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Gender Gaps in the Federal Reserve System*

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Abstract

To better understand the stalled progress of women in economics, we construct new data on women's representation and research output in one of the largest policy institutions—the Federal Reserve System. We document a slight increase in women's representation over the past 20 years, in line with academic trends. We also document a significant gender gap in research output, especially for years in which economists have greater domestic responsibilities, but nearly absent gender gaps in policy output and career progression. This work complements existing research on women in academia, allowing a more comprehensive examination of progress in the economics profession.

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Keywords: central banks, diversity, gender inequality, leaky pipeline, research output.

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1 Introduction

Substantial recent evidence suggests that progress toward reaching gender parity in the economics profession has stalled (Lundberg and Stearns, 2019; Sherman and Tookes, 2022). Women continue to face systematic barriers, including greater obstacles to publication success (Alexander et al., 2023; Hengel, 2022; Hengel and Moon, 2023; Card et al., 2020), lack of credit for equal work (Sarsons et al., 2021), and rampant harassment and discrimination (Wu, 2018). Much of the evidence on this stalled progress, however, focuses on the academic environment. To understand gender gaps in the economics profession, it is also necessary to explore women’s representation and output in policy institutions.

This paper fills a gap in the literature by complementing existing work on academic institutions with evidence from policy institutions. The study of gender gaps in the policy institution environment is important for three key reasons. First, policy institutions can be large relative to academic ones, both in terms of the number of economists and their research output. The Federal Reserve System, which comprises the 12 regional Federal Reserve Banks and the Board of Governors of the Federal Reserve System, is one of the largest policy institutions.¹ The roughly 1,000 economists in the System at present are comparable to the number of all faculty in the top 20 economics departments (Chari, 2023). The System and other policy institutions are also ranked among top research departments. According to the January 2024 rankings by RePEc, 4 of the top 20 economic institutions are policy institutions, with the Federal Reserve Board, for example, ranked 15th.² Consequently, policy institutions employ a large share of research economists and produce a large share of economics research.

Second, the policy institution setting allows us to investigate how women economists may advance in their careers when there exist success measures, such as those related to policy contributions or management, that are unrelated to the peer-review and tenure review processes,

¹We abbreviate these institutions as “the System,” “the Banks,” and “the Board,” respectively.

²More information can be found at RePEc. (n.d.). “Top 10% Economic Institutions, as of July 2024.” IDEAS database, webpage, <https://ideas.repec.org/top/top.inst.all.html>.

which have been shown to exhibit some gender bias. Third, separate from being informative about the state of the economics profession, studying women’s representation and output in the Federal Reserve System is important because it is a public institution. It is essential to have diversity among the System’s researchers so that the institution may benefit from a diversity of perspectives, backgrounds, and experiences that might affect overall economic performance.³

In this paper, we study how women’s representation has evolved in the Federal Reserve System and investigate whether there are gender gaps in research and policy output within the System. We first document a slight increase in the fraction of women economists in the System over the past 20 years, in line with trends in the economics profession. Second, we document a significant gender gap in research output but find no such gap in policy output among System economists. Our evidence on the complementarities and substitution between research and policy output supplements existing literature from the academic setting investigating gender differences in time allocation between research and activities such as teaching, mentoring, and service.

Our results are based on our expansive data set on Federal Reserve System economists, which we have newly constructed from a large number of public sources. We collect names and dates of service of System economists using the current and historical public websites of the 12 Banks and then use existing name dictionaries to gender tag these individuals. We supplement these data with the data constructed by [Datta and Vigfusson \(2024\)](#) on Board economists, also from public sources.⁴ We use these data to study female representation over time, across institutions, and across cohorts and compare results with analogous measures from academia. To measure research and policy output of System economists, we collect data from RePEc on the titles, authors, and publication years of all System working papers, research publications,

³Other papers that explore gender gaps in central banks also find underrepresentation of women ([Azzimonti-Renzo, Jarque and Wyckoff, 2023](#)). For instance, there is not a single woman on the 30-member General Council of the European Central Bank ([Hospido, Laeven and Lamo, 2022](#)).

⁴Although this paper and [Datta and Vigfusson \(2024\)](#) overlap in their data used, the papers are addressing different topics, with this paper looking at System level paper output and career progression and [Datta and Vigfusson \(2024\)](#) studying coauthor relationships at the Federal Reserve Board as a measure of inclusion.

and publicly-available policy reports. We use these data to study gender gaps in research and policy output both on a year-by-year basis and accumulated over each individual's full tenure in the System. Using regression analysis, we also study the potential complementarities and substitution among various types of policy and research output.

Using these data, we document that the female share of economists in the System increased only slightly between 2004 and 2021, from 20 to 22 percent. Overall, female representation in the System has trended in line with that in academia, showing some increase in representation in the early 2000s and more stagnation of late ([Chari, 2023](#); [Sherman and Tookes, 2022](#)). That said, when comparing across the 12 individual Banks and the Board, we find substantial variation in both the levels and trends in representation. Lastly, although we do find fewer women at more senior levels in the System, the decline is not as stark as in academia.⁵

The relative success of women's advancement within the Federal Reserve System may be related to the success we observe in women's relative policy output. We find a large, significant, and persistent gender gap in research output and a nearly absent gap in policy output. In our sample of System economists over 2004 to 2021, women produce, on average, 4.4 fewer working papers, 2.1 fewer peer-reviewed publications, and 1.9 fewer System research publications than men. Notably, though women also produce 1.0 fewer policy reports than men, this gender gap is not statistically significant. Though these gender gaps are estimated over the full sample, similar average gaps are observable when output is measured on a year-by-year basis.

We also investigate potential spillovers among various types of output, as well as patterns of specialization into research or policy. We find that individuals with greater research output also tend to have greater policy output. We also see positive spillovers from policy to research, though they seem a bit weaker on average. Overall, the results suggest complementarities between research and policy are strong, and we do not find much evidence for specialization.

⁵Our findings are generally in line with [Auriol et al. \(2022\)](#) and [Azzimonti-Renzo, Jarque and Wyckoff \(2023\)](#). Our finding of a more gradual decline in female representation at higher levels of seniority than [Azzimonti-Renzo, Jarque and Wyckoff \(2023\)](#) can be attributed to our more expansive sample, which includes not just the Federal Reserve Banks, but also the Federal Reserve Board.

Among individuals who have the same level of policy report output, we find a large gender gap of 3.1 working papers and a small but statistically significant gap of 0.4 peer-reviewed publications. By contrast, among individuals who are equally productive in working paper output, we do not find a significant gender gap in System research or policy output.

Lastly, we explore patterns in production of research and policy reports over time, and, specifically, during the COVID-19 pandemic. Previous research has shown that pandemic disruptions disproportionately affected female academics (Myers et al., 2020; Kruger, Maturana and Nickerson, 2022). We find that policy and research production increased sharply for both men and women in 2020 and, perhaps surprisingly, that female economists were more productive during the pandemic than their male colleagues, especially in terms of working paper output.

Compared with the existing literature, we find similar gender gaps in research output among System economists as have been found in academia (Lundberg and Stearns, 2019; Ceci et al., 2014; Ginther and Kahn, 2004; Ductor, Goyal and Prummer, 2023; Sherman and Tookes, 2022). Many of the previous findings in the literature that might explain this gap in research output also apply to both System and academic economists. For example, Lundberg and Stearns (2019) and Ceci et al. (2014) show that women in STEM (science, technology, engineering, and mathematics) fields, including economics, have fewer publications than men at equivalent stages of their career, though there appears to be no difference in hours worked. In economics, researchers have found that female-authored papers are evaluated more critically and may be held to tougher writing or other standards for publication (Krawczyk and Smyk, 2016; Card et al., 2020; Hengel, 2022). Another obstacle to research output for women may be their smaller research networks (Ductor, Goyal and Prummer, 2023; Ductor and Prummer, 2024), which could be a consequence of rampant discrimination against women that has been documented to be prevalent in the profession (Wu, 2018).

Additional findings in the literature may also help explain why we find a gap in research but not policy output. First, we note that though we expect that all the economists in our sample are salaried employees who are expected to work 40 hours per week, it is likely that many economists

work more than 40 hours in total. If economists prioritize meeting institutional requirements for policy output, and spend the remainder of their time on research, then individuals who work longer hours may spend more time on research. Previous literature has found that women may have greater domestic responsibilities and therefore spend less time working (Lundberg and Stearns, 2019). Consequently, it is possible that women may be working fewer hours overall, and therefore also spending fewer hours on research than men. We explore output per year across different age ranges and show that most of the gender output gap materializes within the 31-to-49 age group, which corresponds to the years with peak probability of having a young child for both genders. We do not find any significant gender gap in research output per year for researchers age 30 or below or above age 50.

Relatedly, studies of faculty in science have also found a gender discrepancy in time use within working hours, with women spending more time on teaching, service, and other non-research academic activities such as mentoring students (Xie and Shauman, 2003; Misra et al., 2011). Similarly, Babcock et al. (2017) show that female faculty are more likely to volunteer for tasks that are unlikely to contribute to chances for promotion. These patterns may be explained by differences in aspirations or expectations about research success or the returns to investment in research (Azmat, Cuñat and Henry, 2024; Shastri and Shurchkov, 2024; McFall, Parolin and Zafar, 2024). Women System economists may similarly be devoting more time to mentoring, service, and policy work than their male colleagues and relatively less time to research. Though women seem to face fewer obstacles to advancement in the System than in academia, these dynamics in time allocation may contribute to the gender gap we observe in research output.

The remainder of the paper is organized as follows: Section 2 describes the data and sample construction. Section 3 discusses the framework and empirical methodology used in the paper, and Section 4 presents the empirical results. Section 5 concludes.

2 Data

2.1 Data collection and construction

Our data set focuses on the 12 regional Federal Reserve Banks and the Federal Reserve Board. These 13 institutions are affiliated through common purpose and participation in the mission of the Federal Reserve System, and collaboration on both policy and research projects is common across the System. Focusing on these institutions allows us to have unique and diverse data on 1,291 economists between 2004 and 2021, which is a large number relative to even a collection of the top economic departments (Chari, 2023). Although these institutions operate independently with respect to hiring, it is common to observe economists who move across institutions within the System, given that experience at either the Board or one of the Banks would be relevant to hiring interests at another.⁶

We hand collected data on the set of System Ph.D. economists, based on the individual public websites of the 12 Banks and the Board.⁷ For historical data on System economists, we use the Wayback Machine, which archives webpages, often multiple times a month.⁸ Using Python, we scrape the names of all System economists listed each year from 2004 to 2021. We use string-matching techniques to aggregate records for individuals who may have changed their names or moved across System institutions over time. Given the appearance and disappearance of individuals from the websites over time, the scraping also allows us to track economists' starting years and departure years, giving us individuals' length and timing of service. We supplement these data with the data collected by Datta and Vigfusson (2024) on Board economists, which is also sourced from Wayback Machine archives of the Board website from 2004 to 2021. For most

⁶We find that around 10 percent of research economists in our sample worked at more than one Federal Reserve institution over the course of their career.

⁷For example, the Board website listing research economists is <https://www.federalreserve.gov/econres/researchers.htm>, and the Federal Reserve Bank of Dallas website listing economists is <https://www.dallasfed.org/Home/research/economists.aspx>.

