state colleges and universities (13)." Exit interviews found men of color tended to cite higher salary and women tended to cite "non-supportive work environment" as reasons for seeking employment elsewhere. "Both men and women of color also reported that geographic location played an important role in their decision [to leave], with 39 percent mentioning it (14)."

Minority women were more likely to be hired ABD and thus to struggle to complete their doctorates while managing a full teaching load. Carter and O'Brien (1993, 13) found "Women faculty were twice as likely as men faculty to be doctoral students" and African American and Hispanic faculty were far more likely to be undertaking their doctorate compared to white or Asian faculty. Again, this could be a factor of age or discipline.

Black women are also more likely to be juggling work, family and community responsibilities (Gregory 2001). Gregory (2001, 131) argues that “a disproportionately greater number of Black faculty women are single, often with children, their marginality is heightened because affirmations of a two-parent home and family are not readily available to them (Dugger 1996)... [They are also] most likely to be primarily responsible for household chores...”

Research questions

In order to examine the relative participation and progress of minority women in accounting academia, the study considers a number of questions for each of the following four subgroups: nonminority men, minority men, nonminority women, and minority women.

- Do rates of graduation from each alma mater quartile differ by subgroup?
- Does alma mater rank differ by subgroup (in total and by alma mater quartiles)?
- Does initial placement rank differ by subgroup? (in total and by alma mater quartiles)
- Does 2007 employer rank differ by subgroup? (in total and by alma mater quartiles)

The expectation from the interdisciplinary literature above is that for all measures of academic progress, nonminority males would rank highest, minority women would lag the most, and nonminority women and minority males would fall somewhere in between. Studies of the academic accounting pipeline suggest that graduates who gain higher ranked initial placements would later have higher ranked employed than their doctoral school peers who accepted lower ranked initial placements.

Methodology

This section explains the data and the methods used to identify and locate the relevant information about accounting doctoral graduates. The analysis is also described.

Data Description

This data set includes all U.S. accounting doctoral graduates for the years 1987 to 2006 inclusive for whom i) gender is known, ii) minority status is known, and iii) initial placement was in a US university. Included are 2,415 graduates of the potential 3,213 graduates that were initially identified through Hasselback's (2007) online listing of doctoral graduates by school. This potential list of graduates was first researched via web searching and phone calls to identify only those with a doctorate in accounting (resulting in a population of 3,206). Gender was not assumed from first names only, given the proliferation of gender neutral names. Internet searches, phone calls and emails enabled the identification of gender for the majority of graduates. Of the initial 3,206 graduates positively identified as accounting PhDs, gender was determined for 96.5%.

Graduates' initial placements were researched using Hasselback's (2007) listing, older directories (Hasselback 1988-2007), alma mater and employer websites, and general internet searches.

Graduates with initial placements outside of the US, in industry or government, or completely unknown were removed, leaving 2,415 graduates for the initial analyses. These graduates without US academic initial placements were not included in the analysis for several reasons but largely because their differential career path is unusual compared to most graduates and because many of these graduates were foreign and have simply returned to their homelands to further their careers, whether in academic or government or industry. The vast majority of these graduates were male non-minorities.

The PhD Project initially provided minority status data. In this study, minorities are identified as those which are under-represented in accounting academia, which includes African-Americans, Hispanic Americans, and Native Americans (Asians are not under-represented in accounting academia). The PhD Project did not collect minority student data before 1994, so graduate minority status was individually confirmed via Internet searches, phone calls and emails. Thus, while this study's data may differ slightly from previous studies (e.g. Hammond 1995, Blanco and de la Rosa

2008), the extensive research and confirmation process used to create this data should provide the most comprehensive and accurate data set possible.

The employer of each graduate in 2007 was identified. Only those graduates in academic positions were included in that part of the analysis. Since graduate some graduates had left academia, retired or died. Thus, the employer rank analysis includes the 2,219³ graduates (of the initial US academia placed population of 2,415) who were identified as being employed in academia, whether in the USA or elsewhere.⁴

Doctoral alma mater rankings, initial placement rankings and 2007 employer rankings were identified using the world ranking of accounting departments created by Chan et al. (2007). Chan et al. (2007) ranked 1,087 universities⁵ according to research productivity based on weighted publications in 24 leading accounting journals from 1991 through 2005.

Analytical Procedures

The analytical procedures largely consist of the generation of descriptive statistics for each variable of interest. Chi-square statistics indicate differences in the distributions of minority and non-minority graduates across a number of variables. The general linear model [GLM] is used to compare various mean institution ranks of the four gender-minority groups, and further, to perform pairwise comparisons of the means, in order to answer the research questions previously identified. While analytical tables have been generated for all variables of interest, only tables that illustrate particularly significant findings are included in the manuscript⁶. However, the significant difference

³ Interestingly, the 196 graduates who left academia altogether between their initial placement and their 2007 employment (or whose employment was unknown) were largely non-minorities. Of the 196, 55% were non-minority males, 44% were non-minority females and less than 2% were minority females. No minority males left accounting academia between their initial placement and 2007. Viewed relative to their distribution in the initial 2,415 graduates, the 196 missing from the 2007 data constituted 10% of non-minority women, 7% of non-minority men, and 4% of minority women. Clearly, minorities are not leaving academia in droves.

⁴ Of the graduates employed in academia outside of the US in 2007, none were minorities.

⁵ The universities were ranked from 1 (for the top institution) downwards. While Chan, Chen and Cheng (2007) did not list every university ranked, the authors were kind enough to share their complete ranking data.

⁶ A full set of all the tables generated for the study may be obtained from the lead author.

in the numbers of male and female minority graduates compared to male and female non-minority graduates requires caution in drawing conclusions about comparative samples (Allen et al., 2002).

Demographics

The distribution of graduates across the four categories by gender and minority status is shown in Table 1. Note that minorities comprise only 5.1% of the graduates studied.

The graduates were divided into alma mater quartiles according to the rank of the doctoral institution. Table 2 summarizes the number of graduates and lists the universities included in each quartile. The number of graduates differs across the quartiles mainly because many of the higher ranked schools tend to graduate the largest numbers of graduates. The lower ranked schools tend to graduate fewer graduates. Plus, some programs are new, and therefore do not have many graduates in the data and new programs tend to be ranked lower in their early years.

Findings

This section describes the findings of the statistical analysis for alma mater rank, initial placement rank, and 2007 employer rank. For each set of rankings, all four gender-minority groups were compared in total using GLM, then they were compared for each of the alma mater quartile groups.

Alma Mater Rank

Table 3 illustrates the distribution of graduates across the alma mater quartiles by both gender and minority status. The distributions of the gender-minority groups within each quartile do not differ statistically ($\chi^2 p=0.994$).

Alma Mater Rank

While minority women appear to graduate from slightly lower ranked doctoral programs than any of the other subgroups, and minority males graduate from slightly better ranked programs, overall no significant differences are found in the rank of the doctoral programs for each subgroup (see Table 4).

Further tests of the mean alma mater rank for each of the four gender-minority groups with each alma mater quartile revealed no differences in the first three quartiles. However, in the bottom quartile, the pairwise comparisons show that the mean alma mater rank of minority women in this quartile is significantly lower than the other three gender-minority groups (see Table 5).

A closer examination of the spread of graduates from all four subgroups across the programs ranked in the bottom quartile shows that minority women are pretty evenly distributed across these programs (although none in the highest ranked three programs), whereas no minority males have attended the bottom eight programs (and none have attended 10 of the bottom 11 programs). Interestingly, three programs (Oregon, Southern Illinois, Texas Tech) ranked near the top of this quartile have graduated large numbers of non-minority males (57 in total) and only one minority (a female) amongst them.

Initial Placement

A gender-minority comparison of the mean rank of the initial placement employers shows no significant differences overall (for all graduates from all quartiles) with $p=0.109$. However, the data show an average ranking for initial placement of minority women (422) that is the lowest (see Table 6). Non-minority males have the highest average initial placement rank, followed by non-minority females, minority males, and minority females. Further analysis of pairwise comparisons reveals that the average initial placement of minority females is significantly lower than the placement of non-minorities, whether male or female.

Each alma mater quartile was then analyzed separately to identify patterns in placement of graduates of similarly ranked programs. In the first quartile, the mean initial placement ranks by gender-minority groups significantly differed ($p=0.000$). These results are summarized in Table 7 which also provides the pairwise comparisons, which reveal that the average initial placement of minority females is significantly lower than the placement of each of the other gender-minority groups. The other pairs do not show significant differences.

For the second quartile, no significant differences were found in mean initial placement overall or in the pairwise comparisons of gender-minority groups.

For the third quartile, no significant differences were found in mean initial placement overall ($p=0.16$), but the pairwise comparisons showed some marginally significant differences for minority women, when compared with males, either minority or non-minority. Interestingly, for graduates of this second quartile, minority women initially placed better than minority men on average. These results are shown in Table 8.

In the bottom quartile, the mean initial placement ranks by gender-minority groups significantly differed ($p=.011$). Almost every pairwise comparison showed significant differences. In this quartile, the lone exception was male non-minorities compared to female non-minorities. The results are summarized in Table 9 which also provides the pairwise comparisons for minority females. The average initial placement of minority females is significantly lower than the placement of each of the other gender-minority groups. Interestingly, the average placement for minority males was the highest (and it differs significantly from all the others in pairwise comparisons). In the bottom quartile, minority males place, on average, better than all the other groups.

2007 Employment

A gender-minority comparison of the mean rank of the 2007 employers shows no significant differences overall (for all graduates from all quartiles) with $p=0.498$. Further pairwise comparisons also show no significant differences.

