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

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Abstract

We document the representation of female economists on the conference programs at the NBER Summer Institute from 2001-2016. Over the period from 2013-2016, women made up 20.6 percent of all authors on scheduled papers. However, there was large dispersion across programs, with the share of female authors ranging from 7.3 percent to 47.7 percent. While the average share of women rose slightly from 18.5% since 2001-2004, a persistent gap between finance, macroeconomics and microeconomics subfields remains, with women consisting of 14.4 percent of authors in finance, 16.3 percent of authors in macroeconomics, and 25.9 percent of authors in microeconomics. We examine three channels potentially affecting female representation. First, using anonymized data on submissions, we show that the rate of paper acceptance for women is statistically indistinguishable to that of men. Second, we find that the share of female authors is comparable to the share of women amongst all tenure-track professors, but is ten percentage points lower than the share of women among assistant professors. Finally, within conference program, we find that when a woman organizes the program, the share of female authors and discussants is higher.

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1 Introduction

Substantial work focuses on the representation of women and minorities in economics departments.[1] This paper provides an alternative approach to examine the representation of women in economics, using a hand-collected panel dataset to measure the share of female authors represented on the program at the National Bureau of Economics Research (NBER) Summer Institute conference between 2001 and 2016. We use these data to measure female representation across both time and subfields.

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 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, 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 and high-profile conference like the NBER Summer Institute also provide a novel look at gender representation 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 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.

We construct a rich panel dataset of these conference programs from 2001 to 2016, 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. With these data, we first present basic summary statistics about the share of female authors in the time series and across fields.[2] We find that the share of female

[1] Alternative approaches analyze representation on other dimensions such as publications, e.g., Hamermesh (2013) for an example.

[2] 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.

authors ticks upwards slightly over the sixteen-year period, from roughly 18.5 percent in 2001-2004 to 20.6 percent in 2013-2016. 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.

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. Indeed, a striking feature of previous work on gender and economics is that it presents economic subfields as a monolith. Far from being homogenous, we find that an economist attending 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 finance, the share of women is roughly 14.4 percent; in macro & international, it is slightly higher, around 16.4 percent; and in micro, the share is highest, with 25.9 percent of 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 important 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-stat = -1.63). 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 fully 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 chosen for the program, discussant selection is not subject to the same constraint. Hence, the selection likely reflect 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 cannot speak to 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). This suggests that women are not systematically submitting lower quality papers, nor are there differences in acceptance rates across subfields.[3]

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 that in fact "there are many qualified women who are less recognized for potential high-level

[3]The fact that the acceptance rates across genders is 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 identical.

roles."[4]

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. 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 different economics topics over the course of their careers. The barriers to entry across these topics are thus presumably lower conditional on acquiring the economics toolset in a Ph.D. program. Hence, the balkanization of economics concerning gender is puzzling. 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 to become 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 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 and examine submission patterns across gender. Finally, we explore the role of organizers and the observed patterns for the gender composition of discussants. Section 4 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

[4] A 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

hosts many different programs, with each program's papers selected by a set of economists affiliated with the NBER. These programs are publicly available on the NBER website.[5] We construct a panel dataset of these conference programs from 2001 to 2016, containing information on the papers presented, their authors, the discussant of the paper, and the organizers of the program.

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. However, due to issues with the formatting of the NBER website, an additional 625 papers were input by hand. This gives an initial total of 7,138 papers and 18,535 authors and discussants. After further data cleaning due to a few webscraping issues, 743 papers were dropped.[6] We were left with a final total of 6,867 papers and 17,474 authors and discussants across the 16-year period (2001-2016).[7]

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.[8] We construct a measure of the probability of male and female names ($\widehat{\Pr}(\text{male}|\text{name})$ and $\widehat{\Pr}(\text{female}|\text{name})$). We then merge this database with the list of authors from the NBER. We mark authors with $\widehat{\Pr}(\text{male}|\text{name}) > 0.95$ as male, and authors with $\widehat{\Pr}(\text{female}|\text{name}) > 0.95$ 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.[9] Of the 7,215 distinct authors in our dataset, 5,604 authors are automatically identified and 1,611 are manually identified.

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

[5] Available here: http://conference.nber.org/confer/old-conference.html

[6] First, 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 PhD students.

[7] We 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.

[8] Database available here: https://sites.google.com/site/facebooknamelist/namelist

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

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. In order 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.[10] To make our results comparable, we use these sub-disciplines in other components of our analysis. For those programs that are not categorized, we omit them from our analysis when focusing on the sub-disciplines.

We compile two additional datasets to construct a set of comparison benchmarks of female representation in economics. First, we use data from the Council on the Status of Women in the Economics Profession (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 two sets of statistics: first, the overall share of each rank (assistant, associate, full professor) at the institutions, across both men and women; [11] and second, 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, where in the most recent time periods, "All" refers to 126 departments surveyed by CSWEP.[12]

Second, we compile all NBER members since 1978 from the NBER website.[13] 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 the purposes of our analysis, we will focus primarily on the stock of NBER members from 2001-2016. We also disaggregate the authors into our three major subfields.

3 Empirical Results

In this section, we first present basic summary statistics on the share of female authors in the time series and across subfields. We then examine potential channels driving differential rates of female authorship on the programs.

[10] These categorizations were chosen with consultation of the NBER and are reported in Table 1.

[11] We scaled the number of women by the share of women to get the overall number of faculty in each position, and then scale by the total number of faculty.

[12] More 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 prior to 2011, we used data from the 2011 and other previous Reports.

[13] Available 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, etc..

3.1 Time Series

In Figure 1, we plot the share of female authors over time divided into four year bins to smooth out year-to-year fluctuations in gender share.[14] Panel A reports the share of female authors across all papers. The figure shows that the share of female authors increases over time, growing from 18 percent in 2001-2004 to slightly over 20 percent in 2013-2016. For each bar, the whiskers plot the 95 percent confidence intervals for the means. Panel B shows the composition of authors across accepted papers broken into three categories: papers with (i) all male authors, (ii) all female authors, and (iii) a mix of male and female authors. While the share of all male and all female authored papers declines over time, the share of papers with both female and male coauthors comprises a rising share of accepted papers. As a result, roughly 40 percent of all accepted papers include at least one female co-author in 2016.

To explain the divergence in the female share of the total number of authors and the share of papers with at least one woman, we examine the number of co-authors per paper over time. Appendix Figure A2 shows that the number of co-authors on each paper rises substantially over time, growing from 1.8 in 2001 to almost 2.5 co-authors per paper in 2016. 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. This is notable in that while the share of papers with a single woman increased over this time period, the movement in the overall share of women is significantly lower.

To more directly study the composition of authorship, we breakdown the share of female authorship across papers with different numbers of coauthors – papers with one, two, three, and four or more coauthors from 2001 to 2016. In Panel A of Figure 2, we first see that the number of sole-authored papers declined substantially over this period, while three- or four-authored papers grow in their stead. However, in Panel B, we see that there is no particular gender pattern across these papers. Sole-authored papers do not have a larger share of women than four-authored papers. This finding is consistent with a mechanical effect of more coauthors leading to a larger share of papers with at least one female author.

[14] We report year-by-year results in the Appendix.

3.2 Time Series by Field

Next, we document the growth in authorship within subfields. As discussed in Section 2, we categorize programs into three subfields: finance, macro & international and micro. Table 1 shows the categorization of different programs into these three broad fields. Figure 3 decomposes the share of female authors over time into these categories and shows significant cross-sectional variation in gender representation across fields. In Panel A, we first plot the share of female authors. In 2013-2016, finance has the lowest representation at 14.3%, macro & international is slightly higher, with 16.3% female authors, and micro has a much higher share of women overall at 25.8%. Growth rates over the period are similar across fields, with very modest growth across all three subfields. Finance grew from 13.3% in 2001-2004, macro & international from 14.4% and micro from 23.5%. Again, the whiskers plot the 95% confidence intervals for the sample means. As expected, finance has larger standard errors due to a smaller share of papers in this subfield.[15] Panel B charts the gender composition shares of papers. Here we also see that the share of papers with both female and male co-authors increases across all subfields. However, the increase is predominantly concentrated in micro and macro & international. In finance in 2013-2016, roughly one-third of the papers have a female author on them, while in micro this share is almost half.

3.3 Across Programs

Next, we plot the distribution of female authorship across individual programs. In order to reduce the amount of noise in these plots, we focus on programs that exist for at least six years in our sample. This procedure excludes one-off programs and other programs with shorter durations. A notable omission is the Development Economics program, which is now a major program but has only been in existence since 2013.[16]

In Figure 4, we present the range of female authorship across programs and years using a box plot of the share of female authorship. The unit of observation is a program-year, and the outcome is the share of female authors. The box reflects the interquartile range for a given program, from the 25th to 75th percentile across years. The tails of the box extend to the furthest value within 1.5 standard deviations of each side of the interquartile range, where the standard deviation is measured within

[15] In Figure 4, it is clear that the average share of women for the Finance subfield is pulled up by Entreprenuership. In unreported results, we reran the time series with Entreprenuership included in Micro instead of Finance. In this case, Finance stayed almost completely flat, with 13.3 percent women in 2013-2016 (and an identical share of 13.3 percent in 2001-2004, as Entrepreneurship began in 2009).

[16] In Appendix Figure A5, we repeat the exercise, but focus on the major NBER programs and include Development Economics. The results look very similar.

program. We plot finance, macro & international and micro in three different colors, and sort the programs based on the programs' median value of female share of authorship. The solid black line presents the overall average female share, weighted by number of papers.

We see substantial variation both across programs and within programs. In particular, while there are exceptions to the ordering of gender-representation across the sub-fields, the ordering of finance followed by macro & international and micro is preserved. There is substantial variation across the individual programs, with the lowest median share of roughly 10 percent (Impulse & Propagation Mechanisms) near the bottom and the highest median share with 37 percent (Children).

3.4 Benchmarking the time series

To draw conclusions about the level of female representation at the Summer Institute, it is necessary to have an appropriate benchmark of overall female representation in economics; i.e., what is the pool of potential authors for the NBER? This is made difficult for two reasons. First, the composition of faculty seniority in the NBER Summer Institute programs may not necessarily correspond to the composition of faculty in departments. Junior faculty may have stronger incentives to write papers and submit to conferences while working towards tenure, while established senior faculty may find it easier to get their papers accepted. Second, it is not clear which economics departments are the most appropriate benchmark for comparison. As the Summer Institute is a prestigious conference, the question arises whether the Top 10 or 20 departments provide the most relevant benchmark or whether we should look more broadly. As a result, the mix at the NBER may not be completely representative of the field.

Using the 2016 data, we manually identify the rank and type of institutions of the authors on accepted papers to provide answers to our questions above. First, in Panel A of Figure 5, we plot the faculty rank share for both men and women accepted to the NBER Summer Institute, and compare it to the relative share of each rank using the data from CSWEP. We see that the representation of assistant professors at the NBER Summer Institute is much higher than at all 126 departments with doctoral programs, as well as at the Top 20 and Top 10 departments. In fact, the share at the NBER is nearly double the share of assistant professors at the Top 10 universities. In contrast, there are far fewer full professors as authors on the NBER Summer Institute programs relative to departments with doctoral programs.[17]

The data from CSWEP also provides the share of women at all 126 doctoral departments, as well

[17] To make these datasets comparable, we exclude non-university economists and graduate students in the NBER dataset when calculating the shares.

as at the Top 20 and Top 10 departments.[18]. Since the data is provided by faculty seniority, we can also estimate the relative share of women by rank. Hence, we next compare the share of assistant faculty and full professors that are women on papers on the NBER schedule to the CSWEP data. In other words, we examine the fraction of female authors who are assistant professors relative to all university faculty authors who are assistant professors and featured on the program. In Panel B of Figure 5, we report these numbers in 2016. In both cases, we see that the NBER Summer Institute shares of female authors reflect roughly 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. This suggests that the composition of faculty at the NBER is heavily skewed towards junior faculty, when compared to the overall academic population, and by rank, the share of women is comparable to the Top 20 departments.