⁸We collect data from Internet Archive. (n.d.). Wayback Machine, <https://web.archive.org/>, though the archive is missing some Banks in some years: Federal Reserve Banks of Richmond (2004), Cleveland (2004), Chicago (2004-06), and Kansas City (2009).

of our empirical work, we focus on economists who are in the System for at least three years. This filtering helps us exclude visiting scholars, who are sometimes listed on these websites but tend to have shorter periods of affiliation and a different set of professional responsibilities from permanent staff. Overall, we are left with 1,291 economists in the System, including 1,002 men and 289 women economists, or about a 22 percent female share.⁹

The gender tags we use for this study are also the result of our data construction effort. We take as given the gender tags of Board economists from [Datta and Vigfusson \(2024\)](#) and then generate the gender tags for Bank economists following a similar procedure. We first use data sets with names of economists and gender tags generated by [Chari and Goldsmith-Pinkham \(2017\)](#) and [Hengel \(2022\)](#). Next, as in [Chari and Goldsmith-Pinkham \(2017\)](#), we gender tag individuals using the [Tang et al. \(2011\)](#) gender dictionary. If a name is associated with one gender at least 95 percent of the time in this dictionary, we apply that gender tag to all individuals in our data set with that name. Finally, we do web searches to identify individuals whose genders remain unidentified by these sources. Of the 1,291 individuals in our data set, 456 are identified by the [Chari and Goldsmith-Pinkham \(2017\)](#) data, 274 are identified by the [Hengel \(2022\)](#) data, 473 are manually identified, and 88 are identified by the supplementary data sets.¹⁰

To construct our data set on research and policy output from the Federal Reserve System, we use the website Fed in Print, which catalogs all series published by the Federal Reserve Banks and the Board.¹¹ The Fed in Print website catalogs publications from the System research departments, including research-related technical publications such as Staff Studies and major articles and testimony as listed in the *Federal Reserve Bulletin*. Using this catalog, we construct a list of all series that have at least 70 individual publication entries since the year 2000. Taking some signal from Fed in Print descriptors for each series' publication type, we then classify each series as either a policy report series (such as regional economic reports or economic

⁹Appendix Table A.1 presents additional detail, including counts of economists by institution.

¹⁰We also verified the gender tagging with Namsor gender tagging; see Namsor. (n.d.). "Recognize the type of a proper noun," <https://namsor.app/features/name-type-recognition/>.

¹¹Fed in Print is available at <https://fedinprint.org/>.

commentary) or a research publication series. Notably, we classify as “policy” reports even articles which are not official policy documents within the Federal Reserve System. Rather, we see these articles as reflecting analysis that is likely relevant to or inspired by policy discussions, even when they represent individual staff views. Additionally, we note that these policy reports capture only a small fraction of the policy work conducted within the Federal Reserve System, as a majority of policy documents and discussions remain internal. After using Fed in Print to identify these series, we collect from RePEc the individual publication titles, authors, and publication years.¹² For the series published by the Board, we use data on working papers collected by [Datta and Vigfusson \(2024\)](#) and supplement with the additional series listed by Fed in Print.

Notably, the list of research publication series available from Fed in Print and RePEc includes both working paper series and journals published by the Banks. To determine which series are “final” System research publications and which are working papers, we use data provided to us by RePEc that links individual working papers to their appearance in peer-reviewed publications.¹³ We take the “republication rate” for each full series as a signal of whether that series is intended as a working paper series or a final publication series. In particular, we consider a series to be a working paper series if, according to RePEc data, more than 10 percent of the series is published again in another periodical series. Conversely, we consider a series to be a System research publication if less than 10 percent of the series is republished. Using all these data, we construct for each economist in our data set the career total as well as annual count of each of our four types of publications: working papers, peer-reviewed publications, System research publications, and policy reports. Appendix Table [A.2](#) presents additional detail.

Overall, we include 17 working paper series, covering about 10,000 working papers from across the System, around 3,000 of which were also published in a peer-reviewed journal.

¹²LogEc. (2024). “Access Statistics for Participating RePEc Services,” <https://logec.RePEc.org/>.

¹³We thank Christian Zimmermann and his team for giving us access to these data. Note also that our measure of peer-reviewed publications by System economists is limited to those publications that first appeared as a System working paper.

Appendix Table A.3 presents all the working paper series and associated publication counts from the Banks and the Board. Appendix Table A.4 lists by institution the policy reports and System research series we include in our data. Among the working paper series, about one-third of papers are from the Board’s two working paper series, the Finance and Economics Discussion Series and the International Finance Discussion Papers series. We also have 12 System research series, including nearly 3,500 observations, and 34 policy reports series, including about 6,000 observations.

2.2 Representation of women in the Federal Reserve System

Using the data we constructed, we document that the female share of economists in the Federal Reserve System increased only slightly in recent decades, from around 20 percent early in the sample to around 22 percent most recently. That said, as shown in panel A of Figure 1, System institutions have roughly doubled in size over our sample period. Consequently, even a stagnant female *share* still has resulted in greater *numbers* of women in each department, which may be helpful for mentorship and collaboration. Trends in female representation across the System are in line with trends in academia. Although the female share of economics faculty in higher education increased in earlier decades, it has been nearly stagnant over the past two decades, and women remain underrepresented, especially in higher faculty ranks.¹⁴

Also as in academia, progress in female representation is uneven across institutions and over time. Panel B of Figure 1 shows substantial variation among the Federal Reserve Banks and the Board. For example, the share of female economists in Boston declined sharply from 45 to 27 percent between 2004 and 2021, and we observe a sharp increase in the share of female economists in Kansas City from 9 to 30 percent over the same period. Some variation across institutions is to be expected given their smaller sizes. Individual Banks have around 20 to 30 economists each in 2004, rising to around 30 to 70 economists in 2021. When we include

¹⁴Chari (2023) shows, using CSWEP Annual Surveys, that during this 2004-21 period, the female share of tenure-track faculty members increased from 15 to 23 percent. For the top 20 schools, the female share of tenure-track faculty members increased only slightly, from 13 to 17 percent.

economists from the entire sample period, the female share of economists by institution varies from 8.3 percent in Philadelphia to 34 percent in Boston.

We next document that, as in academia, we observe generally greater female representation at junior levels of seniority and a decline in female representation at more senior levels. However, this pattern is not as strong in the System as in academia. Additionally, though we see some improvement over time in female representation at each seniority level, progress is uneven. In our data, we have two measures of seniority: years since Ph.D. and tenure in the System. Notably, these two measures may differ more than in academia, as the System frequently hires researchers after they spend some time in academia. Consequently, the distribution of Ph.D. experience and System experience may differ somewhat, including by gender.

Focusing first on measuring seniority by years since Ph.D. attainment, panel A of Figure 2 shows how female representation has changed over time for each level of seniority. We find that female representation is generally increasing only at the midcareer level (shown in yellow). We see only the slightest of indications of increasing female representation for senior women over time (in red) and a decline in the share of female representation for more recent Ph.D. graduates in the last decade (in green). By contrast, notwithstanding the most recent stagnation of earlier upward trends, female shares for assistant, associate, and full professors do seem to have increased about 5 to 10 percentage points from 2004 to 2021 (Chari, 2023). It may be that as efforts to increase women's representation in academia have intensified in recent decades, the System faces increased competition for women job candidates, who tend to be more recent Ph.D. graduates. That said, we do not see a complementary increase in the share of women assistant professors over the same period, calling into question this potential explanation for the declining female share among the most junior System economists in recent years.

For our second measure of seniority, Panel B of Figure 2 shows the number of economists grouped by tenure in the System in 2020. The female share of economists declines from 24 percent for those with up to 8 years of experience to around 21 percent for those with either 9 to 15 years of tenure or with 16 years or more of tenure. Though we see some evidence of

declining representation among more senior cohorts, the decline is not as strong as we observe in academia. For comparison, the shares of female assistant professors, associate professors, and full professors among the top 20 schools were 22.7 percent, 21.2 percent, and 13.4 percent, respectively (Chari, 2023).¹⁵

3 Empirical framework

We examine the relationship between gender and publications using the following regression:

$$Y_i = \alpha + \beta_1 Female_i + \beta_2 X_i + \zeta_i + \varepsilon_i, \quad (1)$$

where Y_i is one of five measures for economist i : working papers, peer-reviewed publications, System research publications, policy reports, or “total publications.”¹⁶ Each measure represents the total count of that publication type each economist generates during our sample period of 2004 to 2021.¹⁷ $Female_i$ is an indicator for a female economist, and ζ_i is an institution fixed effect. X_i represents a vector of control variables, including tenure in the System and, depending on the outcome variable of interest, some of the alternative publication measures. For example, when the outcome variable of interest is the count of working papers, we include System research and policy reports as controls.

Using this regression, the coefficient on the indicator for a female economist provides an estimate of the gender gap in paper production. A positive coefficient would indicate that women produce more publications, on average, than men, while a negative coefficient would indicate the reverse. The tenure variable helps control for the fact that we may have different seniority distributions between men and women in our data and allows us to compare individuals with

¹⁵Among all departments with doctoral students, these shares are 32.8 percent, 28.0 percent, and 15.5 percent, respectively.

¹⁶Our measure of peer-reviewed publications captures only published versions of working papers already included in our data set, not peer-reviewed publications that were not released as System working papers. Consequently, we exclude peer-reviewed publications from this total to avoid double counting.

¹⁷For economists who move across System institutions, we aggregate all their publications and associate their record with their last observed institution.

the same level of System tenure.¹⁸ The additional controls for alternative publications help us investigate the interaction among the various types of output.

Before turning to the regression results, we examine the distributions of each type of publication count by gender. Economists in the System produce, on average, 10 working papers, 4 peer-reviewed publications, 4 System research publications, and 5 policy reports.¹⁹ Figure 3 splits individuals into five bins for each type of output, ranging from economists with zero publications to those with at least 20 publications. We find that the distributions for each type of output are positively skewed, such that the reported means are strongly affected by the most productive economists, and the median economist produces somewhat lower output.

Regarding the gender differences in distributions, we see in the left-most two bins of each panel that the share of female economists tends to be larger than the share of male economists. The large share of women with zero peer-reviewed or System research publications is particularly notable. By contrast, we see larger shares of male economists in the bins with higher paper counts, and we find a strikingly large share of men with more than 20 working papers. Using the gender-specific mean of each distribution to measure the gender gap, we find that women in our sample produce 4.4 fewer working papers, 2.1 fewer peer-reviewed publications, 1.9 fewer System research publications, and 1 less policy report than men. Notably, when we use the median measure, however, the gaps in working papers and peer-reviewed publications are roughly cut in half, the gap in System research disappears, and the gap in policy reports reverses such that the median woman has one *more* policy report than the median man in our sample.

In the regression setting, we can go beyond these simple differences in means and medians and also investigate the interaction among types of outputs. Consider first the regression with working papers as the outcome variable and with policy reports and System research as controls. A variety of effects may influence the estimates of the coefficients on policy reports

¹⁸Men and women both have about 10 years of tenure in the System on average. Note that our tenure variable is biased downward: Because our data set begins in 2004, our tenure variable is censored to only count years of tenure since 2004.

¹⁹Additional detail is reported in Tables A.1 and A.2.

and System research. First, it may be that individual characteristics, such as hours worked or individual productivity will be most important. In this case, individuals who are more productive or who work more hours may produce more of all types of publications, and then we may see positive coefficients on the alternative publication count variables. It is also the case that potential complementarities between working papers and policy reports could result in a positive coefficient on policy reports, and analogously for System research. For example, a single research project may result in multiple types of outputs. However, there is necessarily some substitution of hours worked on different types of output, and we would expect this effect to contribute negatively to the coefficients on policy reports and System research in this regression. That is, more time spent on a policy report may result in less time available for research. This type of specialization, time allocation, or substitution effect could result in negative coefficients on the alternative output measures used as controls. To the extent that such specialization is correlated with gender, inclusion of controls would diminish our estimate of the gender gap in working paper production as represented by the estimated coefficient on gender. Importantly, in this setting, the coefficient on gender represents the gender gap among individuals when holding other types of output constant.