Similarly, a gender-minority comparison of the mean rank of the 2007 employers for top quartile graduates, shows no significant differences overall, nor are significant differences found in the pairwise comparisons. Likewise for the second quartile: no differences found in any of the comparisons.

While the third quartile showed no significant differences in the four way comparison of the gender-minority groups and their mean 2007 employer ranks ($p=0.171$), the pairwise comparisons did show some interesting differences. For graduates from the third quartile doctoral programs, minority women are employed in 2007 at significantly *higher* ranked institutions when compared to each of the other three gender-minority groups. Table 10 summarizes these data.

The fourth quartile showed significant differences in the four-way comparison of groups for 2007 employer ranks ($p=0.002$). In the pair wise comparisons, as was true for initial placement comparisons, every pair was significantly difference except for non-minority males compared to non-minority females. Table 11 summarizes these results. Note that minority men in this quartile were employed at the highest ranked schools on average (mean=338) and minority women were employed at the lowest ranked schools on average (mean=895).

Discussion and Conclusions

Overall, the interdisciplinary literature pertaining to minority women indicates that minority women are more likely than their other gender-minority peer groups to have lower ranked initial placements. Academic career literature, as well as race and gender literature, would then suggest that those with lower initial placements will continue to have subsequent employment at lower ranked institutions. In order to control for the likelihood that the quality of the initial placement will be at least in part influenced by the quality of the alma mater, placements and employment were considered overall and then separately for each of four quartiles of doctoral programs.

For the majority of the quartiles, minority women received doctorates from equally prestigious schools as other graduates. It was only in the bottom quartile that a lower mean was identified. While the pattern of initial placement for the lower three quartiles was consistent with the expectations from the ranks of the alma mater (i.e. minority women placed in similarly ranked institutions to the other groups in quartiles 2 and 3, but significantly lower in quartile 4), a different

pattern was evident in quartile 1, where despite receiving similarly ranked doctorates, minority women placed far lower than their peers.

When employment in 2007 was considered, again quartiles 2, 3 and 4 are consistent with the expectation that initial placement rank would influence subsequent employment. Of interest is that while the minority women in the third quartile gained initial placements at slightly higher ranked institutions, they appeared to have capitalized on their slightly better start to have subsequently gained employment at significantly higher ranked schools than their peers. The only group to have evidenced a pattern substantially different from that anticipated was the minority women in the top quartile. Despite their significantly lower initial placements, by 2007 minority women had upgraded their employment to institutions that ranked no different from their peers who had commenced their careers in much more prestigious institutions.

The pattern of employment of the top quartile minority women warrants further consideration. First, it is necessary to understand why their career pattern differs so much from the norm. Are these graduates selling themselves short in their initial placement? If so, why? Are they choosing to go to a lower ranked institution for personal reasons, such as family commitments, which later resolve and allow them to seek employment elsewhere? Might it be the case, and one hopes this is not so, that minority women's experience of double discrimination in the prestigious doctoral schools drives them to seek a more comfortable initial placement in which to rebuild confidence, energy and so before tackling their careers in earnest? Or have the minority women worked out something that their peers haven't – that there is no need to spend the first few years of your career nearly killing oneself trying to get tenure in a highly ranked institution.

Also of interest is why the career pattern of top quartile minority women in accounting appears to differ from that reported in other disciplines or even from that of the lower quartile doctoral graduates. Of particular concern is that the practice of ranking doctoral programs based on the initial placement of their graduates may lead to such schools holding an unfair perception of the

value of minority women and thus a preference to not take such candidates into their programs. This would be a tragedy given the evidence presented in this paper that top quartile minority women graduates appear to have longer term employment that looks very similar in terms of employer prestige to their nonminority graduating colleagues.

The differences evidenced by breaking the overall graduate employment patterns into subgroups to account for doctoral quality indicate the need to look within the overall graduate cohorts, and not just at the patterns for gender-minority groups as a whole. Employment patterns for doctoral graduates vary markedly across the different alma mater quartiles. Future studies need to consider such analysis to better explain gender and minority career patterns.

Limitations

The very small numbers of minority women mean caution needs to be exhibited in expressing opinions on the findings presented in this paper. The analysis has also grouped a number of different racial minorities into one category to facilitate statistical analysis. This may have masked different graduation and employment patterns that may be experienced by minority women accounting academicians from different racial backgrounds.

Conclusion

Overall, this paper has indicated that minority accounting women academics appear to be outperforming their interdisciplinary sisters in terms of their longer term career activities. While graduates from the lowest ranked doctoral programs appear to significantly lag their nonminority peers in terms of initial placements and employment, graduates from the higher ranked programs do not. It thus appears that rather than having their careers curtailed by the double disadvantage of being both a woman and a minority, accounting graduates appear to be exceptions to the rule. However while this study provides useful and important insights into what is going on in accounting

academia, it does not provide insights into *why* such patterns are occurring. Further exploration through interviews or surveys with minority women themselves is required to provide such an understanding.

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Table 1. Distribution of graduates across gender and minority status groups.

	<u>Graduates</u>		<u>Percentage</u>	
	<u><i>non-minority</i></u>	<u><i>minority</i></u>	<u><i>non-minority</i></u>	<u><i>minority</i></u>
male	1,437	54	59.5%	2.2%
female	853	71	35.3%	2.9%

Table 2. Graduates and schools in each ranking quartile.

	Top Quartile	Second Quartile	Third Quartile	Bottom Quartile
<i>Graduates</i>	808	648	555	404
<i>Universities</i>	Arizona	Alabama	Arkansas	Cal-Irvine
	Arizona State	Carnegie Mellon	Boston	Central Florida
	Berkeley	Colorado	Case Western	Cincinnati
	Chicago	Conn	Florida Int'l	Cleveland St
	Columbia	CUNY-Baruch	GWU	Drexel
	Cornell	Duke	Hawaii	Florida Atlantic
	Georgia State	Florida	Houston	Georgia Tech
	Harvard	Florida State	Kansas	Jackson St
	Illinois	Georgia	Kentucky	Kent St
	Indiana	Iowa	LSU	Louisiana Tech
	Michigan	Maryland	Massachusetts	Miami
	Michigan State	Minnesota	Memphis	Mississippi
	North Carolina	Missouri	Nebraska	Mississippi St
	Northwestern	MIT	North Texas	Oklahoma St
	NYU	Oklahoma	Pitt	Oregon
	Ohio State	Penn State	Purdue	S. Illinois
	Pennsylvania	South Carolina	Rice	St Louis
	Rutgers	SUNY-Buffalo	Rochester	Texas Tech
	Southern Cal	Syracuse	South Florida	Texas-Arlington
	Stanford	Temple	SUNY-Bing'n	Texas-Dallas
	Texas-Austin	Tennessee	Utah	Texas-San Antonio
	Washington	Texas A&M	Va Tech	Tulane
	Wisconsin	UCLA	Wash St	Union-NY
		Wash U-SL	Yale	VCU

Table 3. Distribution of graduates across alma mater quartiles by gender and minority status.

<i>graduates</i>		Top Quartile	Second Quartile	Third Quartile	Bottom Quartile
males	non-minority	478	389	327	243
	minority	19	13	13	9
females	non-minority	291	224	199	139
	minority	20	22	16	13
<i>percent</i>		Top Quartile	Second Quartile	Third Quartile	Bottom Quartile
males	non-minority	59%	60%	59%	60%
	minority	2%	2%	2%	2%
females	non-minority	36%	35%	36%	34%
	minority	2%	3%	3%	3%

Table 4. Mean almatmater rank by gender and minority status

<i><u>gender</u></i>	<i><u>minority</u></i>	Mean Rank	Standard Deviation	N
males	non-minority	82.40	76.97	1,437
	minority	78.22	66.51	54
females	non-minority	82.05	75.58	853
	minority	91.79	101.45	71
<i>total</i>		<i>82.46</i>	<i>77.06</i>	<i>2,415</i>

Table A. Mean almanater rank by gender and minority status, all quartiles and each quartile.

<i>gender</i>	<i>minority</i>	Quartiles				
		All	1	2	3	4
males	non-minority	82	17	54	107	222
	minority	78	18	50	110	200
females	non-minority	82	17	54	110	223
	minority	92	19	51	104	258
<i>total</i>		<i>82</i>	<i>17</i>	<i>54</i>	<i>108</i>	<i>223</i>

Table 5. Almamater rank by gender and minority status for the bottom quartile only.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)	
males	non-minority	222.06	64.47	243	0.049	*
	minority	199.78	19.45	9	0.036	*
females	non-minority	223.33	53.31	139	0.062	*
	minority	257.77	131.36	13	N/A	
<i>total</i>		<i>223.15</i>	<i>63.58</i>	<i>404</i>		

Table 6. Mean initial rank by gender and minority status, all quartiles.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)
males	non-minority	326	333	1,437	0.018 *
	minority	345	306	54	0.201
females	non-minority	339	328	853	0.043 *
	minority	422	411	71	N/A
<i>total</i>		<u>334</u>	<u>333</u>	<u>2,415</u>	

Table I. Mean initial placement rank by gender and minority status, all quartiles and each quartile.