We now expand our benchmark comparison to the full time series. In Figure 6, we plot the share of women in tenure-track positions, both in aggregate and for junior & senior positions, in economics programs at universities with graduate programs. We first see that on average, the overall share of women in all tenure-track positions grew steadily from 2001, from 12.9 percent to 20.1 percent in 2016. In contrast, the fraction of assistant professors who are women has stayed relatively constant since 2005, and the fraction of full professors who are women has gradually risen post-2008 after being flat from 2001-2008.

When compared 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 has shrunk over time. In contrast, the share of women amongst junior faculty is consistently higher than the share of female authors on the NBER Summer Institute program. It is noteworthy that if we were to assume that the composition of junior and senior faculty stayed the same from 2001 onwards, the share of female authors at the NBER Summer Institute should have tracked upwards, since the relative share of female full professors and junior faculty has increased over time.

No single CSWEP comparisons seems highly correlated with the time series of female NBER authorship. Instead, the measure that correlates best with the share of female NBER authors is the stock of female NBER members. This fact holds true even when we split members across fields in Appendix Figure A6. This finding is perhaps unsurprising: NBER members are likely most aware of the Summer

[18]CSWEP's historical panel for estimating female representation has changed over time. As a result, they have made efforts to harmonize the numbers but the results are not perfectly representative. For further discussion, see page 7 of the 2016 CSWEP Annual Report.

Institute, and thus more likely to submit to the conference.

3.5 Submissions

Now, we turn to the pipeline of submissions at the NBER. 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. We find that this is not the case.

Using an anonymized dataset of submissions from the 2016 and 2017 NBER Summer Institute, we are able to identify overall acceptance rates across papers, as well as within each field: finance, macro & international and micro.[19] Figure 7 shows nearly indistinguishable acceptance rates for women compared to men when the groups are pooled together. For both macro and micro, the differences are either close to zero, and are statistically indistinguishable from zero (in the case of micro, slightly weighted towards women). In the case of finance, we see a marginally significant 2 percentage point difference in acceptance rates (t-stat= -1.63). This difference is relatively small percentage-wise, but given a low acceptance rate on average, 2 percentage points is non-trivial difference in rates. Moreover, the difference in acceptance rates in finance appears in both years of the data (see Appendix Figure A10 for both years split out).

The very similar acceptance rates across other programs suggest that the overall proportion of women on programs reflects the submission rates by women. One caveat when interpreting these rates is that papers may be submitted to multiple programs, and typically only get accepted to one. As a result, the probability that a "unique" paper is accepted to the Summer Institute is likely higher. However, unless the number of submissions per paper is correlated with author gender, this should not affect our overall analysis.

3.6 Organizers

We next examine the differences in programs depending on the gender of the organizer. Table 2 reports 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:

$$\text{Female Share}_{it} = \alpha_i + \alpha_t + \text{Female Organizer}_{it} + \epsilon_{it}, \tag{1}$$

[19]We 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.

where the share of women on a program is the dependent variable, the main explanatory variable is "Any Female Organizer" in Panel A which is an indicator for whether any of the organizers are women. In Panel B, we include "Share Female Organizers" which 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, we see in Figure 8 that 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 marginally significant and the effect of female organizers on female-representation on programs is still 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. This result disappears with subfield-by-year fixed effects in Column 6 for finance, but persists in macro & international.

3.7 Discussants

Finally, we turn to the share of women amongst discussants. 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. It is interesting to examine the gender representation of discussants as organizers typically select discussants. For prestigious venues like the NBER, it may be valuable to receive the opportunity to discuss a paper at the NBER, as it enhances a scholar's visibility in the field. At the same time, it does not substitute for presenting one's own work and may reflect a time-consuming burden. Since organizers select discussants based on the papers chosen and not the underlying pool of submissions, they likely reflect the organizers' information set of appropriate discussants, rather than the pool of submitted papers. As a result, this can be a useful tool for studying female representation at a conference, independent of submission rates.

In Figure 9, we compare the share of authors and discussants that are female over time. To 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), and plot the average share of women for authors and discussants similar to Figure 1. Overall, these programs tend to have a lower share of women as authors. When comparing authors to discussants, the share of women as discussants is even slightly lower, with a larger gap in recent years. In Panels B to D, we compare the differences between authors and discussants for each subfield, and find that the gap is largest in micro. To test for statistical differences in aggregate as well as across fields, we run the following specification:

$$\text{Female}_{it} = \alpha_t + \text{Discussant}_{it} + \epsilon_{it}, \tag{2}$$

where an observation is at the person-paper-year level, Female_{it} is an indicator for whether the person is a woman, and Discussant_{it} is an indicator for whether the person is a discussant. We first pool this regression for all sessions, and then separately for each of micro, macro & international and finance. All specifications include year fixed effects and cluster at the session-year level. We report the results in Table 3. 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.

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. What is clear is that the scales are slightly tipped against women as discussants.

We lastly examine whether the gender of the organizers plays any role in explaining differences in the share of female discussants on a program. In Table 4, we run the same regression as Table 2, but now put the female share of discussants as the outcome variable. We see that in Columns 1-3, there is a positive effect of having a female organizer on the female share of discussants. In Column 2, including year and program fixed effects, there is on average a 3.5 percentage point increase in the female share of discussants when a female organizer is present. However, this is only significant at the 10% level. With subfield-year fixed effects, the effects are no longer significant.

4 Conclusion

Our research provides a link to broader research on female visibility at conferences in STEM fields.[20] Studies in STEM have shown evidence of low representation of female scientists as speakers at major conferences, despite an increasing share of women in these fields, (Kalejta and Palmenberg, 2017; Casadevall and Handelsman, 2014; Casadevall, 2015).[21] Although economics often receives STEM designation due to its quantitative content, there is little evidence about the gender composition of economics conference programs. In this paper, we fill that gap using sixteen years of conference programs from the National Bureau of Economic Research's (NBER) Summer Institute to estimate the representation of female economists at the conference across time and subfields.

We find that over the period from 2013-2016, women made up 20.6% of all authors on scheduled papers, but there was large dispersion across different sub-disciplines, with the share of female economists ranging from 7.3% to 47.7% over the programs. While the average share of women on programs has risen slightly over the past 16 years from 18.5% in 2001-2004, the gap of women between finance, macroeconomics and microeconomics subfields has remained constant, with women currently making up 14.4% of authors in finance, 16.3% of authors in macro & international, and 25.9% of authors in microeconomics.

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 difficult to ascertain the pool of academics who submit to the NBER summer institute. From our analysis, the only comparable benchmark of female economists that matches both the level and time series of female representation

[20]STEM refers to the academic disciplines of science, technology, engineering and mathematics. See https://fas.org/sgp/crs/misc/R42642.pdf for a primer.

[21]For example, the New York Times article on September 5, 2016: "Female Scientists Turn to Data to Fight Lack of Representation on Panels" https://www.nytimes.com/2016/09/06/science/gender-bias-scientific-conferences.html?mcubz=3

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.

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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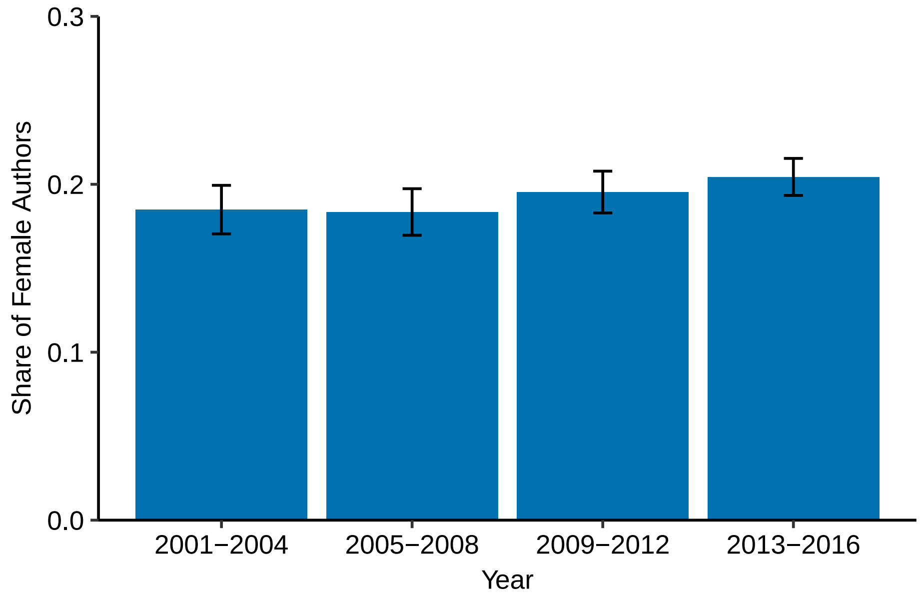
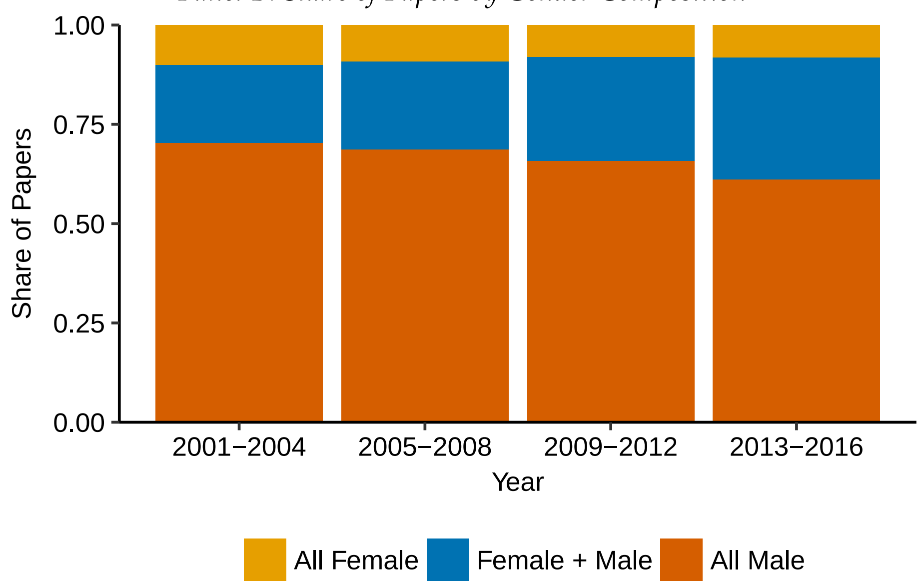
Figure 1: Gender Composition over Time