Our second set of analyses focuses on output per year using the following regression:

$$Y_{it} = \alpha + \beta_1 \text{Female}_i + \beta_2 X_{it} + \zeta_{it} + \tau_t + \varepsilon_{it}, \quad (2)$$

where Y_{it} measures paper production for economist i in year t . We include institution (ζ_{it}) and year (τ_t) fixed effects.²⁰ X_{it} represents controls for tenure in the System and, again, depending on the outcome variable of interest, some of the alternative publication measures. In this specification, the tenure variable measures tenure in the System as of year t . Standard errors are clustered by year.

²⁰For economists who move across System institutions over their career, the institutional affiliation will change over time.

The interpretation of this regression is similar to the previous model but with a few key differences. First, whereas the previous regression measures the average gap between men and women over their entire careers in the System, this regression measures the average gender gap for a single year. As we consider the competing effects of policy and research complementarity and substitution of hours worked, we might hypothesize that hours worked are necessarily more constrained within a single year and so the substitution effect may dominate, leading to negative coefficient estimates on the alternative output measures. On the other hand, it may be that there are some years in which individuals have bursts of individual productivity, higher hours worked, or multiple related policy and research outputs, leading to higher output within a given year and resulting in positive coefficient estimates on these alternative output measures.

Figure 4 shows the raw data on publication output over time, as measured by the average number of each type of publication per year between 2004 and 2021 for men and women. These unconditional means illustrate the gender gap in output, whereby women produce fewer working papers and peer-reviewed publications on average. These gaps seem to diminish over time and eventually reverse for working papers in the final year of the sample. We see a similar gap in System research in the early period, which is greatly reduced in the latter half of the sample period. Lastly, we see a small gap in policy output that opens and closes repeatedly over the sample period.

Notably, coinciding with the start of the pandemic, a significant jump in the count of working papers and policy reports is evident for both men and women in 2020. Perhaps surprisingly, the spike for women is steeper than that for men. We do not see a step-up in peer-reviewed publications at the same time, likely due to the lag in publication timing, though we may expect to see one as more data become available. We also observe a more modest uptick for System research in 2021, which may be consistent with System research taking more time to publish than working papers, but less time than peer-reviewed publications.

Motivated by these observations, we include a related set of analyses using the following regression:

$$Y_{it} = \alpha + \beta_1 Female_i + \zeta_{it} + \tau_t + Female_i * \tau_t + \varepsilon_{it}. \quad (3)$$

Relative to equation 2, this model omits the controls for the alternative publication measures and adds interaction terms between the year fixed effects and the female indicator to measure the gender-specific patterns in paper production during the pandemic. We discuss the pandemic-era findings further in the next section.

4 Results

Panel A of Table 1 shows the coefficient estimates for equation 1, which we use to investigate the relationship between gender and the count of publications each System economist generates over the full sample period. Column 1 shows that female economists produce, on average, five fewer total publications than their male colleagues, even when controlling for tenure in the System. The following columns in panel A of Table 1 report coefficient estimates for the same regression, when using each measure of output in turn, and while controlling for the alternative output measures. In column 2, we estimate that female economists produce 3.1 fewer working papers than men on average. These results suggest that the gap in working paper production accounts for most of the gender gap estimated in column 1. Additionally, this estimate is only slightly smaller than the raw difference between men and women of 4.4 working papers, as implied by Figure 3.²¹

Turning to the other publication measures, in column 3, we also find a statistically significant gender gap. That is, even when we control for the number of working papers (as well as System research papers and policy reports), female economists produce, on average, 0.36 fewer peer-reviewed publications. By contrast, columns 4 and 5 show that there are no gender gaps in System research and policy reports. Notably, though we see a gender gap of 1.9 in the raw

²¹The results are robust to dropping the different alternative measures of output, as shown in Appendix Table A.5.

data for System research as reported in Figure 3, this gap largely disappears once we control for System tenure and alternative measures of output. By contrast, our finding of no statistically significant gender gap for policy reports is consistent with the raw data as well.²²

Given our finding in Figure 3 that the distribution of output is highly right skewed, we next investigate measures of the gender gap in paper production when focused on highly productive economists, defined here as individuals in the 60th to 90th percentiles of working paper production (in panel B of Table 1) or policy reports (in panel C).²³ Panel B shows that among the economists who produce the most working papers, we find no gender gap in policy reports (column 5) and a System research gender gap that is appreciably large but not statistically significant (column 4). However, we do still find a gap in peer-reviewed publications that is significant at the 10 percent level, again underscoring the gender differential in the likelihood of converting working papers to publications (column 3).

Whereas we find no policy output gender gap among research-productive economists, we do find a research output gender gap among economists who are most policy-productive. That is, it seems that when averaging across the men and women who produce the most policy reports, we find that the women tend to produce about 4 fewer working papers, on average, and 2.5 fewer peer-reviewed publications (columns 2 and 3 of panel C). The gender gap for System research among this group (column 4) is small and not statistically significant, however. Overall, these results indicate that research-productive men and women have similar policy output but that women produce fewer peer-reviewed publications. Meanwhile, among policy-productive men and women, we see a large gender gap in research output.

We next turn to investigating the relationship between gender and paper production per year. On average, System economists produce one publication of some variety per year. That said, given the various types of output, an individual who produces just one of any type of output in a given year is in the top quartile of the distribution for that type of output. We estimate average

²²In Appendix Tables A.6 through A.9, we show that the results in Table 1 are robust to dropping the most and least productive individuals.

²³Appendix Table A.10 presents summary statistics for the most productive economists in the System.

annual output for System economists of 0.6 working papers, 0.2 peer-reviewed publications, 0.2 System research publications, and 0.3 policy reports.²⁴

Panel A of Table 2 reports estimation results for equation 2. Paper production is measured at the economist-year level, and our primary variable of interest is the indicator for a female economist. Column 1 in Table 2 shows that, on average, each year, female economists produce 0.11 fewer total publications. Columns 2 and 3 show that, on average, each year, and after we control for other types of output, female economists produce 0.10 fewer working papers and 0.06 fewer peer-reviewed publications, respectively. For context, we find that male economists produce 0.64 working papers per year on average, and female economists produce 0.50 per year. Notably, the unconditional difference in these rates of working paper production is 0.14, whereas our regression estimates imply that the magnitude of the gap is a modestly smaller 0.10 once we control for tenure in the System as well as alternative measures of output. In columns 4 and 5, the estimated coefficient on the female indicator is near zero and not significant. We conclude that after controlling for other types of output, women produce a similar number of System research publications and policy reports per year as men. These results are generally consistent with the results from Table 1.²⁵

A leading hypothesis for why female academics are less productive in research is that women tend to have more domestic responsibilities and therefore may work fewer hours (Kim and Moser, 2021). This explanation seems to be most applicable for women with young children. Consequently, we next investigate output per year for various age groups. Given the limitations of our data, we follow Kruger, Maturana and Nickerson (2022) and estimate age by assuming Ph.D. completion at age 27. Next, we estimate the regression in equation 2 separately for each age group. Figure 5 plots the coefficient on the gender variable for these regressions and shows that the gaps for working papers and peer-reviewed publications (in panels A and C) are largest for the 31-to-49 age group, which corresponds to the peak probability of having a young child

²⁴Appendix Table A.2 reports summary statistics for papers per year.

²⁵In Appendix Tables A.11 through A.13, we show that the results in Table 2 are also robust to dropping the most and least productive individuals.

for both genders (Kruger, Maturana and Nickerson, 2022).²⁶ We conclude that the gender gap in the number of working papers and publications is largely materializing during this age range. We do not find any significant gender differential in output per year for researchers up to age 30 or above age 50.

Another potential explanation for why female economists at the System produce less research output but not less policy output compared with their male colleagues is that female economists may be choosing to specialize in policy or management instead of research. To investigate this possibility, we examine gender gaps in research and policy output across different levels of System tenure, that is, the number of years that each economist has been employed as a researcher in the System. We hypothesize that economists with greater tenure will have more managerial responsibilities or will spend more time on policy work. Figure 6 illustrates the gender gap coefficient when studying subsamples of economists divided by tenure in the System. We find that the gender gap in research output as measured by working papers and peer-reviewed publications is fairly stable at first and then widens sharply among the most senior economists, who have more than 15 years of tenure in the system. By contrast, we find scant evidence of a gender gap in policy or System research output, at any level of tenure.²⁷

In sum, our investigation of gender gaps by age and tenure suggests that women may be falling behind men in research output, particularly during the period when they are most likely to have greater family responsibilities. Gender bias in publication processes may also be a contributing factor. Further, senior women may be specializing in managerial or policy work more frequently than their male colleagues. Though the gender gap in research output per year

²⁶Figure A.1 shows similar results when we explore the difference in paper production per year, by tenure groups. Notably, when measuring seniority by tenure, we do see a gender gap in research production among the most junior economists, which is absent when measuring seniority by Ph.D. year. The difference in results may be attributable to the difference in hiring patterns between men and women: At the time of hiring into the System, we find that the number of years since Ph.D. is often a bit higher for women than men.

²⁷Figure A.2 illustrates the gender gap coefficient when studying subsamples of economists divided by years since Ph.D. We find similar results to those presented in Figure 6. Of course, these results may be related to the previous results on paper production by year. Though the gender gap in research output per year narrows for economists above age 50, the gender gap in total number of papers could remain larger for these individuals due to the cumulative effect from previous years.

narrows for more senior women, the cumulative gap remains wider for more senior than more junior women. Relative to their male colleagues, then, it may be the case that women find it easier to succeed in policy or management roles after having a period of lower research output. Though such a pattern would be particularly harmful to career progression in academia, in the System, women may have a wider set of potential paths to career success. The availability of these alternative paths—for example, in management or policy—may be mitigating the “leaky pipeline” effect in the System relative to academia.

4.1 COVID-19 pandemic disruptions

Previous research has shown that COVID-19 pandemic disruptions disproportionately affected female academics. For example, [Myers et al. \(2020\)](#), [Barber et al. \(2021\)](#), and [Kruger, Maturana and Nickerson \(2022\)](#) show that during the pandemic, the gender gap in paper production widened, even as the overall rate of working paper production increased. To explore whether these patterns are observable in the research and policy output of System economists, we use our yearly output data and estimate equation 3. Relative to the regression specification in equation 2, we drop the controls for alternative outputs, so that we may focus on each output individually, and we add interaction terms between the year fixed effects and the female indicator. Though we include interaction terms for each year of the sample in our estimation, we report the coefficients here only for 2020 and 2021.

In panel B of Table 2, the large positive coefficients on the year dummy for 2020 in columns 2 and 5 provide evidence of a strong uptick in working paper and policy report production in 2020. We then see full retracement for working papers in 2021 (given the negative coefficient in column 2), and partial retracement for policy reports. Surprisingly, we find that female economists in the System increased their production even more than their male colleagues did during the pandemic, as evidenced by the large positive coefficients on the interaction between the female indicator and the fixed effects for 2020 and especially for 2021 for both working

papers and policy reports. These results are consistent with the raw data on paper production over time in Figure 4.

Our results are at odds with existing results noting a more negative effect of the pandemic on women. Pandemic-period findings using survey data, including Myers et al. (2020), Barber et al. (2021), and Deryugina, Shurchkov and Stearns (2021), suggest that financial economists and academics more generally suffered a reduction in research production, with a larger effect among women. Similarly, Cui, Ding and Zhu (2022) find a decline in journal submissions by women during the pandemic years.