<i>gender</i>	<i>minority</i>	Quartiles				
		All	1	2	3	4
males	non-minority	326	153	303	432	560
	minority	345	199	377	516	360
females	non-minority	339	162	342	400	617
	minority	422	405	313	277	810
<i>total</i>		<i>334</i>	<i>163</i>	<i>319</i>	<i>418</i>	<i>583</i>

Table 7. Mean initial rank by gender and minority status, top quartile only.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)
males	non-minority	152.90	217.72	478	0.000 *
	minority	199.32	277.22	19	0.004 *
females	non-minority	161.65	202.37	291	0.000 *
	minority	405.05	433.49	20	N/A
<i>total</i>		<i>163.39</i>	<i>224.54</i>	<i>808</i>	

Table 8. Mean initial rank by gender and minority status, third quartile only.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)
males	non-minority	303.03	305.44	389	0.069 *
	minority	377.31	294.73	13	0.055 *
females	non-minority	342.47	309.91	224	0.157
	minority	313.27	365.59	22	N/A
<i>total</i>		<i>318.50</i>	<i>308.89</i>	<i>648</i>	

Table 9. Mean initial rank by gender and minority status, bottom quartile only.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)
males	non-minority	559.67	358.59	243	0.013 *
	minority	359.78	283.93	9	0.003 *
females	non-minority	617.09	346.18	139	0.060
	minority	810.31	345.14	13	N/A
<i>total</i>		<i>583.04</i>	<i>356.24</i>	<i>404</i>	

Table E. Mean 2007 employer rank by gender and minority status, all quartiles and each quartile.

<i>gender</i>	<i>minority</i>	Quartiles				
		All	1	2	3	4
males	non-minority	409	266	383	513	588
	minority	366	185	459	559	338
females	non-minority	423	295	399	497	630
	minority	451	283	455	311	895
<i>total</i>		<i>414</i>	<i>275</i>	<i>393</i>	<i>502</i>	<i>605</i>

Table 10. Mean 2007 employer rank by gender and minority status, third quartile only.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)
males	non-minority	513.07	368.23	307	0.031 *
	minority	559.08	327.01	13	0.069 *
females	non-minority	496.62	362.52	183	0.051 *
	minority	310.75	354.54	16	N/A
<i>total</i>		<i>502.18</i>	<i>365.63</i>	<i>519</i>	

Table 11. Mean 2007 employer rank by gender and minority status, fourth quartile only.

<i>gender</i>	<i>minority</i>	Mean Rank	Standard Deviation	N	Compared with minority females (<i>sig.</i>)
males	non-minority	587.55	352.83	224	0.003 *
	minority	337.89	299.32	9	0.000 *
females	non-minority	629.67	340.57	121	0.012 *
	minority	895.33	280.17	12	N/A
<i>total</i>		<i>605.43</i>	<i>351.34</i>	<i>366</i>	

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WHO AND HOW?

Daniel S. Hamermesh

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Six Decades of Top Economics Publishing: Who and How?

Daniel S. Hamermesh

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ABSTRACT

Presenting data on all full-length articles published in the three top general economics journals for one year in each of the 1960s through 2010s, I analyze how patterns of co-authorship, age structure and methodology have changed, and what the possible causes of these changes may have been. The entire distribution of number of authors has shifted steadily rightward. In the last two decades the fraction of older authors has almost quadrupled. The top journals are now publishing many fewer papers that represent pure theory, regardless of sub-field, somewhat less empirical work based on publicly available data sets, and many more empirical studies based on data assembled for the study by the author(s) or on laboratory or field experiments.

Daniel S. Hamermesh

Department of Economics

University of Texas

Austin, TX 78712-1173

and NBER

hamermes@eco.utexas.edu

I. Introduction

Navel-gazing has been a favorite activity of economists (and other academics) for at least 60 years. George Stigler (1959) discussed the effect of economics training on political views, and Committee (1965) discussed NSF data on the labor market for economists. One hopes that the rationale for this activity is that it stimulates more than just a prurient interest, and that it can enhance our understanding of the process of scientific discovery, the nature of interpersonal interactions and the role of rewards and incentives in stimulating activity. These last are my purposes here too—but I also hope to provide the enjoyment that contemplating our navels might offer.

The novelty here is several-fold. First, the journal literature studied is a sample of articles published in the leading general economics journals in six consecutive decades, thus offering a long-term perspective on trends in the demographics and focus of economic research at the highest levels. Second, I examine changes in the age structure of authors and in the methods they use (not their topics), neither of which appears to have been considered before. Finally, in addition to presenting some new facts I offer opinions and possible explanations for them. The purpose is not to test the roles of possible causes underlying the phenomena shown here, but to stimulate speculation and hopefully to generate formal examinations of them.

II. The Data

The sample consists of the 748 full-length refereed articles published in the *American Economic Review* (AER), *Journal of Political Economy* (JPE) and *Quarterly Journal of Economics* (QJE), the leading American general economics journals, in one year in each of the past six decades: 1963, 1973, 1983, 1993, 2003 and 2011. I exclude notes, comments/replies

and addresses/speeches.¹ There are 1269 names attached to these papers, representing 1100 different authors. The data collected for each article/author are the number of authors on each paper and each author's gender (both easy to obtain), each author's age (more difficult, and unobtainable for 1 author of a single-authored paper in 1963) and the methodology employed (acquired by skimming each paper). I classify methods into five types: Theory; theory with simulation; empirical using borrowed data; empirical using self-generated data; and experiment. Theory with simulation includes calibration in macroeconomics; borrowed data are all data sets that are copied directly from books (the old technology) or provided electronically; self-generated data include data sets assembled from diverse electronic or other sources; and experiments include both laboratory work and author-initiated field experiments.²

III. The Demographics of Authorship and Co-authorship

Table 1 presents the changing age and gender distributions of authors of articles in these three leading publications.³ In the first four decades of the sample there was very little change in the age structure of authorship. Only a tiny fraction of authors were older than 50, with roughly half being 35 or less, consistent with Harvey Lehman's (1953) path-breaking results on the age distribution at which creative achievements were achieved in a wide range of fields.⁴ By 2003 and 2011 the age distribution of authors of top-journal publications had shifted markedly rightward, so that today nearly 20 percent of authors are 51 or older, with around 6 percent being over 60.

¹I used the data for the first four years in Daniel Hamermesh (1996). I chose 1963 for personal reasons—I started writing publishable articles in 1964—and 2011 was the most recent available year.

²Because of the tremendous changes that have taken place in publishing over these six decades, I could not classify seventeen articles published in 1963 under any of these rubrics.

³The means and distributions are all weighted by the inverse of the number of authors of each paper. Inferences from unweighted data are nearly identical.

⁴The minimum age in the sample was 24, the maximum was 77.

These changes in the age structure are striking, and their causes have apparently not been examined. Some candidate explanations might be:

1. People are starting their careers later, causing an increasing left-truncation of the age distribution. The median age at doctorate in economics in the U.S. was 32.5 in the early 1960s and fell to 30.6 by the late 1970s. It did rise to 32.3 by the early 1990s, but from then to the mid-2000s it fell back to 31.7 (AEA, 2008). This explanation is thus inconsistent with the facts. Perhaps, though, the average age of faculty, as opposed to all Ph.D.s, has risen due to secular declines in new hires.⁵
2. The publishing process in economics has slowed considerably (as Glenn Ellison, 2002, documents), perhaps by two years. Taking all the papers from 1963-93 and adding two years to each author's age, the weighted distribution of authorship would have been 27.9 percent, 64.5 percent, 5.9 percent and 1.7 percent. In the two older categories this is little different from the actual distribution in 1993, but much different from the actual distribution in 2011. This explanation accounts for very little.
3. The internationalization of the profession has resulted in older, foreign-based scholars substituting for their younger, North American counterparts in these samples. It is true that the share of U.S./Canada based authors fell (from 92 percent in 1963-93 to 83 percent in 2003 and 2011); but in the last two years the average age of authors based in the U.S./Canada was 41.0, but was 40.7 of those based elsewhere. This explanation is wrong.
4. The publishing slowdown, coupled with unchanging and short tenure clocks, may have created incentives for younger scholars to shy away from these top journals (where the acceptance rates today average 7 percent) to top-level field journals, where the likelihood of an article being accepted is greater. There is some evidence for the highest-ranked departments showing a shift away from peer review (Ellison, 2011). On the other hand, the scarcity value

⁵A slightly related possibility is that editors are now older and tend to favor their contemporaries. The latter may be true; but the article-weighted age of editors who would have handled the 1963 papers was 53, that of the editors and co-editors who would have handled the 2011 papers was 52.

- of publishing in one of these journals has increased, presumably along with the effects of such publication on the likelihood of being granted tenure.
5. The increasing complexity and specialization in this “science” may have increased the “incubation” time before one can publish top-notch articles (see Benjamin Jones, 2009). Whether this is consistent with the changing methodology of leading publications (see the next Section) is not clear. Perhaps too, as the field has matured the rate of obsolescence of one’s graduate education and early training has slowed.
 6. Perhaps older economists are now healthier and more energetic than those in previous cohorts. This may be true for those ages 61+, but 55-year-old professors in the 1980s were hardly decrepit; and at least in the aggregate the improvement in health in this age range seems minor.⁶
 7. The abolition of mandatory retirement for faculty in 1994 has increased the monetary incentives to continue publishing. Salaries of senior professors have fallen sharply relative to those of junior professors. This might have reduced incentives for junior faculty to publish (and attain promotion and full-professor salaries).⁷
 8. The growth of consulting opportunities is hard to document, but their lures may provide a growing incentive to publish well while young to establish one’s *bona fides* in the lucrative consulting world. This would shift the age distribution leftward, opposite what has occurred. The continuing growth in the relative demand for provostlets and deanlets, who I assume cease contributing to the scholarly literature, provides an additional incentive in this, the opposite direction from what we observe.

⁶Among people 55-64 the percentage rating their health as fair or poor has declined only slightly, from 20.7 percent in 1991 to 19.4 percent in 2010 (NCHS, 2011).

⁷In 1983-84 the ratio of academic-year salaries of full professors to those of assistant professors in Ph.D. granting economics departments was 1.77. It has fallen nearly steadily thereafter, to 1.57 in 2011-12. Thanks to Charles Scott for providing unpublished data for years before 1996-97.