Panel A: Share of Authors



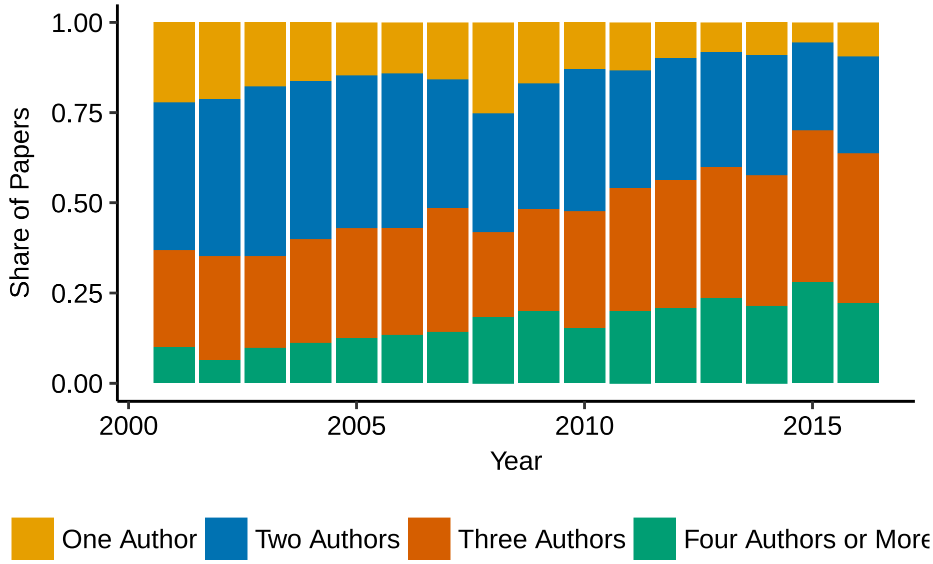
Panel B: Share of Papers by Gender Composition



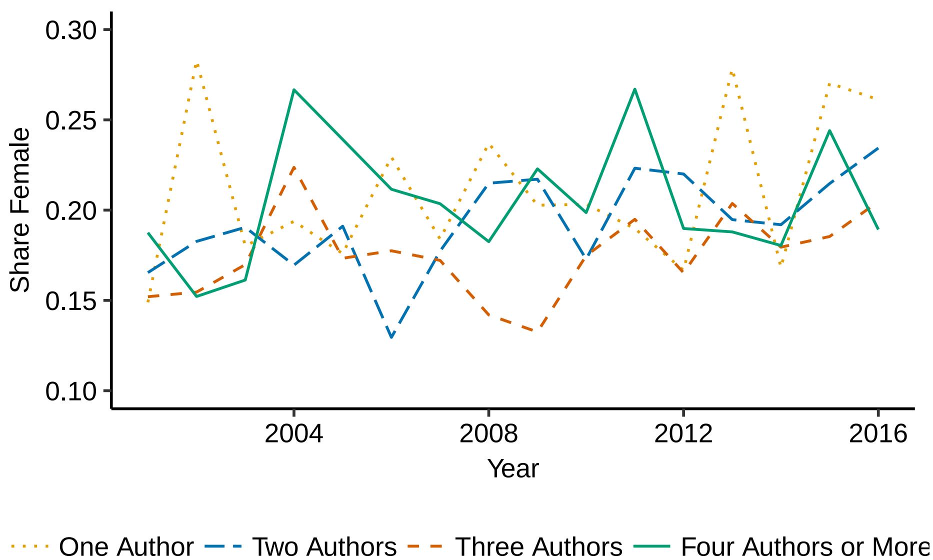
Note: This figure plots the overall representation of female economists divided into four year buckets. Panel A reports the share of female authors across all papers. Panel B shows the composition of authors across accepted papers broken down into categories based on author composition. The error bars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

Figure 2: Gender Composition by Authorship

Panel A: Share of Papers by Number of Authors



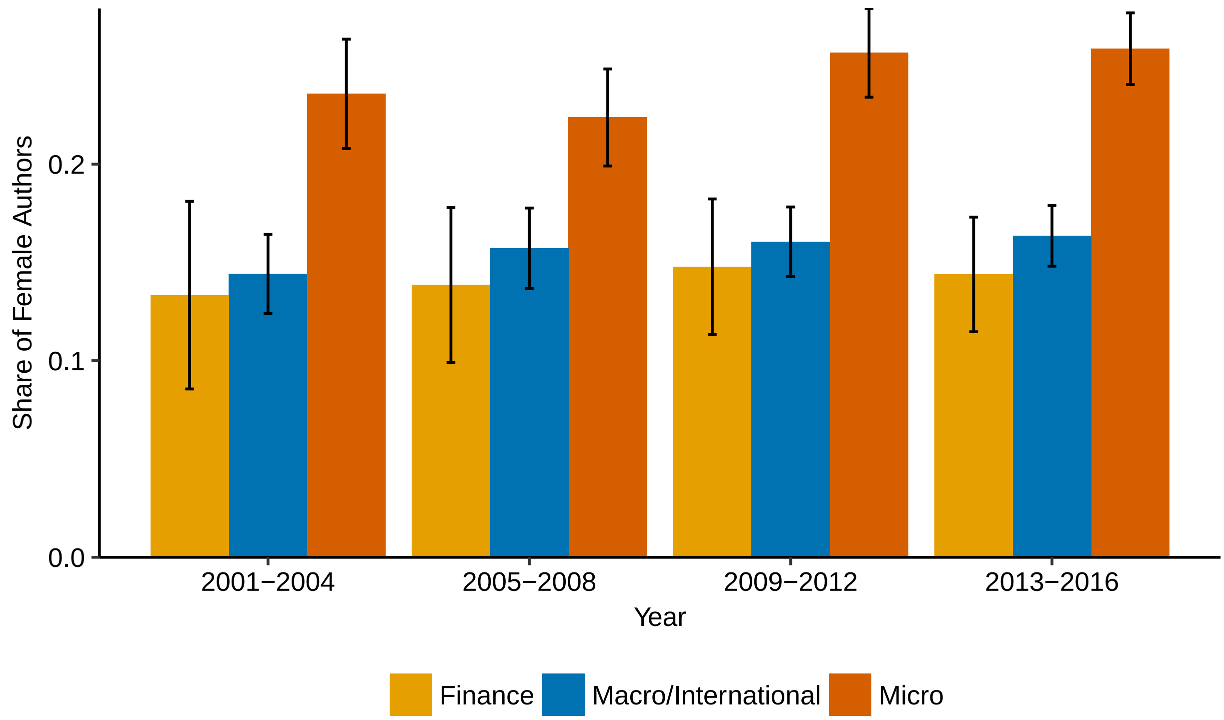
Panel B: Share Female by Number of Authors



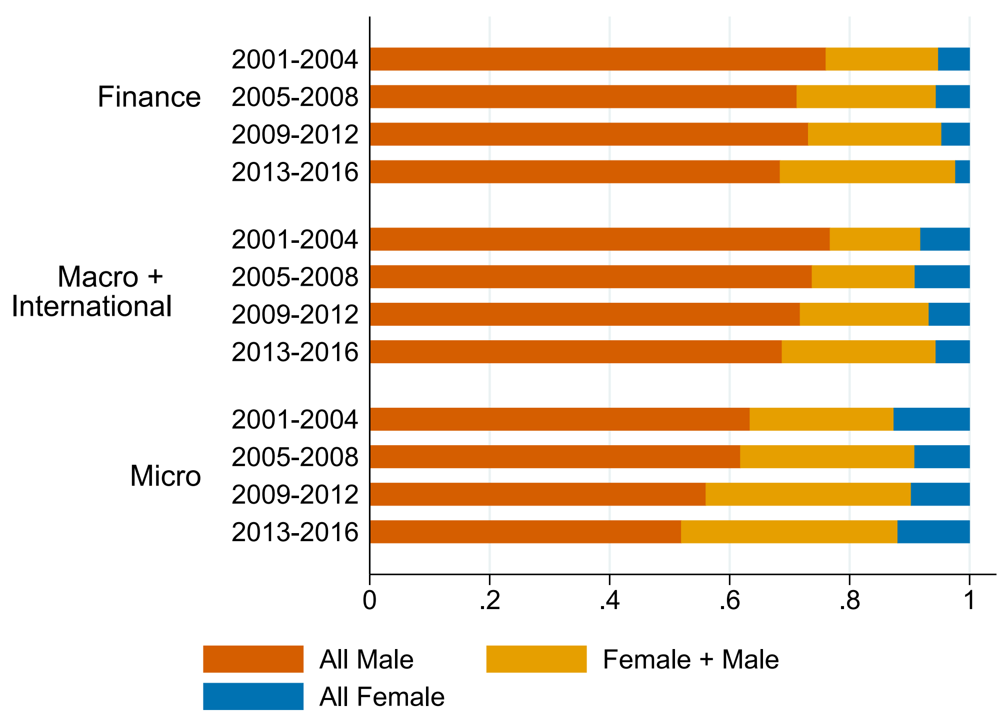
Note: Panel A plots the share of papers by number of co-authors, within each year. Panel B reports the female share of authors on papers by number of co-authors.