That said, our results are consistent with the more nuanced finding by Kruger, Maturana and Nickerson (2022) that both men and women increased their research output during the pandemic and that the most harmful effects of the pandemic can be observed for women in the 35-to-49 age group, who registered the smallest increase in paper production during this period and who are the most likely to have young children. Men in this age range experienced large gains in paper production, and younger and older women fared similarly to their male counterparts. Consequently, Kruger, Maturana and Nickerson (2022) find that the gender gap widens most sharply for the 35- to 49-year-old group. We do not find similar effects, as our data instead show gains for women in all cohorts during the pandemic.²⁸

How can we reconcile our results with these existing studies? One potential explanation is related to the observation in Barber et al. (2021) that relative to men, women allocated significantly less time to research and significantly more time to teaching following the onset of the pandemic. It may be that, in addition to family dynamics, differential expectations or investment in teaching was a key driver of the pandemic effects on the gender gap in research production, and the absence of teaching demands in the Federal Reserve System contributed to the relatively better outcomes for women researchers. Kruger, Maturana and Nickerson (2022) also find negative effects for individuals with more coauthors whose productivity was most affected by the pandemic disruptions. Similarly, we know from Ductor (2015) that coauthoring

²⁸Results are available from the authors upon request.

networks have large spillovers to researcher productivity. That said, we know from [Datta and Vigfusson \(2024\)](#) that at least at the Federal Reserve Board, coauthoring networks are heavily concentrated within the Federal Reserve System. Consequently, it may be that the thick coauthoring networks, along with the observed increase in System research output, were strong enough to offset potentially negative effects on women during this period. That is, to the extent that women researchers in the System experienced fewer disruptions, there was also less amplification of these negative effects across research networks and indeed more positive amplification, leading to better outcomes for women in the System overall.

4.2 Complementarity among outputs

Having investigated the gender gaps in production, we now turn to examining how the inclusion of the alternative output control variables in Tables 1 and 2 can shed light on the complementarities and substitution that may be present among outputs and their interaction with gender differences in paper production. First, if the gender gap in research is driven by a pattern in which women devote more time to policy reports and men devote more time to working papers, then we might expect the estimated gender gap for working papers to be smaller when we add the control for the number of policy reports. That is, we may observe a larger gender gap in working papers on average, but a smaller one when comparing men and women who have the same number of policy reports. The results support this hypothesis to only a modest degree, as we generally observe a gender gap in working paper production even among individuals with the same level of policy report production. Even if to some degree, women specialize in policy output and men specialize in research output, it cannot fully explain the gap in working paper production.

Second, we can examine the coefficient estimates on the controls themselves. There are necessarily some tradeoffs in the allocation of hours worked on different types of output. Consequently, we might expect to see a negative coefficient on the working papers control variable when policy reports are the outcome variable, indicating that, on average, individuals with higher research output have lower policy output. Instead, we generally see positive significant

coefficients on the controls across the various regression estimations, indicating that the effect of time allocation across various outputs may not be that strong. Rather, the complementarities among outputs and effects of higher individual productivity or greater hours worked are likely stronger than the effect of tradeoffs in time allocation.

Third, we note that these complementarities are particularly strong for System research. For System research, we see a gender gap in the raw data, as indicated by the difference in the means of the distributions in Figure 3. In our regression setting, once we control for working papers, this gap in System research paper production largely disappears. This result suggests that closing the gender gap in working paper production could also be beneficial in closing the gender gap in System research production.

Fourth, it is particularly salient that the gender gap exists for peer-reviewed publications. Peer-reviewed publications are a key signal of research success and lead to potential outside options for System economists. We find in Figure 3 that female economists produce about two fewer peer-reviewed publications over the course of their careers. Furthermore, in panel A of Table 1, we find that this gender gap remains even when controlling for the number of working papers (see column 3), indicating that women are also less likely than men to convert working papers into publications. In panel B of Table 1, we also show this gender gap exists even among the most productive researchers. Previous research has found empirical evidence of various obstacles to women's success in research, including higher standards for publications, longer time spent in peer review, and more rounds of revisions required for paper acceptance (Hengel, 2022; Alexander et al., 2023; Hengel and Moon, 2023; Krawczyk and Smyk, 2016; Card et al., 2020).²⁹ The statistically significant gender gap for peer-reviewed publications, even after controlling for the count of working papers, represents a potentially concerning feature of the data that warrants further understanding.

²⁹Another strand of research finds that women tend to have less well-developed coauthorship networks, leading to reduced spillovers to research (Ductor, Goyal and Prummer, 2023).

By contrast, we see little evidence of a gender gap for policy reports in both the raw distributions and the regression setting. One potential explanation for this finding is that these obstacles to publishing and research output are less relevant for policy output (and System research as well), or further, that such obstacles do not exist for policy output. For example, policy reports may not apply higher standards for women or may not take longer for peer review. Coauthorship networks also may play a lesser role for policy reports, which are more likely to result from policy work that is more centrally assigned. Another hypothesis is that System employees are required to have a minimum level of policy output and then may use their remaining working hours to produce research output. Under this model, it may be that men have more time for research, for instance, if (1) men take fewer hours than women to produce the required policy output, (2) men spend less time on service tasks, or (3) men work longer hours on average. Under this hypothesis, the lack of a gender gap for policy output is in some sense an institutional requirement, and the gap in research output remains a potentially concerning feature of the data.

5 Conclusion

This paper measures gender gaps in representation and research and policy output among Federal Reserve System economists. We document only a slight uptick in the female share of System economists over the past 20 years, from 20 to 22 percent, which is roughly in line with trends in the economics profession. We also find that women produce fewer total publications over their career and on a per-year basis. The majority of this gender gap is accounted for by working papers, as the gender gap in System research papers is much smaller and the gap in policy reports is nearly absent. These results suggest that different time allocations between policy and research may drive differences in research output. A successful career as an economist in the Federal Reserve System typically requires contributions to both research and policy analysis, and so gender gaps in research output are important to understand.

Though there are necessarily some tradeoffs in time allocation across outputs, our results suggest that there are strong complementarities across all types of paper production. Even on a year-to-year basis for a given individual, higher output of one type is correlated with higher output of other types in the same year. These results suggest potentially strong spillovers between contemporaneous policy and research output, or life-cycle effects whereby hours worked or individual productivity is particularly high in some years. More generally, we find that the effects of individual output, higher working hours, or spillovers among various measures of output must be stronger than the negative spillovers across output types that must result from the limited time that individuals have to allocate across various types of output.

What can we learn from these results? A leading hypothesis for why female academics are less productive is due to the gender discrepancy in time use even within working hours, with women spending more time on teaching, service, and other non-research academic activities. This result may also apply to Federal Reserve System researchers. Additionally, in the System setting, investment in research production could also be seen as a risky strategy for investing in outside employment options and could be less preferred by women relative to the safer strategy of investment in policy output that may have more certain payoffs in the System setting. Consistent with complementary findings in the literature suggesting that women face greater obstacles in the peer-review and publication process, we find that even after controlling for the number of working papers, there remains a gender gap in the count of peer-reviewed publications. Consequently, it may also be that women's investment in research is riskier than men's investment in research.

Another potential explanation for the gender gaps in research output among System economists is that women have more intense domestic responsibilities and therefore may work fewer hours; indeed, the evidence from most STEM fields is that publications by single, childless females are not significantly different from publications by single childless men. Although we do not have information on the family status of the economists in the System, we do find larger gender gaps in research output among economists in the age range in which individuals have a higher probability of having young kids.

Our investigation of gender and output patterns among central bank economists can be informative for the state of the economics profession. Potential barriers to research output and career progression in the System may echo similar obstacles for women in the economics profession at large, including in academia. Focusing on economists in the System provides a large number of economists to study and thus may provide insight for the broader profession.

Beyond providing information about the economics profession, our evidence showing lagging representation by and contributions from women in the Federal Reserve System may be of concern. The role of the Federal Reserve is to promote the health of the U.S. economy and the stability of the U.S. financial system. Research economists in the Federal Reserve System are responsible for providing economic analysis and recommendations to policymakers on a wide range of topics, including monetary, regulatory, and supervisory policies. It is important to have diversity among the System's researchers to bring in a variety of perspectives, backgrounds, and experiences that might affect overall economic performance.

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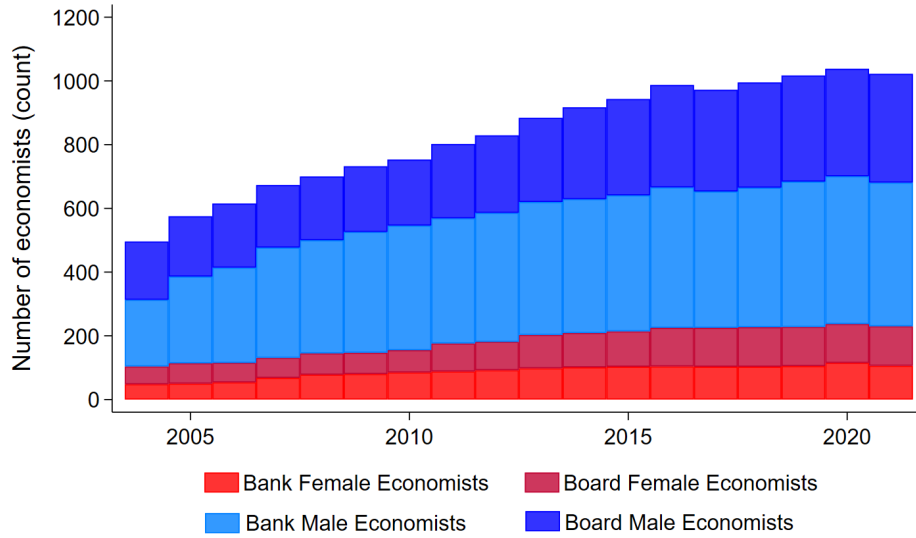
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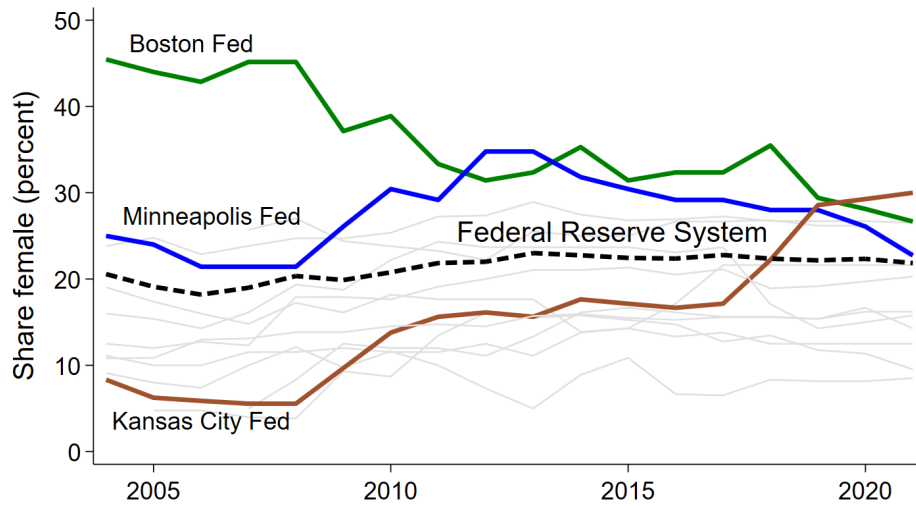
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FIGURE 1
FEMALE REPRESENTATION ACROSS INSTITUTIONS