Table 1 also shows the sharp increase in the fraction of authors who are women, with the share of female authors nearly tripling over this period. This is clearly the result of the increasing femaleness of the profession. While the share of female authors in the 1963 and 1973 samples is not much different from the female share of new doctorates in those years, however, the growing share of female doctorates far outpaced the growing share of authors in these top journals.⁸ Moreover, the female share of authors is now far below the female share of tenure-stream faculty at Ph.D.-granting institutions (AEA, 2012).

Categorizing authorship by age and gender, it is notable that in 2003 and 2011 women ages 35 or less accounted for 16 percent of all authors in that age group, an increase, but still far below the 29 percent female representation among assistant professors at Ph.D.-granting institutions in 2011-12 (AEA, 2012). Whatever the causation, perhaps this deficit explains the greater (and uniquely greater to economics) female survival rate without tenure in this profession (Donna Ginther and Shulamit Kahn, 2004).

Many students of the sociology of economics have pointed out the increase in co-authorship (e.g., Aidan Hollis, 2001), which, as the first column in Table 2 shows, has proceeded over the entire last half century. What is less well known is that the frequency distribution of the number of authors per article has been moving steadily rightwards, as the second through fourth columns of the table show. The first four-authored paper in this sample appeared in 1993, and the first five- and six-authored papers did not appear in this sample until 2011.⁹

⁸In the 1960s the female share of new doctorates was below five percent, while from 2000-06 it was around thirty percent (AEA, 2008).

⁹I treat one many-authored paper from 1983 as having only the one senior author who appears to have been assisted by a large number of students.

Why has this change occurred? A few possibilities suggest themselves and are worth exploring:

1. The degree of complexity of economic research has increased to the point that it is very difficult for single individuals to produce research that meets the highest standards of publication.
2. The creation of email, the internet and inexpensive travel have lowered the cost of co-authoring with non-colleagues. As Hamermesh and Sharon Oster, 2002, show, distant co-authorships have sharply increased their share of all co-authorships.
3. Co-authoring is fun, especially with old friends or those in distant places to which one can travel for joint work and leisure.
4. Also on the supply side, in this increasingly rat-race world it is difficult to find people to read drafts of one's papers. Co-authoring obligates others to read one's work, since it is also their own.
5. The returns to having one's name on two two-authored papers exceed those of publishing one single-authored paper of equal quality. While Raymond Sauer (1988) demonstrated in the mid-1980s that the monetary payoff to a co-authored article was almost exactly half that of a sole-authored paper, one wonders whether that is still true today.¹⁰

The formation of co-authorships will depend on the potential productivity of possible partnerships and on individuals' preferences for forming co-authorships with other scholars of different ages (see John McDowell and Michael Melvin, 1983, and Matthias Krapf, 2012). How does this depend on the ages of potential authors? One's first reaction is that much of the co-authorship might be of the older European model, with the senior professor co-authoring with his/her Ph.D. student/recent graduate. The probit and ordered probit estimates in Table 3 provide

¹⁰One school offers salary bonuses X for publications, graded by the quality of the journal, with the bonus equaling an amount $X/\sqrt{N}$, where N is the number of authors. One young economist told me that, in recognition of the profession's unwillingness to divide by N , a friend and he now put each other's names on each paper.

an initial suggestion that this may be the case, as authors ages 36 to 50, the most active mature scholars, are significantly and substantially more likely than younger or older authors to choose to co-author.¹¹

Going behind the estimates to particular co-authorships suggests that this model does not characterize most of these publications. Fifty-five percent of the two-authored papers in the sample are produced by people within five years of age (and in 2011 only two represented collaborations between young faculty and their current or recent Ph.D. student). The only (weak) evidence for this inference is that in only 35 percent of the 85 three-authored articles is the average absolute age difference among the authors five years or less, and in nearly half of them the oldest author is more than 10 years older than the youngest.¹² At the very least, however, most the greater propensity of prime-age scholars to coauthor does not appear to be attributable chiefly to their publishing with Ph.D. students.

Using a sample of articles from these three journals for the 1990s, Anne Boschini and Anna Sjögren (2007) find women are less likely to coauthor than men. The probit and ordered probits in Table 3, covering a much longer time period, weakly suggest the same conclusion. Moreover, an expanded specification that interacted gender with time showed that this difference has not changed over these six decades. To the extent that economics faculties do not “divide by N” in judging young faculty members’ publications at tenure time, this deficit may also help explain the unusually high rates of “survival” without tenure among female economists. But

¹¹Indicators for each journal are also included, with articles in the *AER* having significantly more authors than those in the other two journals. The average age in two-author articles ranges from 28 to 64, in three-authored articles from 30 to 56.

¹²In 7 of the 16 four-authored articles the average absolute age difference is five years or less.

when they do co-author, women are also typically not “junior partners” to their male colleagues: In 26 of the 40 two-authored mix-gender co-authorships the scholars are within five years of age.

IV. Changing Methodology and Its Demographics

It is easy to obtain authors’ classifications of their published papers by subject (*JEL* code), but subject does not automatically imply method: For examples, one can imagine the currently in vogue method of field experiments being used in such broadly diverse areas as industrial organization, labor economics and public economics; and a purely theoretical study could be published in almost any subject area. The issue here is not the subject, but rather the methodological focus of the top journals, its secular changes and their causes.

Table 4 presents the five-fold categorization of the methods used in these leading articles in the samples from each of the six decades (excluding those from 1963 that simply could not be classified under these rubrics). In the first three years in the sample the leading journals almost exclusively published articles that were either theoretical or that contained empirical work based on ready-made data (typically government-provided macroeconomic time series or, beginning in the early 1970s, large household surveys that the author(s) laboriously obtained and massaged on a mainframe computer).¹³ Since then the share of purely theoretical articles has plummeted, with most of the decline taken up by empirical studies for which the author(s) created the data set. The rest of the decline is accounted for by growth in theory with simulation (mostly macroeconomic calibrations) and experimental work (either in a laboratory or in the field).

Why the changing focus in these top journals? Some possibilities are:

1. Changing technology in the form of the internet has made it much easier to create one’s own data by assembling information from a variety of previously unrelated

¹³Observing this pattern led one Nobel Prize winner to complain about the sterility of the field (Wassily Leontief, 1982).

sources. Similarly, the declining price and easier access to large-scale computing facilities has facilitated simulating/calibrating complex general equilibrium models.

2. The creation of economics laboratories, typically governmentally funded but, more than anything else due to path-breaking work by one economist, has generated a new methodological sub-field that is reaching maturity.¹⁴
3. Economic theory may have become so abstruse that editors of the leading general journals, recognizing that very few of their readers could comprehend the theory, have cut back on publishing work of this type.

Table 5 presents multinomial logit estimates of a model describing the demographic correlates of the choice of methodology. Other than the time trends, which replicate the percentage distributions in Table 4, the central results are: 1) Women are much less likely than men to publish theoretical papers; 2) With one notable exception there are no significant differences by age in the propensity to publish using different methodologies. Moreover, an expanded model shows that the differences, or lack of differences, have not changed over these six decades.¹⁵

The one significant age difference in method is the fact that older authors have been **more** likely than others to publish theory articles. This finding contradicts a claim made by a theorist in a lunchtime conversation, “Empirical work is what you do when you can’t do theory any longer.” The evidence from these repeated cross-sections suggests that assertion is wrong.

¹⁴The Nobel citation to Vernon Smith was, “For having **established** [bold mine] laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms.”

¹⁵The equations also include indicators for each journal. There are significant differences in methods in these articles across the journals, with the *QJE* being more likely to publish purely theoretical papers and those with self-generated data, and both the *JPE* and the *QJE* being less likely than the *AER* to publish experiments.

Cross-section data may not, however, be the correct test of this (to an elderly empirical researcher in a youth-oriented profession, very annoying) claim. Eighty-two authors appear in at least two different cross-sections (in different decades), so we can create an unbalanced panel (since some authors appear three or even four times) to remove person fixed effects. Fifty-five of these authors published at least one theoretical paper. Of these, 60 percent published only in theory (with or without simulations), 9 percent published an empirical paper before a theoretical one, and 31 percent published a theoretical article before an empirical one.¹⁶ But this result is due solely to the secular decrease in theory papers in these journals: Looking only at longitudinal data from 1963-93, the few authors who did switch are as likely to move from empirical work to theory as vice-versa. The claim is simply wrong.

The simultaneous trends in the top general journals away from theory and toward increasingly older authors are consistent with each other and with the observation (Lehman, 1953, across disciplines; Bruce Weinberg and David Galenson, 2005, for methodologies in economics) that thinkers reach their peak productivity at younger ages in areas requiring more mathematical thinking. They are, however, inconsistent with this evidence on the age distribution of authors by type of method used.

The market determination of the type of methodology appearing in top journals has changed, whether because of changes in editors' preferences (either their own, or as agents for preferences of members of the profession) or because of changes in authors' preferences and production technologies. So too the propensity to co-author has changed over time, although the changes are presumably the result of changing conditions on the supply (of scholarship) side. I have assumed that both trends have resulted from many possibly exogenous shocks, including

¹⁶Taking the 22 "methodological switchers," the probability that we would observe so many more switching in one direction instead of the other is 0.002.

the demographics that I have identified. But even though I do not claim that it might be causative, is there any interaction of these trends?

Table 6 presents estimates of a multinomial logit like that in Table 5, but excluding the demographic variables and including only indicators for the number of authors (two, three or more, with sole authorship the excluded category).¹⁷ The coefficients on the vector of indicators of number of authors are jointly significant ($\chi^2(8) = 35.62$, $p < 0.001$) and show that co-authorship, and especially multiple authorship, is more common in articles with self-generated or experimental outcomes than in other types of studies. Unsurprisingly, theory is especially unlikely to be the result of collaborations.