Figure 3: Gender Composition Over Time by Field

Panel A: Share of Authors

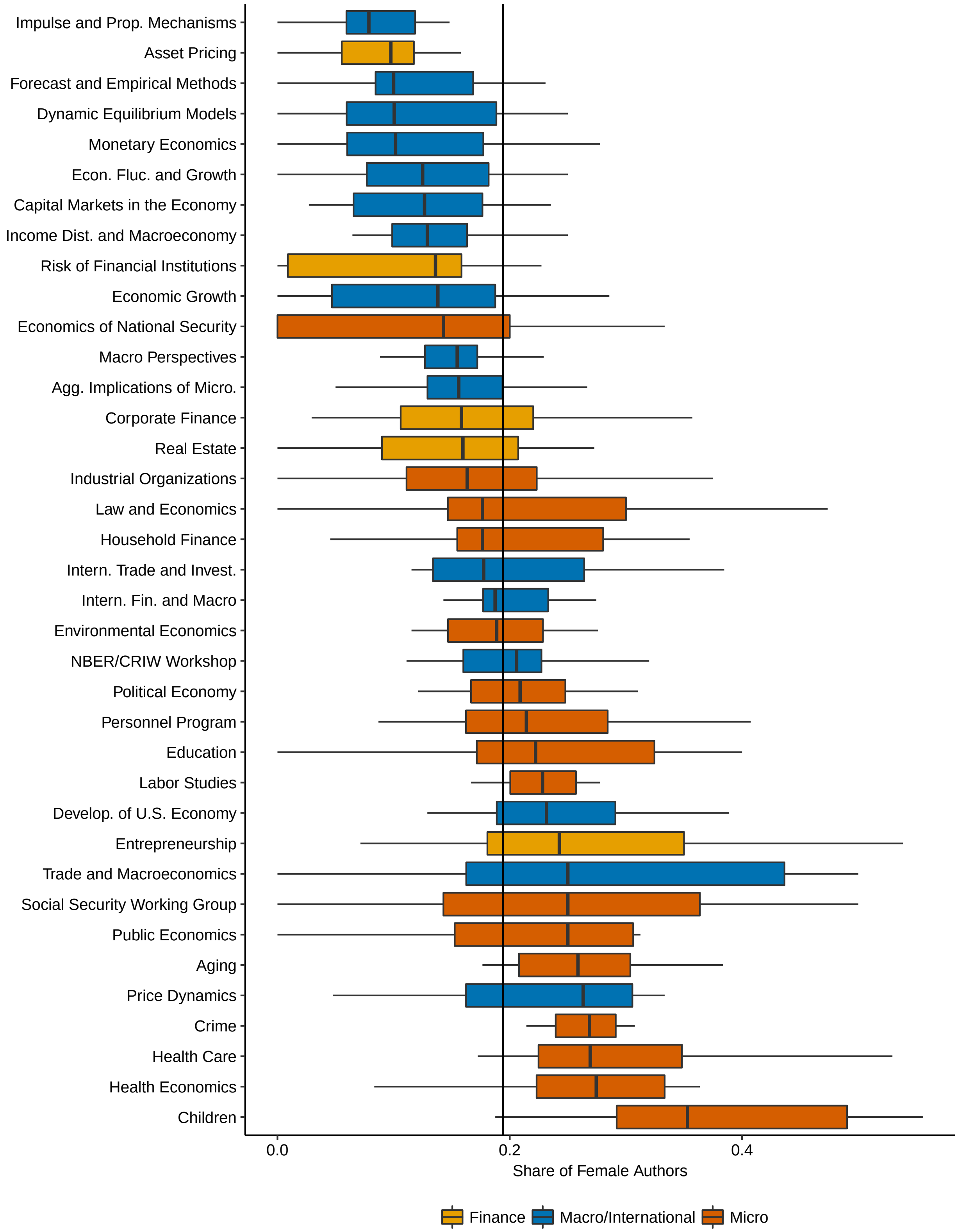


Panel B: Share of Papers by Gender Composition



Note: This figure plots the representation of female economists by field, divided into four year buckets. Panel A reports the share of female authors across all papers, by field. Panel B shows the composition of authors across accepted papers over time and across field, broken down into categories based on author composition. Our field categorization is defined in Table 1. The error bars represent +/- 1.96 times the standard error of the mean.

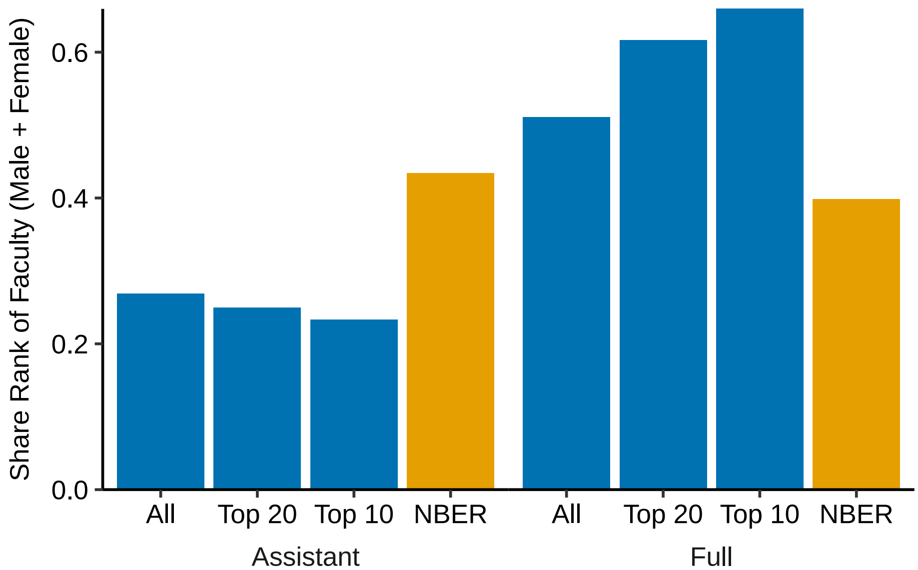
Figure 4: Gender Composition Across Programs



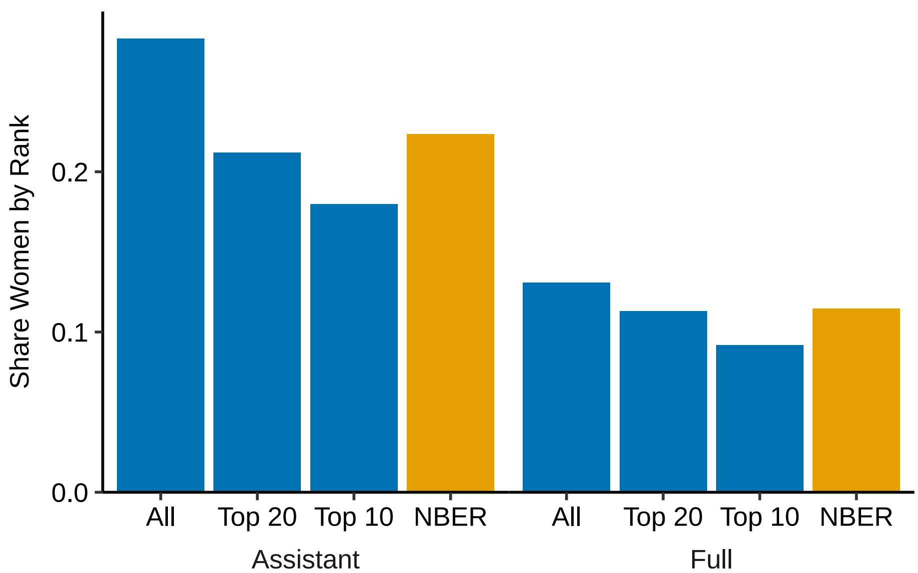
Note: This figure plots a box plot of the gender composition across programs using all data from 2001 to 2016. For each program, the box reflects the interquartile range, with the middle line reflecting the median. The lines reflect the furthest value that is within 1.5 standard deviations of the interquartile 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 6 years of data. Programs are coded into fields using the categorization in Table 1.

Figure 5: Benchmarking the share of female economists in 2016

Panel A: Share Rank of Faculty (Male + Female)

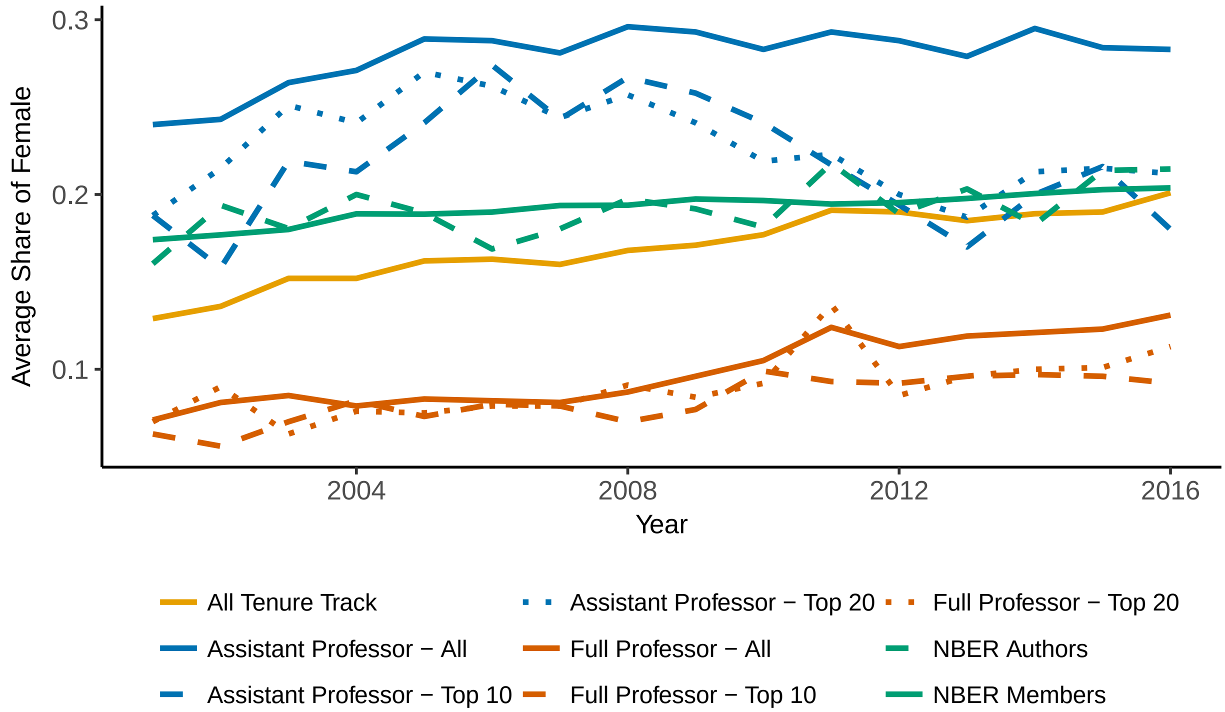


Panel B: Share Women by Rank



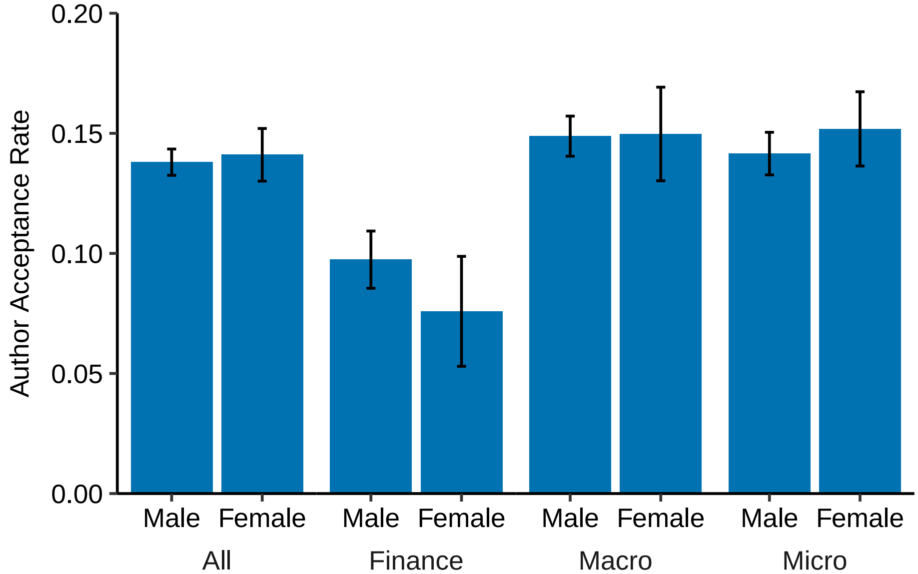
Note: Panel A of this figure plots the share of seniority at the NBER and at economics departments with doctoral programs. The left four columns in Panel A are the share of faculty that are assistant professors (including both men and womne), with the first three columns corresponding to economics departments 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. In Panel B, we report, for a given faculty rank – either assitant or full professor – the share of female economists either in an economics department or on the NBER programs. 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 6: Benchmarking the share of female economists over time