Panel A. Federal Reserve Board and Reserve Banks



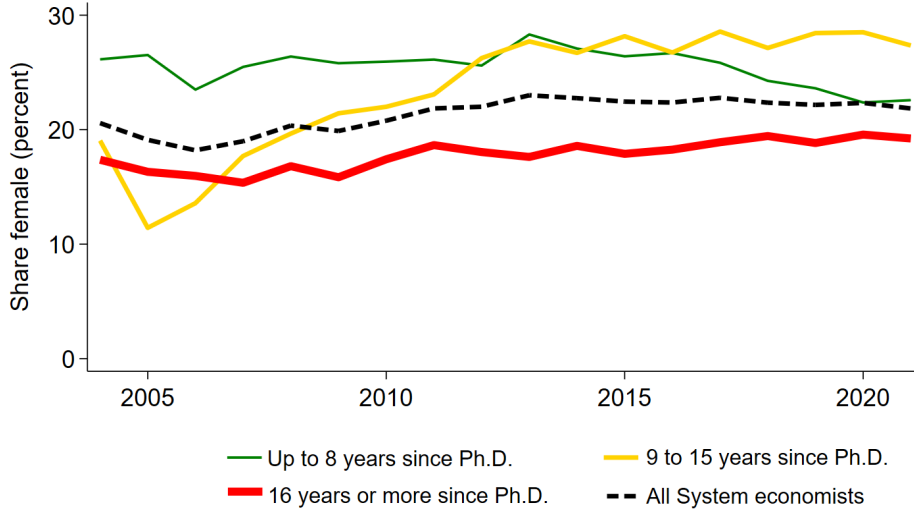
Panel B. Female Share, by Institution



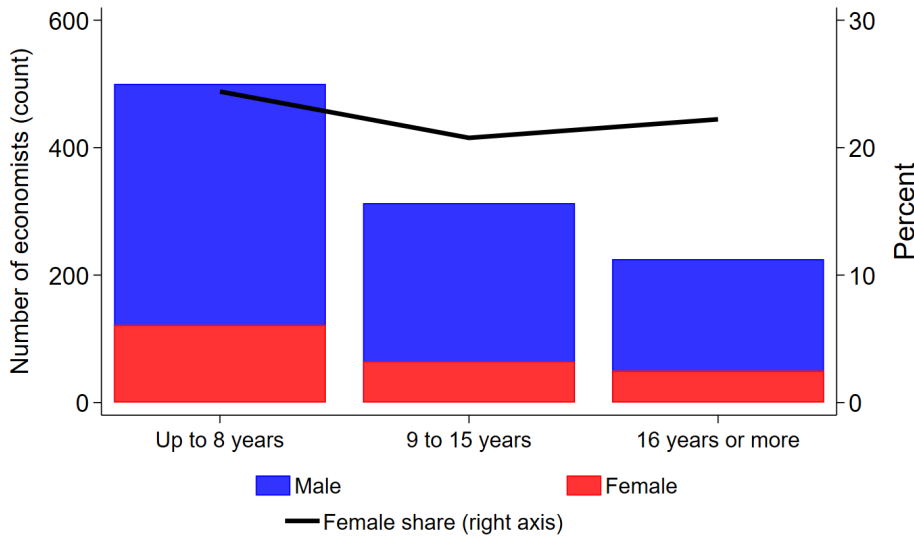
NOTES: Panel A shows the number of male and female economists at the Federal Reserve Board and Reserve Banks between 2004 and 2021. Panel B shows the share of female economists between 2004 and 2021 at each of the 12 Federal Reserve Banks and the Board. A few Banks with notable trends are highlighted.

FIGURE 2
FEMALE REPRESENTATION ACROSS SENIORITY LEVELS

Panel A. Female Representation over Time, by Years since Ph.D.

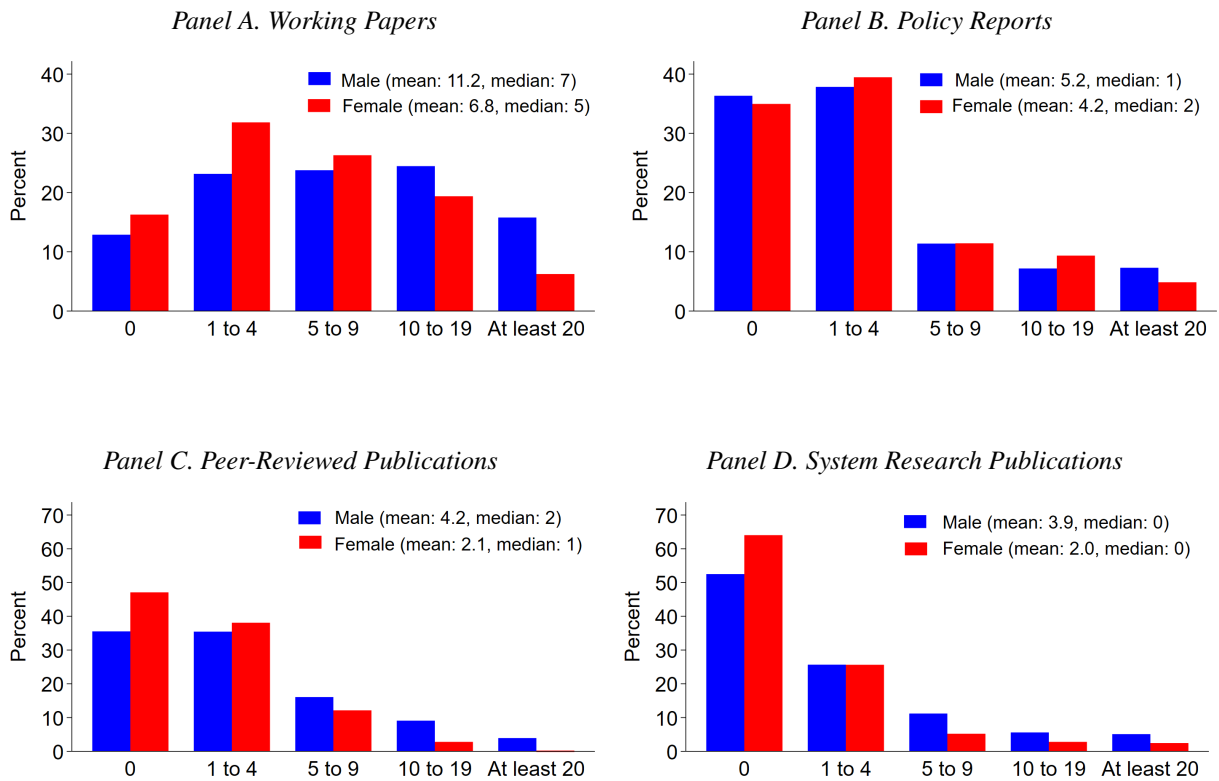


Panel B. Female Representation in 2020, by Years of System Tenure



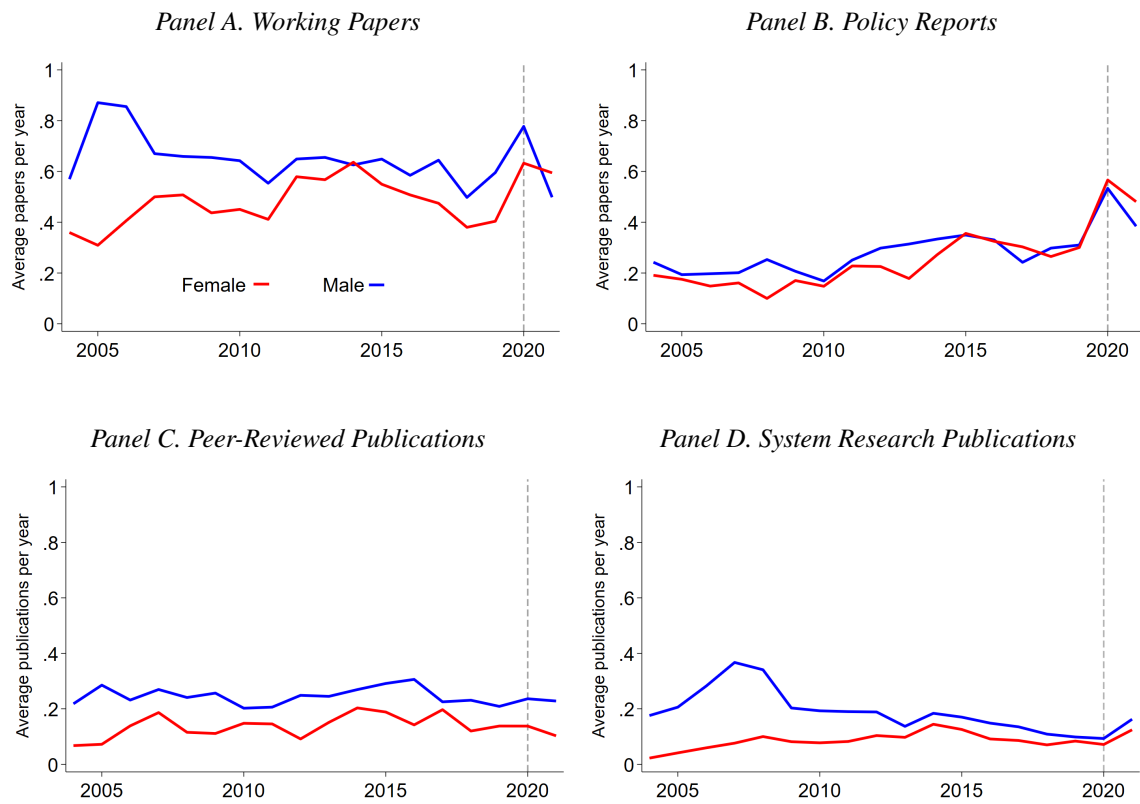
NOTES: Using years since Ph.D. to measure seniority, panel A shows how the female share of Federal Reserve System economists evolves over time at each level of seniority. Using years of System tenure to measure seniority, panel B shows the number of male and female System economists and female share of System economics at each level of seniority in 2020.

FIGURE 3
DISTRIBUTION OF PUBLICATION COUNT BY GENDER



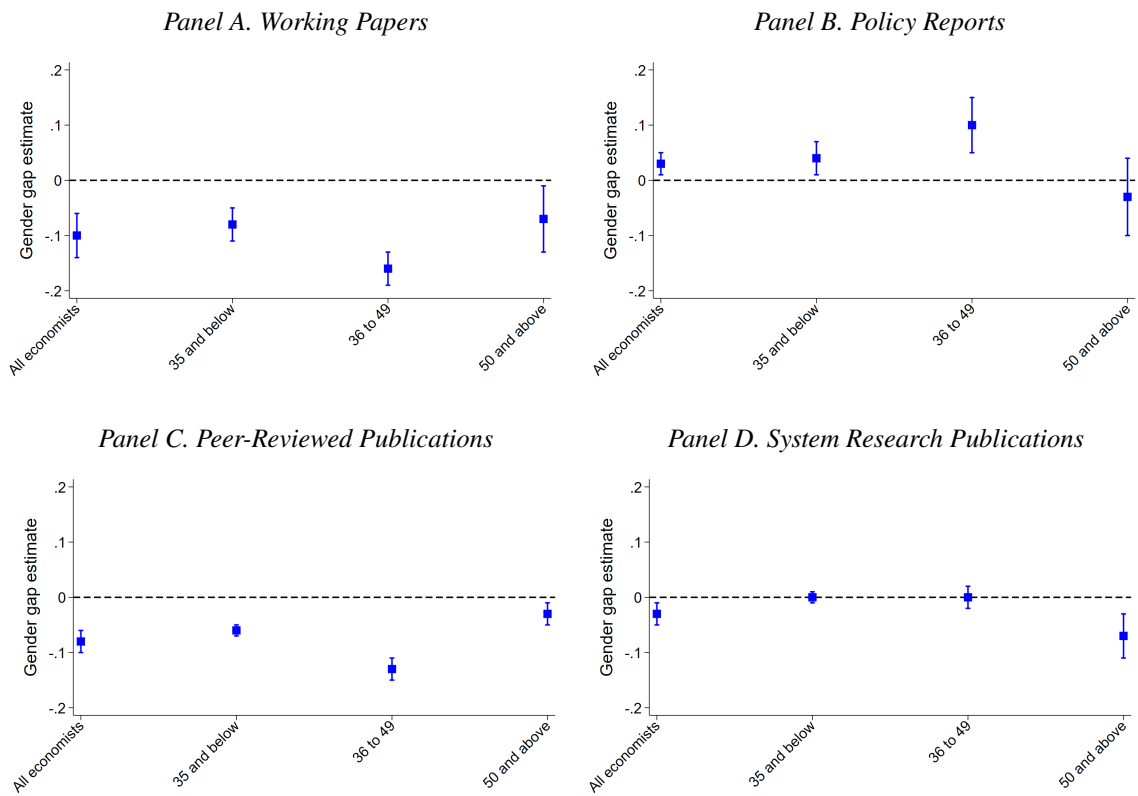
NOTES: This figure shows, for men and women economists, the distributions of the count of working papers (panel A), policy reports (panel B), peer-reviewed publications (panel C), and Federal Reserve System research publications (panel D). The sample is restricted to System economists with at least 3 years of service. The lists of working paper, System research, and policy report series at each System institution can be found in Appendix Tables A.3 and A.4.