One might think that these patterns result from the simultaneous trends toward more authors per article and self-generated data and experiments. They do not: Adding interactions of the numbers of authors and the time trend to the specification underlying Table 6 yields terms that are jointly insignificant ($\chi^2(8) = 8.98$, $p = 0.34$) and individually statistically insignificant in seven cases. The trends in the leading general journals toward increasing numbers of authors on each article and away from theory have essentially been independent.

V. Where Is Publication Heading?

Predicting changes in age structure of top-level authorship in economics is easy. Barring some new, fundamentally different methodological approach for which the skills are learned mostly by new or recent Ph.D.s (essentially as occurred with experimental methods), we will not see a return to top-level publishing as a strikingly young person's game. That prediction is reinforced by my guess that the age distribution of academic economists will not shift leftward. The abolition of mandatory retirement will lead to more people staying on after age 70, and it is

¹⁷An equivalent way of examining this correlation is to estimate an ordered probit on the number of authors, with indicators for the type of methodology as explanatory variables. Not surprisingly, that model gives the same conclusions as the multinomial logit discussed in the text.

unlikely that we will see a hiring boom of young people at public institutions, which constitute the overwhelming majority of the academic labor market.

We also will not see co-authorship diminishing. The same forces that have created incentives for multiple authoring are, if anything, becoming stronger. Entries in Table 2 for future decades are likely to show even higher percentages in the first four columns.

As important as they are, even viewed over the intermediate term of the six decades covered here the methodological innovations that have captivated the major journals in the past two decades—experimentation, and obtaining one’s own unusual data to examine causal effects—are unlikely to be any more permanent than was the profession’s fascination with variants of micro theory, growth theory and publicly available data in the 1960s and 1970s. No doubt they will eventually give way in part to new approaches based on new methodological innovations. Not in the next few years, but surely as reflected in leading journals if a replication of this study is undertaken in 2043. Indeed, if it were not demonstrable then, an impartial observer would reasonably conclude that the field had become remarkably stagnant and in-bred.

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Table 1. Age and Gender Distributions of Authors of Articles in Top Economics Journals, 1963-2011*

Year	Age (percent distribution)				Percent Female
	<=35	36-50	51-60	61+	
1963	50.5	45.3	2.4	1.8	4.7
1973	61.5	32.6	5.9	0	3.4
1983	48.5	47.2	3.5	0.8	6.8
1993	49.8	43.1	5.6	1.5	9.3
2003	36.8	50.4	10.7	2.1	10.3
2011	33.0	48.1	13.0	5.9	12.6

*Here and in all other tables the results are based on the *American Economic Review*, *Journal of Political Economy* and *Quarterly Journal of Economics*. The population excludes all Presidential and Nobel addresses, comments, replies and notes. The statistics here and in Tables 3-6 are weighted by the inverse of the number of authors on each article. The age of one author in 1963 was unavailable.

Table 2. Distributions of the Number of Authors per Article, 1963-2011

Year	Pr{>1}	Pr{3+ 2+}	Pr{4+ 3+}	Pr{5+ 4+}	N Articles	N Authors
1963	16.3	0.0	0.0	0.0	86	100
1973	28.6	2.9	0.0	0.0	119	154
1983	45.6	14.0	0.0	0.0	125	190
1993	55.1	28.0	9.5	0.0	136	234
2003	74.1	28.0	21.4	0.0	135	269
2011	79.6	38.5	22.2	20.0	147	322

Table 3. Probit and Ordered Probit Estimates of the Determinants of Co-authorship*

Variable:	Multiple Authors	Number of Authors
Age 36-50	0.150 (0.035)	0.313 (0.073)
Age 51-60	-0.023 (0.069)	-0.049 (0.139)
Age 61+	0.074 (0.124)	0.013 (0.205)
Female	-0.102 (0.062)	-0.229 (0.128)
Time	0.015 (0.001)	0.038 (0.002)
Pseudo-R ²	0.166	0.128

*The probit estimates are derivatives at the means. The ordered probit estimates are the parameters. The age category ≤ 35 is excluded. Each equation also contains indicators for the individual journals.

Table 4. Percent Distributions of Methodology of Published Articles, 1963-2011*

Year	Type of Study				
	Theory	Theory with Simulation	Empirical: Borrowed Data	Empirical: Own Data	Experiment
1963	50.7	1.5	39.1	8.7	0
1973	54.6	4.2	37.0	4.2	0
1983	57.6	4.0	35.2	2.4	0.8
1993	32.4	7.3	47.8	8.8	3.7
2003	28.9	11.1	38.5	17.8	3.7
2011	19.1	8.8	29.9	34.0	8.2

*A type could not be assigned to seventeen of the articles published in 1963.

Table 5. Multinomial Logit Estimates of the Demographics of Methodology*

Variable:	Theory	Theory with Simulation	Empirical: Borrowed Data	Empirical: Own Data	Experiment
Age 36-50	0.015 (0.140)	-0.091 (0.253)	0	0.162 (0.198)	-0.141 (0.364)
Age 51-60	0.850 (0.279)	-0.049 (0.497)	0	0.051 (0.390)	-0.223 (0.679)
Age 61+	-0.099 (0.472)	-1.467 (1.142)	0	-0.693 (0.644)	-0.176 (0.829)
Female	-1.064 (0.291)	-1.427 (0.626)	0	0.318 (0.266)	-0.571 (0.608)
Time	-0.022 (0.005)	0.037 (0.009)	0	0.060 (0.008)	0.088 (0.018)
Pseudo-R ²		0.077			

*The age category ≤ 35 is excluded. The equation also contains indicators for the individual journals.

Table 6. Multinomial Logit Estimates of the Relation Between Methodology and Co-authorship*

Variable:	Theory	Theory with Simulation	Empirical: Borrowed Data	Empirical: Own Data	Experiment
Two authors	-0.186 (0.147)	-0.207 (0.278)	0	0.107 (0.226)	0.986 (0.624)
>2 authors	-0.394 (0.252)	0.274 (0.361)	0	0.723 (0.276)	2.238 (0.632)
Pseudo-R ²		0.082			

*The equation also contains a time trend and indicators for the individual journals.



Anonymous job applications of fresh Ph.D. economists

Annabelle Krause^a, Ulf Rinne^{a,*}, Klaus F. Zimmermann^{a,b}

^a IZA, Schaumburg-Lippe-Str. 5-9, 53113 Bonn, Germany

^b University of Bonn, Department of Economics, Adenauerallee 24-42, 53113 Bonn, Germany

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ABSTRACT

This paper analyzes anonymous job applications of Ph.D. economists in the academic job market. We use data on interview invitations from a randomized experiment at a European-based research institution. Results show that the underrepresented gender was hurt by anonymous applications.

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1. Introduction

Firms should hire the most productive workers—discrimination is costly. However, empirical studies document substantial discrimination in hiring (e.g. Bertrand and Mullainathan, 2004; Carlsson and Rooth, 2007). This market failure calls for policy interventions, among which anonymous job applications gain popularity. Their intuition is straightforward: Removing information about characteristics employers may discriminate against should reduce or even eliminate discrimination. Several European countries have recently conducted experiments with this approach. Available results are encouraging and indicate that positive effects for minority groups can materialize (e.g., Åslund and Nordström Skans, 2012; Krause et al., 2012).

This paper analyzes the effects of anonymous job applications in a particular labor market. We use data on interview invitations from a randomized experiment. Participants are economists applying at a European-based economic research institution for a post-doctoral position. Because of random assignment, we can rule out any selection into treatment status. Our paper therefore adds to the literature on anonymous job applications and to the literature on the annual job market.

2. The job market for Ph.D. economists

The annual job market for Ph.D. economists is exceptionally organized. Mainly academic institutions, but also government agencies and private firms stand on the demand side. The screening process is an annual three-step procedure.

The first step is in early fall when vacancies are posted. Candidates send their applications to potential employers, who then decide about interview invitations. The second stage takes place at the Allied Social Science Association (ASSA) meetings in January, where candidates and employers meet for interviews. In a third step, the most convincing candidates visit the institutions between January and March. Job offers are also communicated during this period. Candidates and institutions from outside the United States also participate in this market.

The literature on the annual job market is mainly concerned with determinants of the screening process. Professional signals are identified as most important determinants of interview and hiring decisions. For example, the number of publications positively affects the number of interviews and site visits (Taube, 1987; Carson and Navarro, 1988; List, 2000). Ph.D. economists from higher-ranked departments tend to have more interviews and job offers (Stock et al., 2000). Reference letters from eminent economists increase the number of interview invitations (List, 2000, 2001). On the demand side, the higher employers are ranked, the more likely are applicants to accept their job offer (Barbezat, 1992; Stock et al., 2000).

* Correspondence to: Institute for the Study of Labor (IZA), P.O. Box 7240, D-53072 Bonn, Germany. Tel.: +49 0 228 3894 528; fax: +49 0 228 3894 510.

E-mail address: rinne@iza.org (U. Rinne).

Table 1

Descriptive statistics.

Source: Own experimental data.