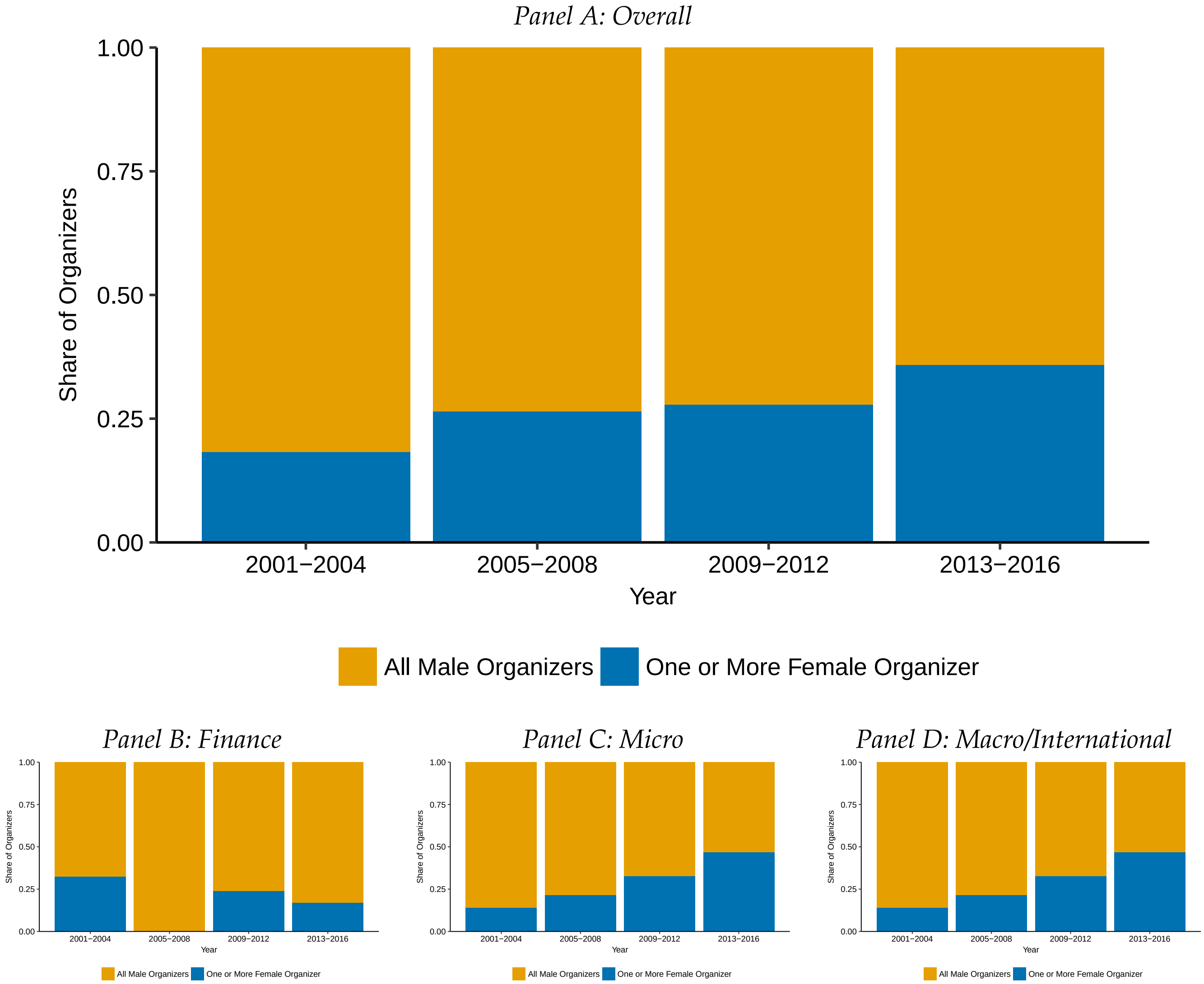
Note: This figure plots the share of female economist in different categories over time. The lowest set of orange lines report the share of women who are Full professors at all institutions with graduate programs, or at the Top 10 and Top 20 instutitions. The top blue lines report the share of assistant 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 green line reports the share of NBER members (research associates and faulty research fellows) that are women. This comes from the NBER website on NBER members. The dashed green line reports the share of authors that are female on the NBER programs.

Figure 7: Acceptance Rate Across Fields and Gender



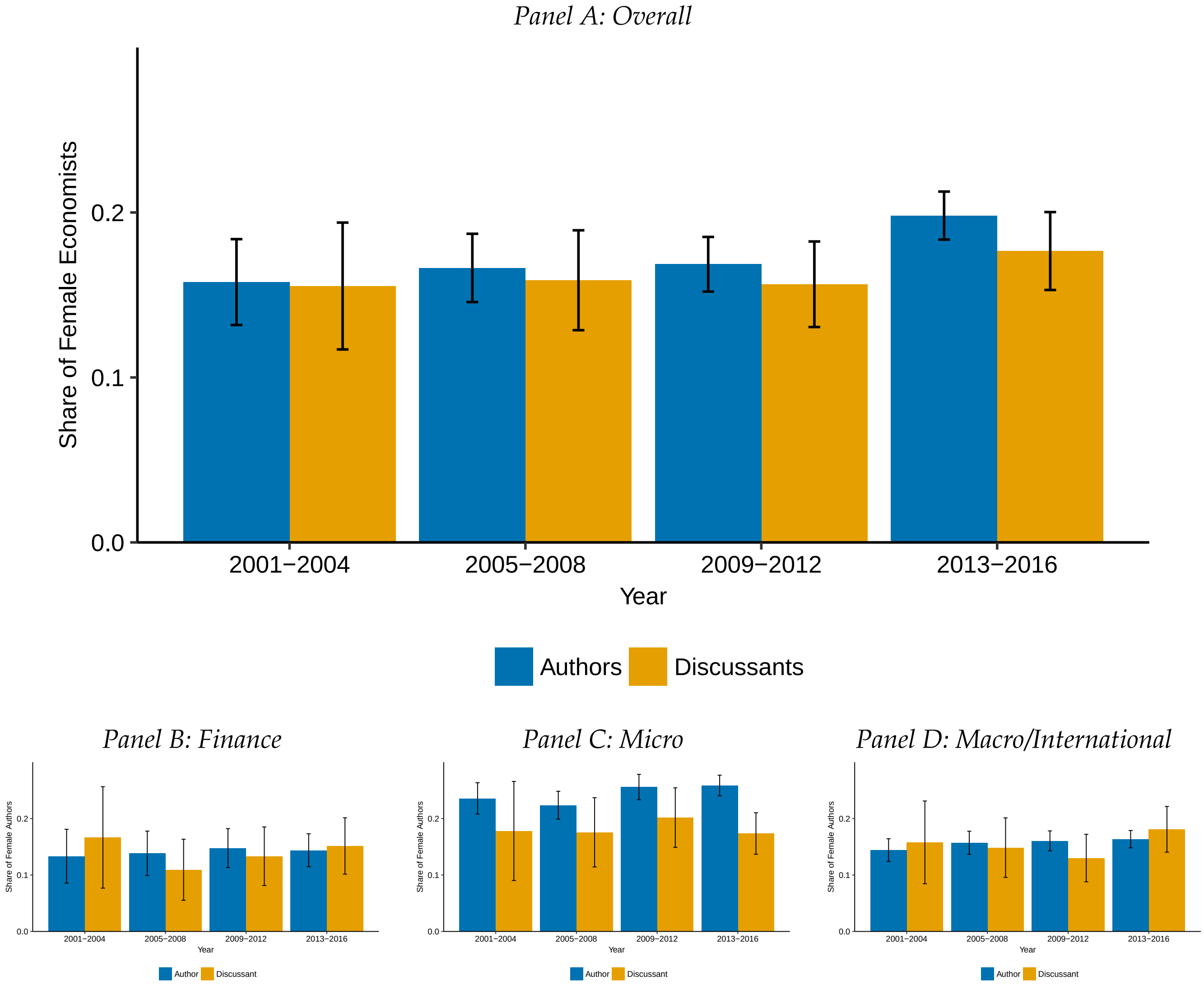
Note: This figure plots the acceptance rate of authors for the 2016 and 2017 NBER Summer Institute. The first set of bars plot the acceptance rate for male and female authors for all fields pooled. The next three sets split out acceptance rates by field. The error bars represent +/- 1.96 times the standard error of the mean. None of the differences is significant, except for finance, with a t-stat of -1.63.

Figure 8: Share of Female Organizers over Time



Note: This figure plots the share of papers that have at least one women as an organizer on their program. Panels B-D repeat the exercise for each subfield. Our field categorization is defined in Table 1.

Figure 9: Discussants vs. Authorship over Time



Note: This figure plots the share of female authors and the share of female discussants, divided into four year buckets. Panel A compares the share of female authors and the share of female discussants. The blue bar reports the share of female authors across all papers in sessions with discussants. The yellow bar reports the share of female discussants across all sessions that have a discussant. Panel B through D report the share of female authors and discussants across all papers in programs with discussants, by overall field. Our field categorization is defined in Table 1. The error bars represent +/- 1.96 times the standard error of the mean.

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: Organizer Effects

Panel A: Any Female Organizer

	(1) Share Female	(2) Share Female	(3) Share Female	(4) Share Female	(5) Share Female	(6) Share Female
Any Female Organizer	0.027	0.035**	0.032*			
	(0.020)	(0.015)	(0.016)			
× Finance				-0.040	-0.039***	-0.022
				(0.043)	(0.007)	(0.016)
× Micro				-0.002	0.025	0.022
				(0.029)	(0.016)	(0.017)
× Macro				0.067**	0.072***	0.064**
				(0.027)	(0.026)	(0.029)
Observations	654	654	544	544	544	544
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

Panel B: Female Organizer Share

	(1) Share Female	(2) Share Female	(3) Share Female	(4) Share Female	(5) Share Female	(6) Share Female
Share Female Organizers	0.050	0.074***	0.068***			
	(0.041)	(0.022)	(0.024)			
× Finance				-0.083	-0.077***	-0.044
				(0.085)	(0.012)	(0.032)
× Micro				-0.026	0.063*	0.052
				(0.045)	(0.037)	(0.037)
× Macro				0.102**	0.098***	0.091***
				(0.042)	(0.025)	(0.030)
Observations	654	654	544	544	544	544
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: This table presents regression results from versions of the following specification:

$$\text{Female Share}_{it} = \alpha_i + \alpha_t + \text{Female Organizer}_{it} + \epsilon_{it}, \tag{3}$$

where the share of women on a program is the dependent variable, the main explanatory variable is either Any Female Organizer, an indicator for whether any of the organizers are women, or 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. * p<0.1, ** p<0.05, *** p<0.01

Table 3: Difference in Gender amongst Discussants

	All	Micro	Macro & International	Finance
Discussant	-0.014	-0.034*	-0.012	-0.004
	(0.009)	(0.017)	(0.014)	(0.018)
Obs	9,460	3,038	3,231	1,911
Mean of Outcome	0.176	0.207	0.167	0.142
Year FE	Yes	Yes	Yes	Yes

Note: This table presents results from the following specification:

$$\text{Female}_{it} = \alpha_t + \text{Discussant}_{it} + \epsilon_{it}, \qquad (4)$$

where an observation is at the person-paper-year level. Female_{it} is an indicator for whether the person is a woman, and Discussant_{it} is an indicator for whether the person is a discussant. Column 1 pools for all sessions together, and then Column 2-4 reports regressions seperately for each of Micro, Macro/International and Finance. Programs are coded into fields using the categorization in Table 1. All specifications include year fixed effects and cluster at the session-year level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 4: Organizer Effects on Discussants