FIGURE 4
GENDER AND PAPER PRODUCTION PER YEAR, OVER TIME



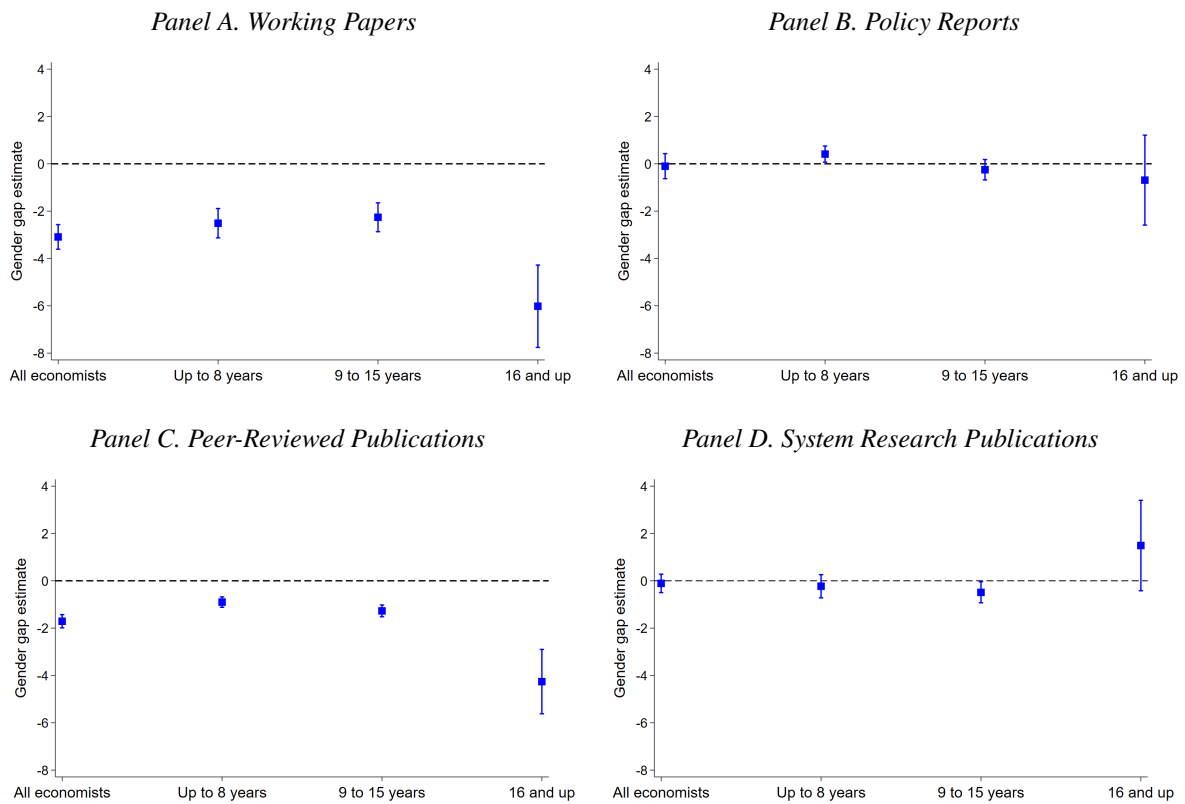
NOTES: This figure plots average annual paper production by men and women for working papers (panel A), policy reports (panel B), peer-reviewed publications (panel C), and Federal Reserve System research publications (panel D). The sample covers 2004 to 2021 and includes all System economists with at least 3 years of service. The vertical line in each panel denotes the onset of the COVID-19 pandemic period in 2020.

FIGURE 5
GENDER GAPS IN PAPER PRODUCTION PER YEAR, BY AGE



NOTES: This figure illustrates gender gaps in average annual production of research working papers (panel A), policy reports (panel B), peer-reviewed publications (panel C), and Federal Reserve System research publications (panel D), by age. We estimate the age of an economist by assuming Ph.D. completion at age 27 and adding the years since Ph.D. attainment through the relevant year. The sample is restricted to System economists with at least 3 years of service. Table A.3 lists research working paper series at each Federal Reserve institution. Table A.4 lists System research and policy report series.

FIGURE 6
GENDER GAPS IN PAPER PRODUCTION, BY YEARS OF SYSTEM TENURE



NOTES: This figure illustrates gender gaps in the total number of research working papers (panel A), policy reports (panel B), peer-reviewed publications (panel C), and Federal Reserve System research publications (panel D), by years of System tenure. The sample is restricted to System economists with at least 3 years of service. Table A.3 lists research working paper series at each Federal Reserve institution. Table A.4 lists System research and policy report series.

TABLE 1
GENDER AND PAPER PRODUCTION

	1	2	3	4	5
	Total publications	Working papers	Peer-reviewed publications	System research	Policy reports
Panel A. All economists					
Female	-5.00*** (1.30)	-3.09*** (0.52)	-0.36** (0.15)	-0.11 (0.39)	-0.10 (0.53)
Tenure	1.77*** (0.53)	0.68*** (0.09)	0.04 (0.05)	0.15 (0.11)	0.36* (0.20)
Policy reports		0.09 (0.07)	0.01 (0.01)	0.06 (0.05)	
System research		0.48*** (0.11)	-0.00 (0.03)		0.14 (0.16)
Working papers			0.44*** (0.02)	0.21*** (0.07)	0.09** (0.03)
Observations	1,291	1,291	1,291	1,291	1,291
R-squared	0.34	0.34	0.77	0.37	0.26
Panel B. Highly productive working paper authors					
Female			-0.57* (0.30)	-0.75 (0.52)	-0.01 (0.77)
Tenure			0.17*** (0.05)	0.18 (0.10)	0.53* (0.29)
Observations			445	445	445
R-squared			0.15	0.38	0.18
Panel C. Highly productive policy report authors					
Female		-3.98*** (0.82)	-2.51*** (0.29)	-0.25 (0.51)	
Tenure		0.69*** (0.19)	0.41** (0.15)	0.29 (0.26)	
Observations		258	258	258	
R-squared		0.25	0.22	0.40	

NOTES: This table reports coefficients from regressions of the form $Y_i = \alpha + \beta_1 Female_i + \beta_2 X_i + \zeta_i + \varepsilon_i$, where Y_i is one of five measures of publications for economist i : working papers, peer-reviewed publications, System research, policy reports, or “total publications,” which we define as the sum of working papers, Federal Reserve System research, and policy reports. Each measure represents the total count of publications the economist has generated over the course of their System tenure since 2004. $Female_i$ is an indicator for a female economist, and ζ_i represents institution fixed effects, which are included in all regressions. X_i represents the vector of control variables, which include the alternative publications measures for which coefficients are reported in the table. The sample consists of all economists with at least 3 years of tenure in the System over the 2004–21 period. The lists of working papers, System research, and policy reports series at each System institution are in Appendix Tables A.3 and A.4. All regressions include institution fixed effects. Panel A includes all the economists at the System, panel B includes economists with 8 to 23 working papers, and panel C includes economists with 4 to 12 policy reports (equivalent to the 75 to 90 percentile range for each working papers and 60 to 90 percentile for policy reports). Panels B and C include the same controls and fixed effects as in panel A. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

TABLE 2
GENDER AND PAPER PRODUCTION PER YEAR

	1	2	3	4	5
	Total publications	Working papers	Peer-reviewed publications	System research	Policy reports
Panel A. Output per year					
Female	-0.11** (0.04)	-0.10** (0.04)	-0.06*** (0.01)	-0.02 (0.01)	0.03 (0.02)
Tenure	0.01 (0.01)	-0.00 (0.01)	0.01** (0.00)	0.00 (0.00)	0.01 (0.01)
Policy reports per year		0.09*** (0.01)	0.01 (0.01)	0.05** (0.02)	
System research per year		0.16** (0.07)	0.06* (0.03)		0.11* (0.06)
Working papers per year			0.20*** (0.04)	0.05** (0.02)	0.06* (0.03)
Observations	12,996	12,996	12,996	12,996	12,996
R-squared	0.13	0.06	0.17	0.12	0.19
Panel B. Focus on the pandemic period					
Female	-0.21 (0.19)	-0.14 (0.12)	-0.13** (0.05)	-0.10 (0.07)	0.03 (0.10)
Year 2020	0.45 (0.32)	0.24 (0.14)	0.04 (0.06)	-0.13 (0.08)	0.34 (0.26)
Year 2021	0.10 (0.30)	-0.04 (0.11)	0.03 (0.10)	-0.06 (0.06)	0.20 (0.21)
Female#2020	0.23 (0.19)	0.05 (0.13)	0.06 (0.04)	0.12 (0.08)	0.06 (0.10)
Female#2021	0.50* (0.24)	0.29** (0.12)	0.03 (0.06)	0.10 (0.08)	0.11 (0.15)
Tenure	0.01 (0.01)	-0.00 (0.01)	0.01 (0.00)	0.00 (0.00)	0.01 (0.01)
Observations	12,996	12,996	12,996	12,996	12,996
R-squared	0.13	0.05	0.04	0.11	0.18

NOTES: For panel A, this table reports coefficients from regressions of the form $Y_{it} = \alpha + \beta_1 Female_i + \beta_2 X_{it} + \zeta_i + \tau_t + \varepsilon_{it}$, where Y_{it} is one of five measures of publications for economist i in year t : working papers, peer-reviewed publications, Federal Reserve System research, policy reports, or “total publications,” which we define as the sum of working papers, System research, and policy reports in a given year. Each measure represents the total count of publications an economist has produced in a given year. $Female_i$ is an indicator for a female economist. All regressions include institution fixed effects (ζ_i) and year fixed effects (τ_t) for 2004 to 2021. X_{it} represents the vector of control variables, which includes the alternative publications measures. For panel B, the regression is of the form $Y_{it} = \alpha + \beta_1 Female_i + \zeta_i + \tau_t + Female_i * \tau_t + \varepsilon_{it}$. Relative to the regression in panel A, this model omits the controls for the alternative publication measures and adds an interaction term between each year fixed effect and the Female indicator. Though all years and year interactions are incorporated in the regression, only coefficients of primary interest are reported. For both panels, the sample covers the 2004-21 period and includes all economists with at least 3 years of tenure in the System. The lists of working papers, System research, and policy reports series at each System institution are in Appendix Tables A.3 and A.4. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels respectively.