	Standard	Anonymous	<i>t</i> -statistics
Interview invitation	0.244 (0.435)	0.171 (0.381)	0.811
Female	0.341 (0.480)	0.366 (0.488)	−0.228
Non-Western origin	0.293 (0.461)	0.268 (0.449)	0.234
Age	30.78 (3.158)	29.95 (2.747)	1.269
Number of papers	4.366 (3.352)	4.610 (2.862)	−0.354
Number of publications in A/A+ journals	0.073 (0.461)	0.195 (0.511)	−1.266
Ph.D. from top 20 university	0.171 (0.381)	0.293 (0.461)	−1.306
Years to complete Ph.D.	5.000 (1.285)	4.707 (1.167)	1.080
Ph.D. at time of application	0.146 (0.358)	0.171 (0.381)	−0.299
Work experience	0.122 (0.331)	0.049 (0.218)	1.181
Experience in institution's fields of specialization	0.756 (0.068)	0.634 (0.076)	1.195
Number of observations	41	41	

Notes: standard deviations in parentheses. Non-Western origin is defined as having citizenship from an African, Asian, Latin American or Eastern European country. A/A+ journals are defined according to the *Handelsblatt* journal ranking. Top universities are defined according to the *RePEc* ranking (July 2011). * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

However, some studies suggest that gender, age and ethnic background influence the invitation probability (e.g. List, 2001). This gives rise to the question whether such different treatments are present when anonymous job applications are introduced.

3. Experiment and sample

Our experiment took place at a European-based economic research institution during the annual job market 2010/2011. In total, 148 applications were screened and 26 candidates were invited for interviews at the ASSA meetings.

Because of data protection laws, our sample decreases to 96 individuals. Participants in the experiment have to give permission to use their data, and we electronically asked them to do so. The response rate of about 65% appears reasonable, in particular when considering the time lag of about four months between application submission and request for permission. We are not aware of any reason why this procedure results in a selective sample. For example, our outcome of interest appears not related to individual responses. Out of 26 candidates who received an interview invitation, 6 applicants did not give permission. Data protection laws prevent us to analyze the issue of selective response in more detail. Our final sample consists of 82 individuals when we exclude observations with missing information about age and citizenship.

Applicants were not aware of the experiment. Applications were submitted as usual and no specific requirements were imposed. After the application deadline had expired, treatment status was randomly assigned. If included in the treatment group, name, contact details, age, nationality, gender and any other indications of the candidate's identity were overwritten with correction fluid.

Otherwise, the screening process for interview invitations was conducted as in previous years by two members of the institution's experienced hiring committee. Both are male, of European origin and senior researchers involved for years in hiring decisions.

They reviewed both standard and anonymous applications. While they were aware of the experiment, they were involved neither in its design nor in the analysis of the data. The preparation of the material and an imposed strong time-pressure to review the applications have left only a few possibilities to identify the applicants. Both reviewers are experienced researchers and interviewers, open to experiments and monitoring. Also in previous traditional recruitments, invitation decisions were typically reviewed by a different member of the hiring committee. Hence, the reviewers were unlikely to react to the experimental situation. According to the recruiters, a maximum of four to six positions could be filled.

Table 1 displays descriptive statistics for the two groups with anonymous and standard applications. The randomization appears successful as any differences are insignificant. About 20% receive an interview invitation. About one third are female, the average age is around 30 years, and roughly 30% have a non-Western background. Applicants have written between four and five papers, of which less than one is published in A/A+ journals. About 25% receive their Ph.D. degree from top 20 departments. Applicants need about five years to complete their Ph.D. and less than 20% already hold a Ph.D. degree when they apply. Few applicants have work experience outside academia. About 70% have experience in the institution's fields of specialization.¹

The distribution of characteristics is similar to related studies. The slightly larger fraction of women in our sample is likely related to the increasing number of female economists over time (most other studies use data from more than ten years ago). The fraction of applicants from top 20 departments may appear relatively small. But given that most of these departments are based in the United States, and that most applicants receiving their Ph.D. in the United States apply in this region, applicants from these departments should appear more often in North American data.

¹ Results are similar when excluding 25 applicants without experience in these fields.

Table 2
Probit regressions.
Source: Own experimental data.

	(1)	(2)	(3)	(4)
Anonymous	−0.073 (0.089)	−0.056 (0.089)	−0.029 (0.086)	0.124 (0.104)
Female		0.117 (0.086)	0.129 (0.082)	0.297*** (0.107)
Anonymous × Female				−0.383*** (0.136)
Non-Western origin		−0.020 (0.090)	−0.030 (0.089)	−0.007 (0.123)
Anonymous × Non-Western origin				0.038 (0.176)
Age		1.067** (0.477)	1.158** (0.523)	1.131** (0.480)
Age squared		−0.017** (0.008)	−0.019** (0.009)	−0.018** (0.008)
Number of publications in A/A+ journals			0.052 (0.081)	0.032 (0.085)
Ph.D. from top 20 university			−0.092 (0.098)	−0.128 (0.094)
Years to complete Ph.D.			−0.065* (0.034)	−0.058* (0.032)
Ph.D. at time of application			−0.206 (0.149)	−0.248* (0.149)
Work experience			0.284** (0.133)	0.250** (0.124)
Log likelihood	−41.516	−37.532	−34.619	−32.166
Number of observations	82	82	82	82

Notes: average marginal effects. Standard errors in parentheses. Dependent variable equals 1 if individual is invited.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

4. Results

Table 2 displays the results of probit regressions. The dependent variable equals 1 if an interview invitation is received and 0 otherwise. Column (1) displays the raw difference in this outcome between standard and anonymous applications. This difference is not statistically different from zero and remains so when we include additional control variables. Hence, anonymous job applications do not have an impact on the invitation probability.

We include socio-demographic and professional characteristics in columns (2) and (3). Age has an inversely U-shaped effect on the invitation probability. Being female and having a non-Western background do not significantly influence the recruiters' decision. The number of publications in A/A+ journals is positively associated with the invitation probability, although this effect is not statistically significant. Candidates who already hold a Ph.D. degree have a lower invitation probability. Already holding a degree may be interpreted as a negative signal because it likely indicates that the candidate does not participate in the market for the first time (Cawley, 2011). Work experience outside academia has a significantly positive effect on the outcome variable. This can be explained by the fact that the institution also serves as a place of communication between economic research and political practice.

To identify whether anonymous job applications have different effects on certain groups, we add interaction terms between treatment status and socio-demographic characteristics in column (4). Whereas the coefficient estimate on the interaction term between anonymous applications and female is significantly negative, the coefficient estimate for female becomes significantly positive. This indicates that (a) with standard applications, female applicants are more likely to receive an interview invitation

relative to male applicants, and that (b) this relative advantage disappears with anonymous job applications. One possible explanation is that female candidates are generally favored in the hiring process at this institution, but such behavior is not possible when gender is unknown.

Professional signals might receive a different weight when screening anonymous applications. This hypothesis is confirmed when we include interaction terms between professional characteristics and treatment status.² For example, whereas publications in A/A+ journals have a significantly negative effect on the invitation probability with standard applications, this effect disappears with anonymous job applications. It thus seems that the recruiters interpret "traditional" quality signals differently when confronted with anonymous job applications.

5. Conclusions

To analyze the effects of anonymous job applications in the annual job market for Ph.D. economists, we use data from a randomized experiment among applicants at a European-based economic research institution. Our results indicate that anonymous job applications are in general not associated with a different invitation probability.

However, whereas female applicants have a higher probability to receive an invitation than male applicants with standard applications, this difference disappears with anonymous applications. Whereas this indicates that males were discriminated against with standard application procedures, this is not the case for applicants

² Results confirming this hypothesis are displayed and discussed in an earlier version; see Krause et al. (2011).

of non-Western origin. The results moreover indicate that certain professional signals are weighted differently with anonymous applications. Our results concur with the often discussed notion that anonymity prevents employers from favoring minority applicants when credentials are equal—at least in the initial stage of the hiring process (see, e.g., Åslund and Nordström Skans, 2012, p. 100) (Krause et al., 2012, p. 48). Anonymous job applications thus do not have very large effects in our study. However, one should be cautious when generalizing from this finding. We also need to recognize that the instrument of anonymous job applications only has potential if there is a relevant size of discrimination. Discrimination is lower for high-skilled occupations and in more competitive labor markets. This may limit the effects of anonymous job applications in the case studied here. The effects may, however, be very different in other job markets.

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The Gender Gap in Citations: Does It Persist?

Authors: Marianne A. Ferber and Michael Brün

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Abstract

In the late 1970s and early 1980s, several researchers showed the importance, in the United States, of the number of times scholars' publications are cited for determining their bargaining power in academia. Not surprisingly, the question was soon raised whether citations are a good measure of scholarly merit. Are women at a disadvantage in male-dominated fields, such as economics? Studies had shown that authors tended to cite a larger proportion of publications by authors of the same gender. This paper examines whether women's disadvantage in garnering citations has been reduced by the increasing representation of women in economics and finds that this has been the case in both labor economics and economics in general, albeit not to the same degree.

Notes

The other studies cited here all focus on the United States, with the exception of Ferber ([Citation1986](#)), which includes Canadian journals. We have not been able to find comparable published studies for other countries. They are nonetheless of interest to scholars from other countries because the peripatetic scholars of today frequently have visiting appointments in the US and because institutions in many other countries likely give credit for citations in US journals.

Some earlier studies even suggested that women themselves also thought more highly of the work of men than of women (for example, Philip A. Goldberg [Citation1968](#) and Gail I. Pheterson, Sarah B. Kiesler, and Philip A. Goldberg 1971), but there is no evidence that this has been true in more recent years.

Except in instances of multiple authorship where there was at least one female and one male author in any case.

It should be noted that because the proportion of women was even smaller in the past and because some citations are from substantially earlier years, male bias against citing women will be somewhat overstated, while the opposite will be true for female bias against men.

Interestingly, Carole Hollenshead ([Citation2003](#)) reports that the University of Michigan, recognizing that it was more difficult for women to find collaborators, provided funds for

which they could apply that would enable them to spend summers at other institutions where they had co-authors.

In these kinds of surveys, one must beware of statistical results being significantly distorted by a few frequently cited “star” authors. A cursory examination of our data revealed no such obvious “stars”; but if a larger study were to be done, a comparison of the distributions of citation frequencies for each author type, FA, FMA, and MA, would be helpful before more precise statistical inferences were attempted.