Panel A: Any Female Organizer

	(1) Share Female	(2) Share Female	(3) Share Female	(4) Share Female	(5) Share Female	(6) Share Female
Any Female Organizer	0.048***	0.035*	0.030			
	(0.015)	(0.020)	(0.024)			
× Finance				0.116**	0.117**	0.083
				(0.055)	(0.056)	(0.060)
× Micro				0.045**	0.031	0.037
				(0.021)	(0.023)	(0.036)
× Macro				0.052***	-0.007	-0.009
				(0.017)	(0.021)	(0.024)
Observations	321	321	255	255	255	255
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: This table presents regression results from versions of the following specification:

$$\text{Female Share}_{it} = \alpha_i + \alpha_t + \text{Female Organizer}_{it} + \epsilon_{it}, \tag{5}$$

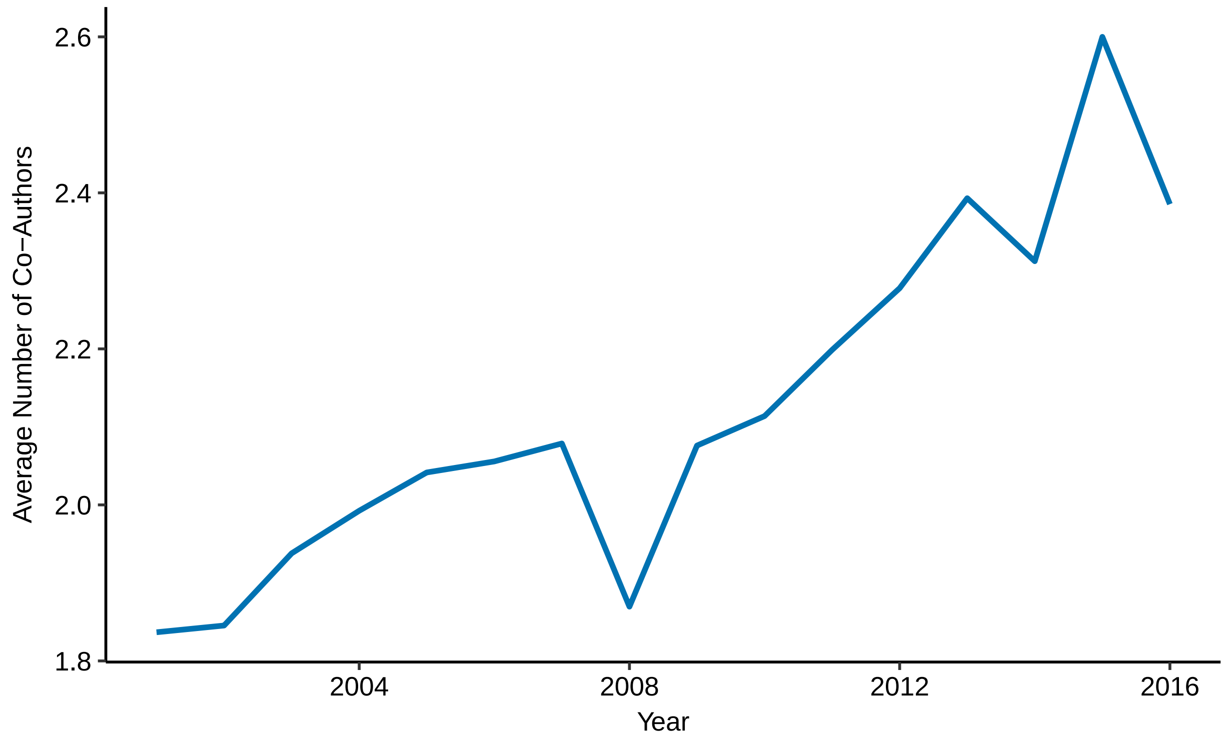
where the female share of discussants on a program is the dependent variable, the main explanatory variable is Any Female Organizer, an indicator for whether any of the organizers are women. The unit of analysis is a program-year. In Column 1, we report the coefficients using just year fixed effects. 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. * p<0.1, ** p<0.05, *** p<0.01

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

Online Appendix

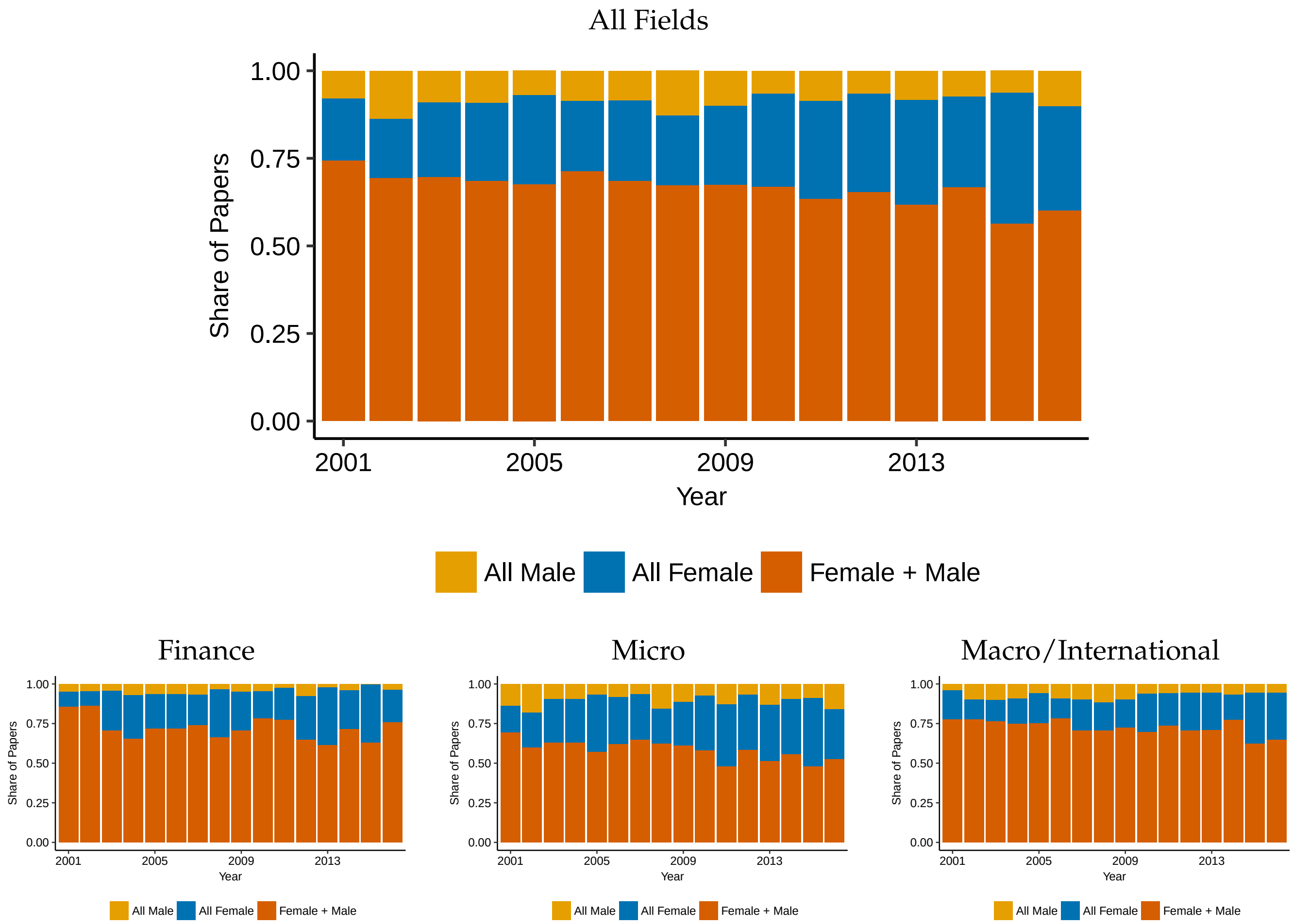
Anusha Chari Paul Goldsmith-Pinkham

Figure A1: Number of Coauthors per Paper Over Time



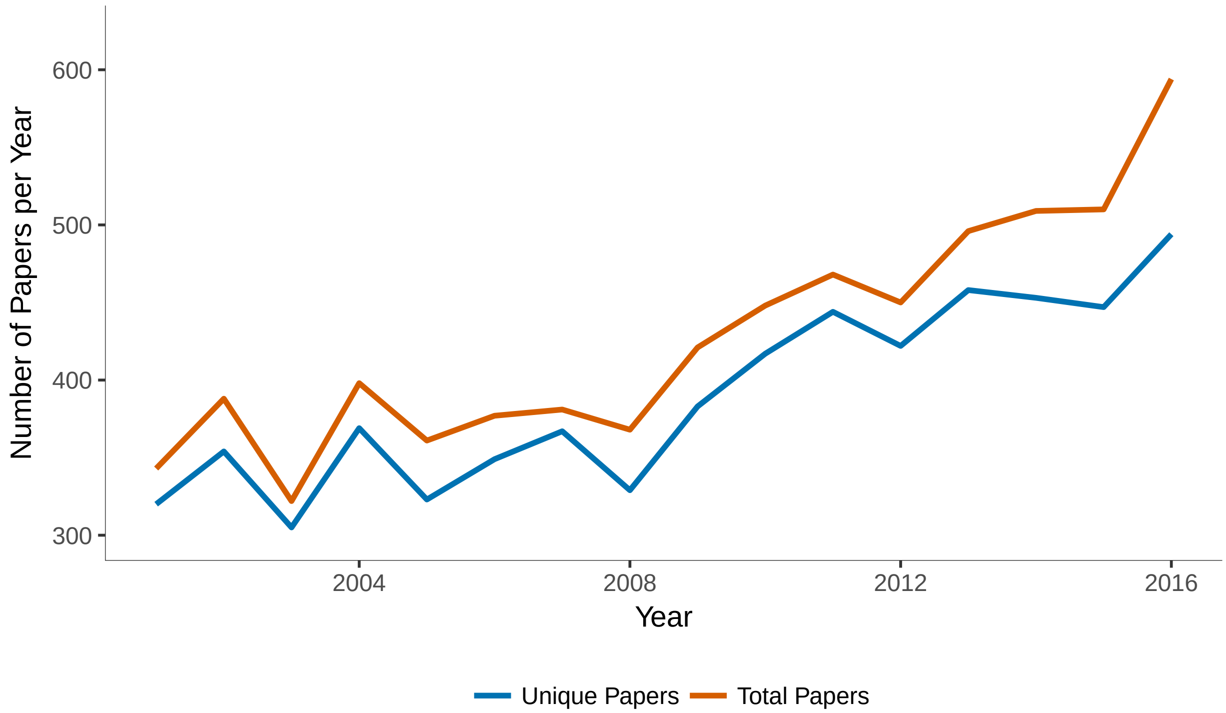
Note: This figure plots the average number of co-authors on a paper by year.