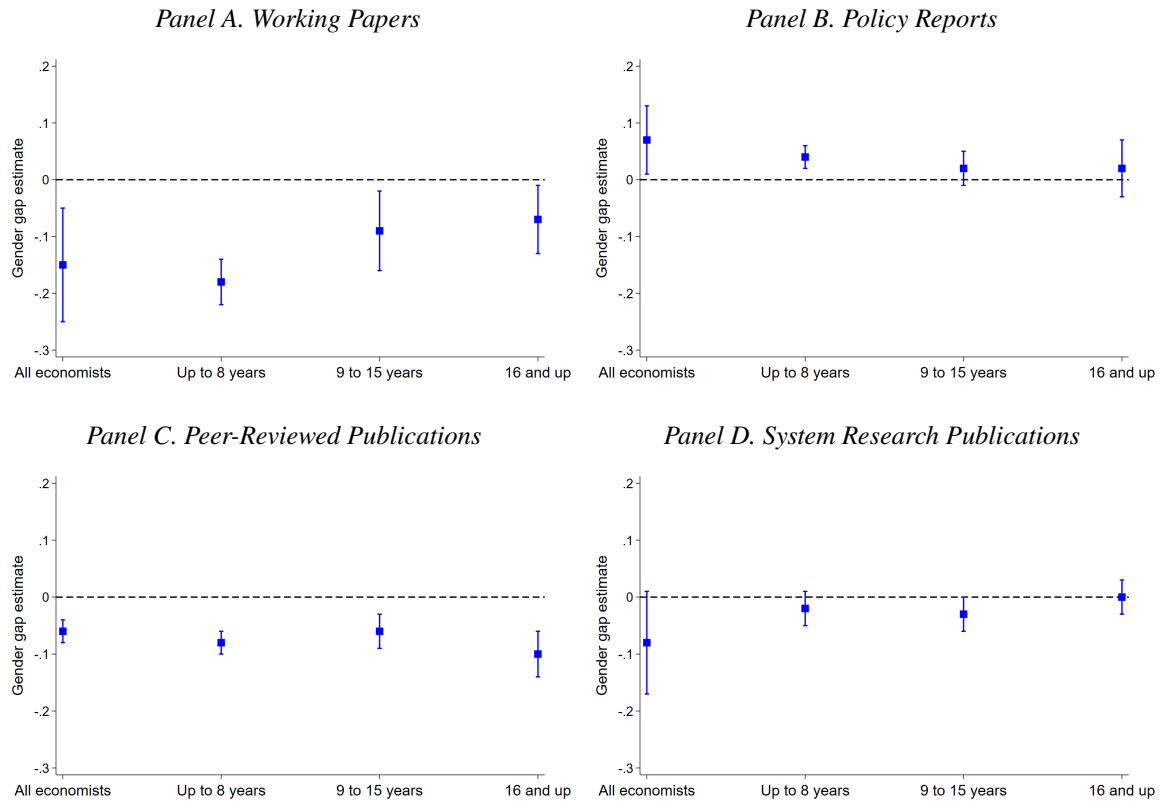
Online Appendix
Gender and Productivity in the Federal Reserve System

Deepa D. Datta

Nitzan Tzur-Ilan

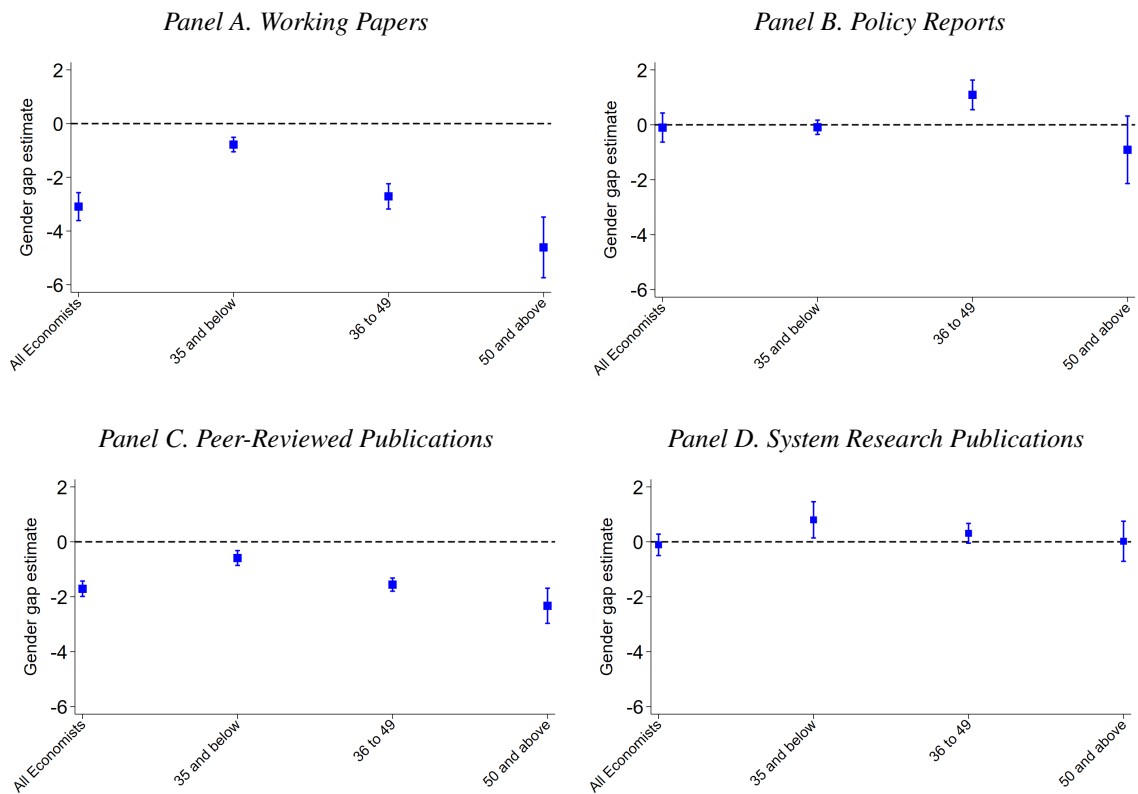
A Additional Figures and Tables

FIGURE A.1
GENDER GAPS IN PAPER OUTPUT PER YEAR, BY SYSTEM TENURE



NOTES: This figure illustrates gender gaps in average annual production of research working papers (panel A), policy reports (panel B), peer-reviewed publications (panel C), and System research publications (panel D), by years of System tenure. The sample is restricted to Federal Reserve System economists with at least three years of service. Table A.3 lists research working paper series at each Federal Reserve institution. Table A.4 lists System research and policy report series.

FIGURE A.2
GENDER GAPS IN PAPER OUTPUT, BY AGE



NOTES: This figure illustrates gender gaps in the total number of research working papers (panel A), policy reports (panel B), peer-reviewed publications (panel C), and Federal Reserve System research publications (panel D), by age. We estimate the age of an economist by assuming Ph.D. completion at age 27 and adding the years since Ph.D. attainment through either the end year of our sample (2021) or their last year of System employment if it is earlier than 2021. The sample is restricted to System economists with at least 3 years of service. Table A.3 lists research working paper series at each Federal Reserve institution. Table A.4 lists System research and policy report series.

TABLE A.1
SUMMARY STATISTICS: SYSTEM ECONOMISTS

Institution	Number of economists	Share of women	Years of System tenure	Years since Ph.D.	Total publications	Number of working papers	Number of peer-reviewed publications	Number of System research publications	Number of policy reports
Board	562	26.3	9.9	15.2	9.4	7.6	2.5	0.3	2.7
Atlanta	47	19.1	12.2	23.5	21.2	14.9	6.0	3.9	2.7
Boston	53	34.0	10.2	19.4	13.4	9.0	2.7	0.3	6.8
Chicago	51	25.5	12.2	20.2	24.1	13.7	5.1	4.1	8.3
Cleveland	80	18.8	8.0	18.5	13.7	8.8	3.0	5.4	1.2
Dallas	62	19.4	9.2	15.8	20.6	10.8	3.7	3.3	7.1
Kansas City	53	26.4	8.2	15.1	16.0	7.0	1.6	6.4	3.4
Minneapolis	35	22.9	9.4	23.7	16.1	17.3	7.1	0.5	1.4
New York	115	20.0	9.8	16.7	28.5	12.6	4.6	3.1	15.0
Philadelphia	36	8.3	10.5	18.9	24.1	18.6	6.0	5.2	1.9
Richmond	43	14.0	9.9	18.9	20.2	8.8	3.0	11.0	1.3
San Francisco	89	13.5	10.4	23.2	22.1	11.0	4.9	10.8	1.8
St. Louis	65	12.3	9.5	21.9	43.9	19.8	8.1	7.7	18.3
Full System	1,291	22.4	9.9	17.5	18.7	10.3	3.7	3.5	5.0
Women	289		9.8	16.9	13.0	6.8	1.9	2.0	4.2
Men	1,002		9.9	17.7	20.3	11.2	4.2	3.9	5.2

NOTES: This table shows summary statistics on economists at the Board of Governors and the 12 Federal Reserve Banks. Economists in the sample are those employed between 2004 and 2021 with at least 3 years of service. Column 1 presents counts of economists, and column 2 presents the share of female Ph.D. economists. Column 3 shows the average total tenure for economists at each institution, defined as years of employment during our 2004-21 sample period. Column 4 shows the average years since Ph.D. for economists at each institution, defined as years since Ph.D. for each individual economist as of the end year of our sample (2021), or as of their last year of Federal Reserve System employment if it is earlier than 2021. For each institution, we report the average number of publications per economist. Column 5 reports averages for total publications per economist, which is the sum of their working papers, System research publications, and policy reports. Remaining columns report the average number of publications by type, including working papers, peer-reviewed publications, System research publications, and policy reports. Data on publications are collected from RePEc and supplemented by data collected by [Datta and Vigfusson \(2024\)](#). The lists of working papers, System research, and policy reports series at each System institution are in Appendix Tables [A.3](#) and [A.4](#).

TABLE A.2
SUMMARY STATISTICS: PAPERS PER YEAR

	Mean	Std. dev.	75th percentile	Share of obs. w. zeros
Total publications	1.06	1.75	2	0.53
Total publications - Women	0.86	1.40	1	0.56
Total publications - Men	1.11	1.83	2	0.52
Working papers	0.61	1.11	1	0.65
Working papers - Women	0.50	0.90	1	0.68
Working papers - Men	0.64	1.17	1	0.64
Peer-reviewed publications	0.22	0.61	0	0.84
Peer reviewed publications - Women	0.14	0.44	0	0.89
Peer-reviewed publications - Men	0.24	0.65	0	0.83
System research publications	0.16	0.63	0	0.89
System research publications - Women	0.09	0.36	0	0.93
System research publications - Men	0.18	0.69	0	0.88
Policy report	0.29	0.96	0	0.85
Policy report - Women	0.27	0.82	0	0.84
Policy report - Men	0.29	1.00	0	0.85

NOTES: This table shows summary statistics for publications per year for all economists, split by gender. The sample is restricted to Federal Reserve System economists with at least 3 years of service.