According to the 2006 report of the Committee on the Status of Women in the Economics Profession, they comprised only 24.8 percent of the faculty at the top ten research institutions.

Economics

History, Methodology, Philosophy

1-1 | 2011

Women in Economics Discipline: A Tribute to Anne P. Carter / Varia

Women in Economics Discipline

American Women and the Economics Profession in the Twentieth century

American Women and the Economic Professions in the 20th Century

EVELYN L. FORGET

p. 19-30

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Summaries



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nomists in the economics profession during the 20th century
fore 1918, women represented a distinct minority within the
s and professional journal articles, received PhDs in economics
red at professional gatherings and built careers as economists.
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ted fields such as social work and home economics. Academic
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roblems increasingly found employment in state and federal
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participated in professional meetings and gatherings, and
uring the interwar period, women became less visible in the
ial problems began to move into related subjects such as social

work and home economics. The employment of women in academia began to decline, as did the number of doctorates awarded to women.

Index entries

Keywords : women in economics , women's employment

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Full text

- 1 Anne P. Carter was awarded the Carolyn Shaw Bell Award by the Committee on the Status of Women in the Economics Profession (CSWEP) in 2008. This award recognizes “an individual who has furthered the status of women in the economics profession, through example, achievements, increasing our understanding of how women can advance in the economics profession, or mentoring others”.¹ In a 2009 interview celebrating the award she recounts the many annoyances and petty injustices she faced as a woman in a male-dominated profession during and after the Second World War. The chair of the economics department at Harvard (HH Burbank) met her when she arrived to join the graduate program in 1945, with the statement that “we get a lot of little girls who come here with good grades, but they don't last” (McCulloch, 2009, 16). Women students at Harvard in 1945, of course, received a degree from Radcliffe College. She remembered that male advisors took their male students to the American Economic Association annual meetings and made introductions, ensuring that they found suitable employment; female students neither expected nor received similar assistance (McCulloch, 2009, 16). Lured back to Harvard from a teaching position at Brooklyn College by Wassily Leontief to work on his Harvard Economic Research Project, she negotiated a job for her husband on the project only to find that her “trailing spouse” was to be paid significantly more than she was (McCulloch, 2009, 16). After twenty years at Harvard where she never felt welcome, she was ultimately turned down for tenure and left for Brandeis (McCulloch, 2009, 16). These stories, told by a high-achieving woman economist, are representative of the social and institutional context in which American women built careers as academic economists in a less than welcoming field in the 1950s and 1960s.

- 2 The history of American women economists in the economics profession during the twentieth century can be divided into four phases. The earliest women, those writing before and during the Second World War, represented a distinct minority within the



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icipated in professional conferences, received advanced degrees, published books, articles and monographs on topics similar to those of their male colleagues. Between the two wars, new professional training programs attracted many women writing about economic and social issues. Doctorates in economics awarded to women increased from 0.1% in the 1920s to 4.2% in the 1950s (Chamberlain, 1988, 1998). Women such as Anne Carter increasingly took positions alongside men in academic appointments and publishing research. Despite the many barriers women faced to focus on family matters and the demands of their male colleagues. By the 1970s, women increasingly enjoyed working conditions similar to those enjoyed by their male colleagues. As their representation within the profession began to grow, they began to work alongside male peers.

1. The Prehistory

- 3 Women economists were present and publishing from the very beginnings of the American Economic Association. The earliest historical literature tended to underestimate the number of women in the profession. William Baumol, in a 1985 essay on the history of the *American Economic Review*, noticed that a few women were contributing to the literature, but argued that their topics were predominantly focused on “women's issues” (Baumol, 1985). The most comprehensive histories of American economic thought—Joseph Dorfman's *The Economic Mind in American Civilization, 1606–1933* (Dorfman, 1946–1959) and William Barber's *Breaking the Academic Mold* (Barber, 1988)—underplay the contributions of women. Groenewegen and King, however, documented a much more significant presence, as did Robert Dimand (Groenewegen and King, 1984; Dimand, 1995). More recent scholarship continues to publicize the presence and contributions of individual women (Berg, 1992; Dimand, Dimand and Forget, 1995, 2000).
- 4 Robert Dimand reminds us that women published extensively in the early years of the 20th century (Dimand, 1995). Edith Abbott² wrote 19 articles in the *Journal of Political Economy* between 1904 and 1925, articles in the *American Economic Review* and books on *Women in Industry* (1910) and *Public Assistance* (1940). Emily Green Balch published a monograph on “Public Assistance of the Poor in France” in the *Publications of the American Economic Association* (First Series, VIII, nos. 4–5) but was not reappointed to a full professorship at Wellesley college in 1918 because of her social reform and antiwar activism—activism which ultimately won her the Nobel Peace Prize in 1946 (Dimand, 1995, 6). Sophonisba Preston Breckinridge published 8 articles in the *Journal of Political Economy*; Katharine Bement Davis published 4 and Helen L. Bliss, 6. Katharine Coman wrote two books on economic history and a monograph on contract labor in Hawaii that was published by the American Economic Association, as well as articles in *Journal of Political Economy*, *American Economic Review*, and the *Journal of the American Statistical Association*. Helen Sumner received a doctorate in economics from Wisconsin in 1908, and went on to publish extensively in labor history. Agnes Ergeland published 6 *Journal of Political Economy* articles in economic history between 1900 and 1905. Minnie Throop England wrote several articles on finance in the *Journal of Political Economy* and the *Quarterly Journal of Economics*, as well as monographs on the purchasing power of money. Without listing all the women active in the profession before the end of the First World War, it is sufficient to say that women were not invisible in economics (Dimand, 1995).



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presence in doctoral programs in economics during these years. The *American Economic Review* published a list of showed women writing 6.15% of all PhD dissertations in 1920 before falling for the next two decades to 6.94% of dissertations in progress being written by women did not fall after the Second World War (Forget, 1995). The focus disproportionately on labor, economic history and many of the same topics, writing dissertations on labor history. Moreover, women by and large studied at the same times, with by far the most PhDs earned at Columbia with Dimand, 1995, 27). Not all of the economics dissertations were in economics. For example, many women who earned PhDs at Chicago on economic topics in the Department of Philosophy, nonetheless, Emily Balch, Sadie Gregory, Hazel Kyrk and worked at Chicago. After earning a PhD at Chicago in 1905, Sophonisba Breckinridge to organize the Graduate School of

Social Service Administration at Chicago that hired mostly female faculty (Bernard, 1964, 246–247).

- 6 The expansion of women's colleges in the US during the first decades of the twentieth century both generated the women students who went on to graduate training in economics and provided academic jobs for these same women. Vassar hired a large number of women among its social science and history faculty (Bernard, 1964, 126). Emilie Louise Wells earned a Vassar baccalaureate before studying at Chicago, and returned to Vassar as a faculty member until her death in 1910. Mabel Newcomer and Ruth Gillette Hutchinson, both economists, joined the faculty at Vassar. Katharine Bement Davis and Julia Lathrope studied at Vassar. Sadie Gregory and Edith Abbott both taught at Wellesley. Emily Balch graduated from Bryn Mawr and taught at Wellesley for eighteen years before her pacificism denied her a reappointment (Converse, 1939, 95). Economic historian Katharine Coman succeeded her as department head at Wellesley (Converse, 1939, 68).
- 7 Not all women interested in economic topics, however, became academic economists. Women economists found themselves increasingly unwelcome in many colleges and universities as the 20th century unfolded, and some turned to the new female professions that began to emerge during the Progressive era—social work, home economics, public health nursing and doctors in “female” specialties (Muncy, 1991, xiii–xiv). Emily Balch worked in a Boston settlement, Katharine Coman was associated with the Wellesley College Settlements Association, and Jane Addams became head of Hull House. Home economics and social work were to become increasingly important venues for women economists after the First World War.

2. The Interwar Years

- 8 Despite the growing market of the women's colleges, the academic employment of
women in the United States began to fall after 1930 for all fields as many universities and
colleges began to hire only men. In economics, however, the contraction seems to have
begun a decade earlier (Graham 1977–1978; Libby 1984, 1987, 1990).
- 9 After 1920, women were writing fewer PhD dissertations in economics, earning fewer
doctorates in economics, and filling fewer academic positions in economics. Simple gender
discrimination is part of the story. Eleanor Lansing Dulles, who wrote a Harvard
(Radcliffe) dissertation on French inflation ultimately published as *The French Franc* in
1933, published her memoirs in 1930 in which she recounts an attempt to appropriate her

Paris revising her dissertation for publication, she was joined by James Harvey Rogers of Columbia:



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small grant and working alone, studying the nature of
 gers is working with our group and can do a more
 /e want you to turn over your notes to us and we'll carry
 mprehensive project." (Dulles 1980, 100–102; Dimand

ver, is not the entire story. Women began to disappear as part of the general contraction of female academic at this was exacerbated by three developments that work started to emerge as an academic subject and drew as a way of addressing social injustice. Second, home portance during this period and attracted a number of of labor and consumption eco- nomics away from

economics towards this newly professionalizing discipline. Third, the expansion of federal government employment in areas of agriculture, home economics, consumer affairs and labor offered another, more welcoming, employment opportunity for women.

12 Social work acted as a magnet for women economists and, as social work became an academic discipline in the US, it seemed a natural home within the academy for some women. Edith Abbott, after earning a PhD in economics at the University of Chicago, worked to create the Chicago School of Civics and Philanthropy, and later the Graduate School of Social Service Administration rather than join the economics department. Departments of social work welcomed women faculty and students, and women economists increasingly found a nurturing academic environment in such departments. This rising employment opportunity followed naturally from the earlier involvement of many women economists in the settlement movement. Women economists had always been drawn to social work practice and, when the opportunity arose, many of these same women turned to social work within the university.