Figure A2: Composition of Authorship Gender over Time



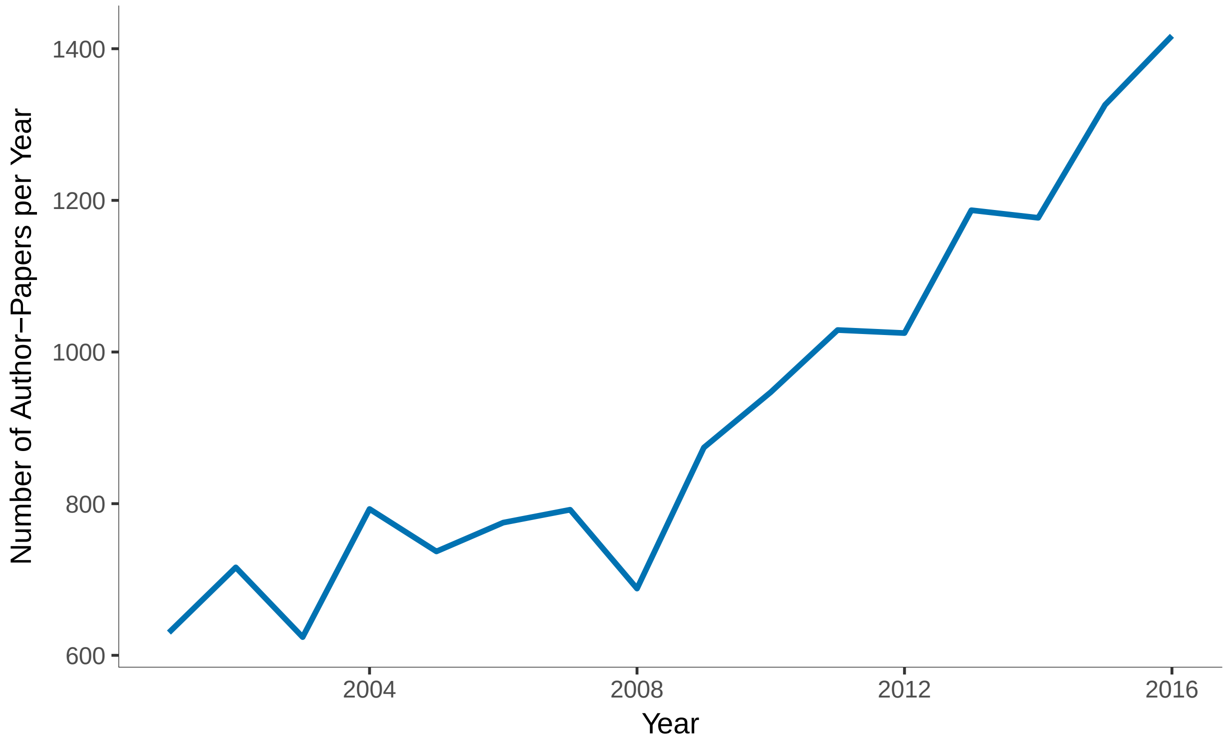
Note: This figure plots the composition of authors across accepted papers broken down into categories based on author composition.

Figure A3: Number of Papers over Time



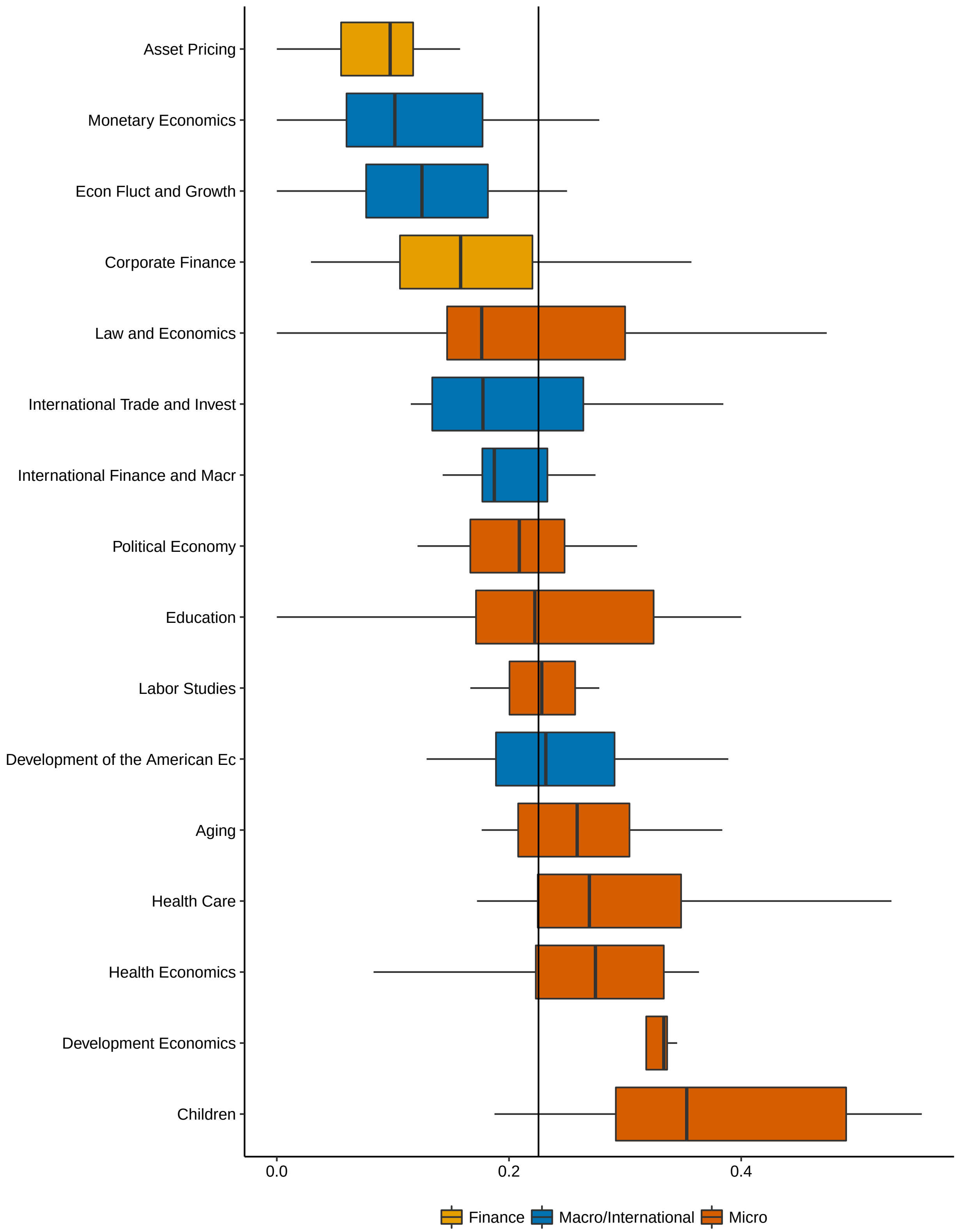
Note: This figure plots the number of NBER Summer Institute papers over time. The lower blue line reports the number of unique papers, which is based on counting unique paper titles. The upper red line reports the total number papers, which is based on counting unique paper ids (i.e. papers in multiple programs during a particular year).

Figure A4: Number of Paper-Authors over Time



Note: This figure plots the number of paper authors over time.

Figure A5: Gender Composition Across Programs - Major Programs

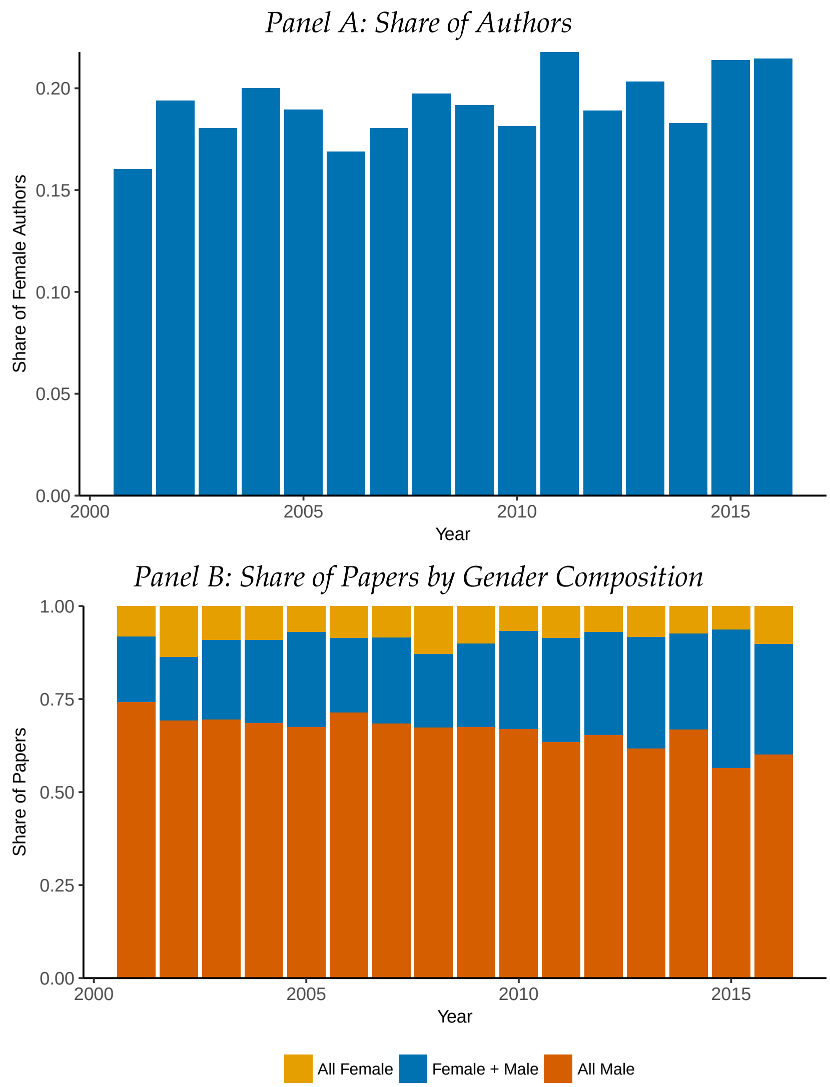


Note: This figure plots a box plot of the gender composition across the major programs for the NBER Summer Institute using all data from 2001 to 2016. For each program, the box reflects the interquartile range, with the middle line reflecting the median. The lines reflect the furthest value that is within 1.5 standard deviations of the interquartile range. The overall black line reflects the overall average share of women. Programs are coded into fields using the categorization in Table 1.

Figure A6: Gender Composition Across Fields - NBER Member and Authorship

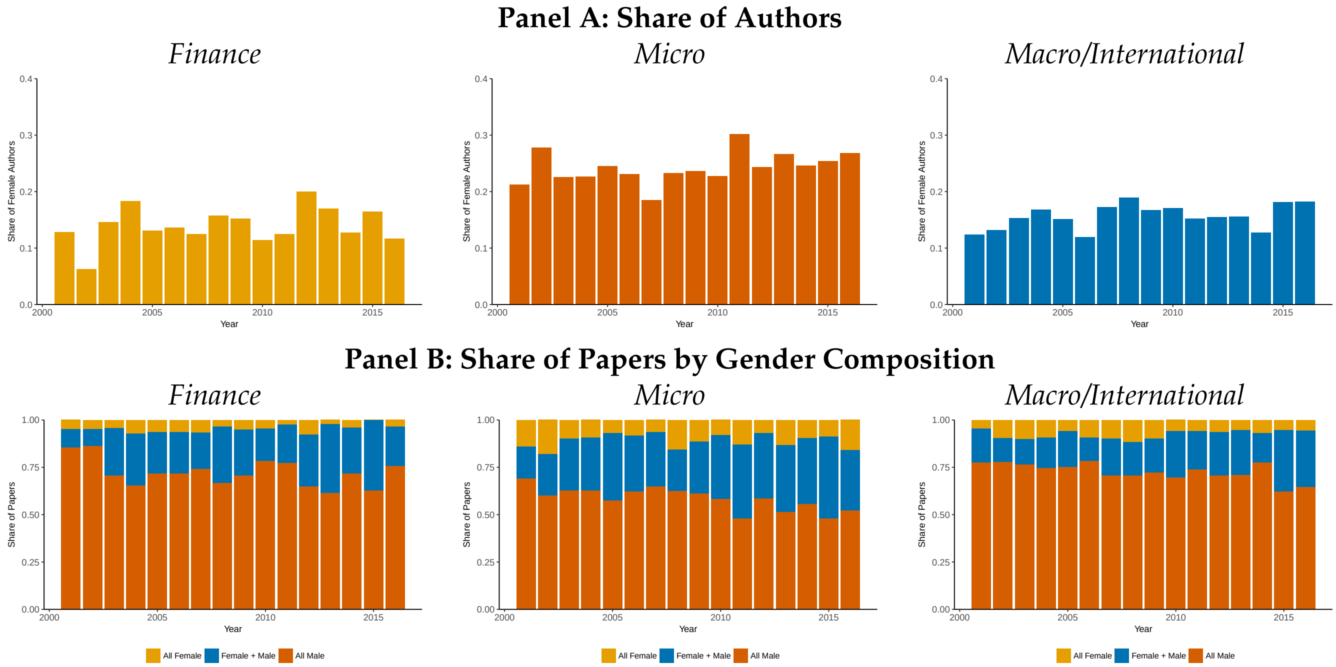
Note: This figure plots the share of female economist in different categories over time. The dashed lines reflect the share of NBER membership (research associates and faulty research fellows) that are women, within each field. This comes from the NBER website on NBER members. The solid reflect the share of authorship that is female at each NBER summer institute. Programs are coded into fields using the categorization in Table 1.

Figure A7: Gender Composition over Time



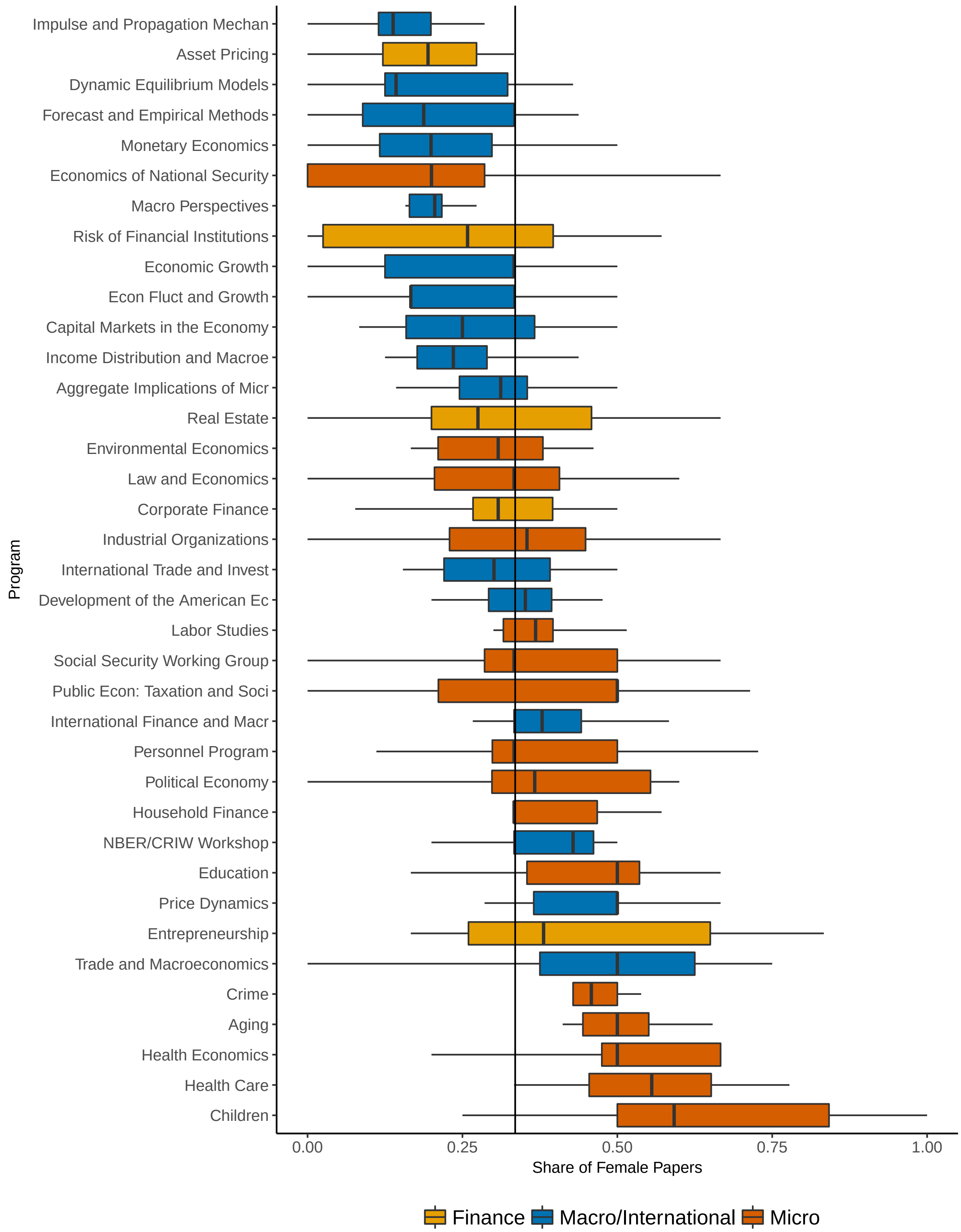
Note: This figure plots the overall representation of female economists by year. Panel A reports the share of female authors across all papers. Panel B shows the composition of authors across accepted papers broken down into categories based on author composition.

Figure A8: Gender Composition Over Time by Field



Note: This figure plots the representation of female economists by field and year. Panel A reports the share of female authors across all papers in each field. Panel B shows the composition of authors across accepted papers over time, by field, broken down into categories based on author composition. Our field categorization is defined in Table 1.

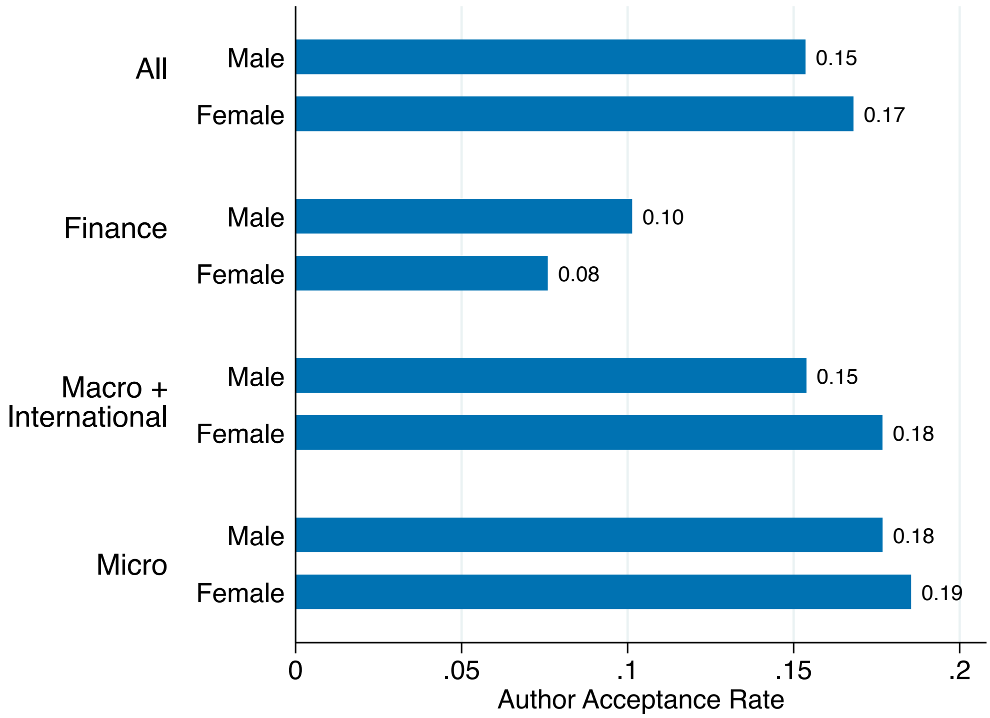
Figure A9: Share of Papers with Female Authors Across Programs



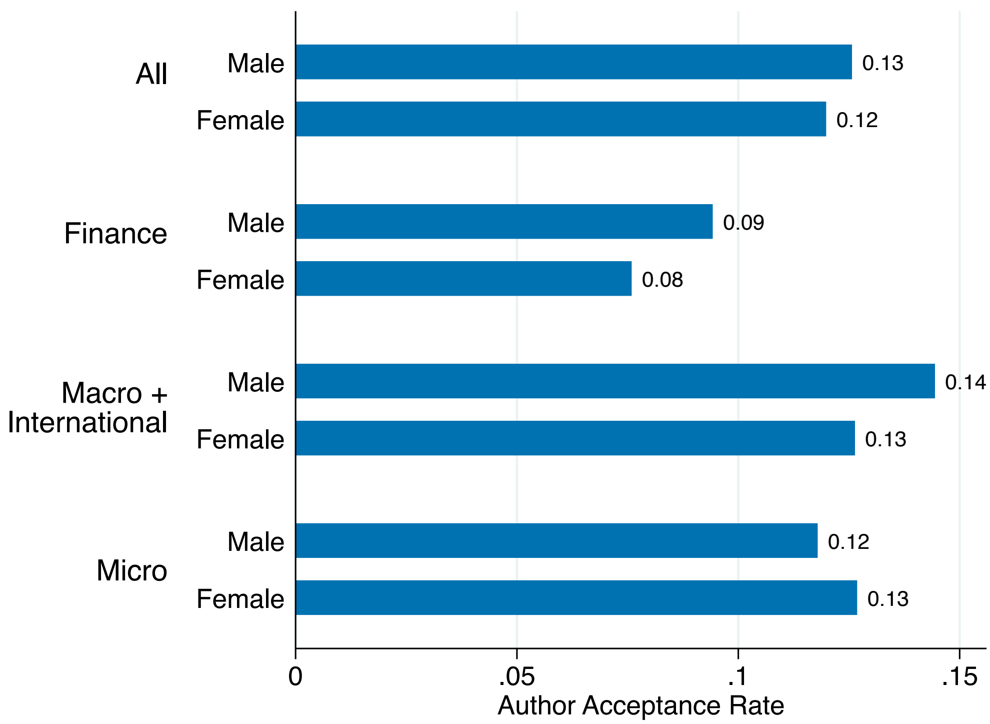
Note: This figure plots a box plot of the composition of papers with female coauthors across the major programs for the NBER Summer Institute using all data from 2001 to 2016. For each program, the box reflects the interquartile range, with the middle line reflecting the median. The lines reflect the furthest value that is within 1.5 standard deviations of the interquartile range. The overall black line reflects the overall average share of papers that contain female coauthors. We only report programs that have a minimum of 6 years of data. Programs are coded into fields using the categorization in Table 1.

Figure A10: Acceptance Rate Across Fields and Gender, by Year

Panel A: 2016 NBER



Panel B: 2017 NBER



Note: This figure plots the acceptance rate of authors for the 2016 and 2017 NBER Summer Institute, broken down by field. The upper bar in each field reports share of male authors accepted and the lower bar in each field reports share of female authors accepted.