13 Another growing professional opportunity for women was even more significant. In 1862, the Morrill Act increased the number of land-grant universities and colleges in the US. These institutions were a response to the perception that traditional colleges concentrated on classical education and intended mostly to train students for the traditional professions of medicine and law. The new land-grant institutions were designed for students from a broader background, and were meant to offer a wider range of educational opportunities than the traditional eastern universities and liberal arts colleges. Typically, they were characterized by large agricultural faculties because of the large number of students they attracted from rural backgrounds. These universities were called land-grant institutions because the federal government transferred tracts of federally controlled land to the states to be developed or sold to create the new colleges. The most significant of these land-grant institutions were in the Midwest and grew throughout the first decades of the twentieth century. Home economics was an essential feature of these institutions—the feminine counterpart of agricultural education for men—and the discipline grew with the expansion of the land-grant colleges.

14 The term “Home Economics” was developed at the first ever Lake Placid Conference held in 1899. The American Home Economics Association (AHEA) lobbied to make home economics available in elementary and high school curricula, and raised money for the expansion of the discipline. Over the course of the interwar period, many federal government acts contributed to the expansion of home economics. In 1927, the Bureau of Home Economics Act was passed, and in 1937 the George-Dean Act increased funding and practice for the discipline.



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nomics at the primary and high school levels focused on make women better homemakers, the movement itself home economists worked directly with the expanding cities and western states. The social problems that economists early in the century became the special focus moved into the community to work with the socially home economics as a teachable subject meant that women in primary, high school and university education al governments employed home economics graduates as marily with prices and wages. The money raised by the projects for home economics faculty at land-grant be empirical investigations that focused on consumer social issues including poverty and unemployment, and

and these new opportunities and, in the process, became en the economics profession was itself moving towards

applied work. After earning a PhD in economics from Chicago 1920, Hazel Kyrk went on to become a faculty member in both economics and home economics at Chicago (1925–1952). She was mentor to a generation of women like Margaret Reid, most of whom moved between the disciplines of economics and home economics and between government employment and academic appointments as opportunities arose. Hazel Kyrk forged a new career path for women economists at the same time that she broadened the Chicago economics curriculum to include consumption economics. Margaret Reid and Elizabeth Hoyt (Radcliffe PhD, 1925) mentored, in turn, another generation of women at Iowa State University (Thorne, 1995).

- 17 Women interested in labour and social issues then faced a clear choice. They could prepare to become economists and hope to teach in the well-established (and very slowly growing) traditional universities and liberal arts colleges that preferred to hire men, paid women less than men, tended to employ women in subordinate roles, and aimed to prepare a limited number of mostly male students for the professions, or they could turn to the newly professionalizing home economics and social work disciplines that offered the possibility of teaching at the rapidly expanding land-grant institutions alongside the certainty that high school or primary school employment was available, as was funding for independent research projects on topics that had traditionally attracted the majority of women economists, and employment in a female-dominated profession that offered the kind of mentoring opportunities traditionally restricted to men. Many women preferred the latter.
- 18 Throughout the interwar period, the federal government expanded its research and administrative capacity and developed an almost insatiable appetite for statistical analysts to work on social issues, labor and prices. In the 1930s, the Department of Agriculture grew increasingly important as marketing boards and agricultural support programs began to grow. This created opportunities for women to do the kind of research that had attracted them to economics in the first two decades of the twentieth century, but to do it outside the traditional university community. Home economists, familiar with agricultural issues and consumer affairs from their backgrounds and training, trained in empirical analysis, and interested in the policy issues of the period, were in particular demand.
- 19 The interaction of these three factors—the growth of the government bureaucracy and the growth of the home economics movement and social work as an academic career—created alternative career paths for women who might otherwise have earned PhDs in economics and gone on to become professional economists. Accommodating environments that valued their skills and welcomed women must have presented an attractive alternative to women who were only grudgingly accepted by an economics profession that they were present.



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continued to work in a variety of roles in the traditional economic profession. She was a prolific writer and well-known in the field of demand and price theory (Thomas, 2000). She earned her PhD in 1929 from the University of Chicago and had a long association with Harvard University in the same year. She was Secretary to the Committee on Research in the Social Sciences and later became Executive Secretary. She became Associate Director of the Economic Research Project in 1950 and served as its Acting Director. Her work involved some teaching, but was largely administrative. She was advised at Radcliffe in an academic capacity, serving as a faculty member. In 1941, she worked in the Office of Strategic Services in 1942–43 and then in the Bureau of Labor Statistics from 1960 to 1964. For these reasons, the visibility of women in the economics profession increased in the interwar period. Academic women working on research became increasingly visible, as did the legion of professional economists working on labor and prices in the federal bureaucracy.

3. The 1950s–1960s

22 If the First World War heralded the rise of new career paths for women in social work and home economics that drew them away from the economics profession, the Second World War created opportunities for some to return. Academic economists did not open wide the doors and welcome women ungrudgingly, as Carter's comments acknowledge, but the growth of American university education in the wake of the GI Bill, and the growing recognition that women in departments of home economics and in government employment possessed many of the statistical skills increasingly required in economic research, created some opportunities for women in economics departments.

23 The University of Chicago was among the first departments to offer women economists work, and the department looked first to the students of Hazel Kyrk for the skills it needed. Margaret Reid earned a PhD in economics from Chicago in 1931, and went on to teach in the Departments of Economics and Home Economics at Iowa State until 1943. Between 1943 and 1948, she worked for the federal government, and in 1948 she became professor of economics at the University of Illinois at Urbana-Champaign. In 1951, she joined the University of Chicago Economics Department and went on to work as a statistical expert with Modigliani and Friedman. Her intellectual circle at Chicago included Rose Friedman and Dorothy Brady. In 1980, Reid was the first woman chosen Distinguished Fellow by the American Economic Association, which honored her for her work in consumption economics and her contributions to the empirical tradition at Chicago. Dorothy Brady received a PhD in mathematics in 1933, and spent most of the next two decades working as a statistician and economist, much of the time employed as a home economist in the Department of Agriculture. In 1951, she joined the Department of Economics at the University of Illinois and in 1956 joined the Economics Department at the University of Chicago. Two years later, she left for the Wharton School. Rose Friedman worked with Dorothy Brady for two years (1941–1943) at the Bureau of Home Economics in Washington, and collaborated with Milton Friedman.

24 Although the new opportunities for women in economics first emerged at the growing midwestern institutions that had welcomed the home economists of the interwar years, the more slowly growing eastern institutions eventually opened to women, albeit slowly. Anne Carter says she “never felt welcome” at Harvard, despite twenty years of employment, and eventually sought out a more encouraging atmosphere at Brandeis. Before 1966, there were no women on the economics faculty at Harvard. In 1966, Carter became the first female assistant professor after fifteen years as a research fellow. In 1970, she went to

accepted a position as full professor in 1972.

sitional years for women in economics. Trained alongside any no longer sought the alternative employment offered s Departments. Yet, the economics departments seemed in support positions, as technical analysts, than as full



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d Beyond

t of the 1960s led to the organization of women in the s. On 29 December 1971 a group of women calling itself ore the Executive Committee of the American Economic ons designed to equalize opportunities for women in re intended to address the widely perceived inequities atial access to graduate training, funding and job-market nd unequal promotion opportunities for women. The

Women's Caucus encouraged the Executive of the American Economic Association to recognize that the economics profession should be open to women and men. Women were to be encouraged by undergraduate and graduate instructors to study economics. They were to be admitted to graduate programs using the same criteria and awarded financial assistance according to the same terms as men. Once admitted, they were to be mentored and assisted to the same degree as male students, and to receive the same job-market assistance as men. Hiring committees were to use the same criteria for women as for men and, once hired, women were to be considered for tenure and promotion according to the same criteria as men. Salaries, departmental resources and fringe benefits were to be equal. Women were not to be discriminated against on the basis of family relationships with existing faculty members. The Executive created the Committee on the Status of Women in the Economics Profession (CSWEP), and passed a series of resolutions encouraging journal editors to appoint women to editorial boards, to encourage program chairs to include women in national meetings and to encourage regional associations to adopt similar measures. An open listing of all job opportunities was created, and a code of hiring procedures adopted. Childcare arrangements were to be encouraged at national meetings, and part-time working arrangements were to be encouraged to meet the needs of two-career families (Bartlett, 1999, 65). Then the newly created CSWEP set about its work.

27 Its first task was to gather data. At 42 PhD-granting institutions that responded to a survey, 6% of economics faculty were women in 1971, and only 11% of PhDs and 13% of MAs were granted to women. Only 2% of full professors of economics were female (Bartlett, 1999, 65). At the 1972 annual meetings, two women presented papers, three chaired sessions and six were discussants. No member of the American Economic Association Executive was female. In 1972, *CSWEP* clearly had work to do.

28 The most recent date for which CSWEP has data is 2009. 117 of 119 PhD-granting institutions responded to the questionnaire, and indicated that 32.9% of new PhDs were awarded to women, 28.4% of assistant professors are women and 9.7% of full professors are women. At non-PhD granting institutions, the numbers are significantly higher. These numbers reflect, at least in part, the efforts of CSWEP to encourage women economists, to create employment opportunities, and to mentor women economists. Just as significantly, they reflect the persistence of women like Anne Carter, like Margaret Reid and Hazel Kyrk, women like Edith Abbott and Jane Addams—women who saw economics as a way to better understand the social world in which we live and worked steadfastly to take their place in the profession.



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Women's participation in the ASSA meetings [Full text]

Women's participation in ASSA meetings.

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