TABLE A.3
WORKING PAPER SERIES AND PEER-REVIEWED PUBLICATIONS, BY FEDERAL RESERVE INSTITUTION

Institution	Fed in Print content type	Series	Working papers	Publications
Board	Working paper	International Finance Discussion Papers	931	342
	Working paper	Finance and Economics Discussion Series	2,054	665
Atlanta	Working paper	FRB Atlanta Working Paper	475	168
Boston	Working paper	Working Papers	327	85
Chicago	Working paper	Working Paper Series	513	176
Cleveland	Working paper	Working Papers	113	23
	Working paper	Working Papers (Old Series)	462	134
Dallas	Working paper	Globalization Institute Working Papers	150	51
	Working paper	Working Papers	344	90
Kansas City	Working paper	Research Working Paper	340	80
Minneapolis	Working paper	Working Papers	181	52
	Report	Staff Report	351	148
New York	Report	Staff Reports	924	285
Philadelphia	Working paper	Working Papers	674	187
Richmond	Working paper	Working Paper	293	79
San Francisco	Working paper	Working Paper Series	605	255
St. Louis	Working paper	Working Papers	1,044	374

NOTES: This table shows the list of research working paper series and publications by Federal Reserve Banks. We scrape all the economists' research working papers titles, authors, and publication year for all 12 Federal Reserve Banks from the RePEc website. This table presents only papers defined as research papers by the Fed in Print website. For the Federal Reserve Board working papers, we use the data collected by [Datta and Vigfusson \(2024\)](#).

TABLE A.4
SYSTEM RESEARCH AND POLICY REPORTS SERIES BY FEDERAL RESERVE INSTITUTION

Institution	Fed in Print content type	Series	Classified as	Number of papers
Board	Report	Reports and Studies	Policy	37
	Discussion paper	FEDS Notes	Policy	454
	Journal article	Federal Reserve Bulletin	Policy	221
Atlanta	Journal article	EconSouth	Policy	32
	Journal article	Economic Review	System research	136
Boston	Discussion paper	Public Policy Discussion Paper	Policy	62
	Conference paper	Conference Series ; [Proceedings]	Policy	39
	Journal article	Regional Review	Policy	54
	Journal article	Communities and Banking	Policy	7
	Journal article	New England Economic Review	Policy	154
Chicago	Newsletter	Chicago Fed Letter	Policy	430
	Journal article	Economic Perspectives	System research	244
	Journal article	Profitwise	Policy	19
	Conference paper	Proceedings	Policy	248
Cleveland	Conference paper	Proceedings	Policy	54
	Journal article	Economic Commentary	System research	444
Dallas	Journal article	e-Perspectives	Policy	5
	Journal article	Southwest Economy	Policy	343
	Journal article	Economic Letter	System research	137
Kansas City	Conference paper	Proceedings - Economic Policy Symposium	Policy	43
	Journal article	TEN	Policy	33
	Journal article	Main Street Economist	Policy	64
	Journal article	Economic Review	System research	368
Minneapolis	Journal article	The Region	Policy	19
	Journal article	Fedgazette	Policy	113
New York	Journal article	Current Issues in Economics and Finance	Policy	162
	Discussion paper	Liberty Street Economics	Policy	864
	Journal article	Economic Policy Review	System research	212
Philadelphia	Discussion paper	Consumer Finance Institute Discussion Papers	Policy	19
	Journal article	Economic Insights	Policy	53
	Journal article	Business Review	System research	226
Richmond	Briefing	Richmond Fed Economic Brief	System research	126
	Journal article	Economic Quarterly	System research	245
	Journal article	Econ Focus	System research	163
San Francisco	Conference paper	Proceedings	Policy	144
	Journal article	Community Investments	Policy	4
	Journal article	Community Development Innovation Review	Policy	83
	Journal article	FRBSF Economic Letter	System research	1,055
St. Louis	Newsletter	Page One Economics Newsletter	Policy	25
	Journal article	Bridges	Policy	33
	Journal article	Monetary Trends	Policy	105
	Journal article	Burgundy Books	Policy	36
	Journal article	National Economic Trends	Policy	118
	Journal article	Economic Synopses	Policy	431
	Journal article	The Regional Economist	Policy	569
	Journal article	Review	System research	527

NOTES: We examine all series from Federal Reserve institutions catalogued by the Fed in Print website that have more than 70 papers published since 2000. We classify as working papers those series that have at least 10 percent of entries appearing in another peer-reviewed publication and report these series in Table A.3. The definition of Federal Reserve System research and policy reports series was taken from the Fed in Print website <https://fedinprint.org/>, which is also used by RePEc in the classification of research and policy reports.

TABLE A.5
GENDER AND PAPER PRODUCTION

	1	2	3	4	5
	Total publications	Working papers	Peer-reviewed publications	System research	Policy reports
Panel A. Gender and paper production					
Female	-5.00*** (1.30)	-3.57*** (0.57)	-1.92*** (0.27)	-0.89* (0.50)	-0.53 (0.55)
Tenure	1.77*** (0.53)	0.90*** (0.17)	0.44*** (0.11)	0.37* (0.20)	0.49** (0.22)
Observations	1,291	1,291	1,291	1,291	1,291
R-squared	0.34	0.26	0.22	0.29	0.24
Panel B. Gender and paper production per year					
Female	-0.11** (0.04)	-0.10** (0.04)	-0.08*** (0.02)	-0.03 (0.02)	0.02 (0.02)
Tenure	0.01 (0.01)	-0.00 (0.01)	0.01 (0.00)	0.00 (0.00)	0.01 (0.01)
Observations	12,996	12,996	12,996	12,996	12,996
R-squared	0.13	0.04	0.03	0.11	0.17

NOTES: This table reports coefficients from regressions of the form $Y_i = \alpha + \beta_1 Female_i + \beta_2 X_i + \zeta_i + \varepsilon_i$, where Y_i is one of five measures of publications for economist i : working papers, peer-reviewed publications, Federal Reserve System research, policy reports, or “total publications,” which we define as the sum of working papers, System research, and policy reports. Each measure represents the total count of publications the economist has generated over the course of his or her System tenure since 2004. $Female_i$ is an indicator for a female economist, and ζ_i represents institution fixed effects, which are included in all regressions. X_i represents the vector of control variable, which include tenure at the System. The sample consists of all economists with at least 3 years of tenure in the System over the 2004-21 period. The lists of working papers, System research, and policy reports series at each System institution are in Appendix Tables A.3 and A.4. All regressions include institution fixed effects. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

TABLE A.6
GENDER ON PRODUCTIVITY - WORKING PAPERS

	1	2	3	4	5
	Baseline estimation	WPs>0	WPs<60 (99%)	WPs<34 (95%)	WPs< 24 (90%)
Female	-3.09*** (0.52)	-3.22*** (0.58)	-2.60*** (0.42)	-1.66*** (0.26)	-1.26*** (0.23)
Tenure	0.68*** (0.09)	0.70*** (0.12)	0.63*** (0.05)	0.51*** (0.04)	0.38*** (0.05)
Policy reports	0.68*** (0.09)	0.70*** (0.12)	0.63*** (0.05)	0.51*** (0.04)	0.38*** (0.05)
System research	0.48*** (0.11)	0.46*** (0.11)	0.42*** (0.08)	0.25*** (0.04)	0.18*** (0.04)
Institution FE	+	+	+	+	+
Observations	1,291	1,115	1,278	1,218	1,151
R-squared	0.34	0.35	0.34	0.29	0.24

NOTES: This table reports coefficients from regressions of the form described in equation 1. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of working papers (WPs). Table A.3 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.

TABLE A.7
GENDER AND PRODUCTIVITY - PEER-REVIEWED PUBLICATIONS

	1	2	3	4	5
	Baseline	Publications>0	Publications<30 (99%)	Publications<16 (95%)	Publications<10 (90%)
Female	-1.71*** (0.28)	-2.43*** (0.47)	-1.39*** (0.23)	-0.77*** (0.16)	-0.40*** (0.09)
Tenure	0.33*** (0.08)	0.33*** (0.10)	0.30*** (0.04)	0.22*** (0.03)	0.15*** (0.02)
Policy reports	0.05 (0.03)	0.05 (0.04)	0.03 (0.02)	0.01 (0.02)	0.01 (0.01)
System research	0.21*** (0.06)	0.22*** (0.07)	0.16*** (0.04)	0.06** (0.02)	0.04** (0.02)
Institution FE	+	+	+	+	+
Observations	1,291	799	1,278	1,224	1,153
R-squared	0.29	0.28	0.30	0.23	0.20

NOTES: This table reports coefficients from regressions of the form described in equation 1. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of peer-reviewed publications. Table A.3 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.

TABLE A.8
GENDER AND PRODUCTIVITY - SYSTEM RESEARCH PUBLICATIONS

	1	2	3	4	5
	Baseline	Sys. research>0	Sys. research<42 (99%)	Sys. research<17 (95%)	Sys. research<8 (90%)
Female	-0.11 (0.39)	-0.59 (0.85)	-0.14 (0.37)	-0.14 (0.09)	-0.15 (0.09)
Tenure	0.15 (0.11)	0.31** (0.14)	0.11 (0.08)	0.05 (0.04)	0.03 (0.02)
Policy reports	0.06 (0.05)	0.05 (0.06)	0.07* (0.03)	0.03 (0.02)	0.02* (0.01)
Working papers	0.06 (0.05)	0.05 (0.06)	0.07* (0.03)	0.03 (0.02)	0.02* (0.01)
Institution FE	+	+	+	+	+
Observations	1,291	580	1,278	1,221	1,146
R-squared	1,291	580	1,278	1,221	1,146

NOTES: This table reports coefficients from regressions of the form described in equation 1. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of System research publications. Table A.3 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.

TABLE A.9
GENDER AND PRODUCTIVITY - POLICY REPORTS

	1	2	3	4	5
	Baseline	Policy Reports>0	Policy Reports<52 (99%)	Policy <24 (95%)	Policy<13 (90%)
Female	-0.10 (0.53)	-0.50 (0.88)	0.58 (0.35)	0.67** (0.23)	0.40* (0.20)
Tenure	-0.10 (0.53)	-0.50 (0.88)	0.58 (0.35)	0.67** (0.23)	0.40* (0.20)
System research	0.14 (0.16)	0.18 (0.22)	0.02 (0.05)	0.01 (0.02)	0.02* (0.01)
Working papers	0.14 (0.16)	0.18 (0.22)	0.02 (0.05)	0.01 (0.02)	0.02* (0.01)
Institution FE	+	+	+	+	+
Observations	1,291	826	1,278	1,226	1,152
R-squared	0.26	0.25	0.32	0.29	0.23

NOTES: This table reports coefficients from regressions of the form described in equation 1. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of policy reports. Table A.3 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.

TABLE A.10
SUMMARY STATISTICS FOR HIGHLY PRODUCTIVE SYSTEM ECONOMISTS

	Highly productive Working paper authors	Highly productive Policy report authors
Female	0.2	0.3
Tenure	10.7	10.5
Working papers	13.2	12.0
System research publications	3.8	3.5
Policy reports	5.7	5.6
Publications	4.4	4.3

TABLE A.11
GENDER AND PRODUCTIVITY OVER TIME - WORKING PAPERS PER YEAR

	1	2	3	4	5
	Baseline	WPs per year > 0	WPs < 4 (99%)	WPs < 3 (95%)	WPs < 2 (90%)
Female	-0.10** (0.04)	-0.13** (0.05)	-0.05 (0.04)	-0.03 (0.03)	-0.02 (0.02)
Tenure	-0.10** (0.04)	-0.13** (0.05)	-0.05 (0.04)	-0.03 (0.03)	-0.02 (0.02)
Policy reports	0.09*** (0.01)	0.02 (0.03)	0.07*** (0.01)	0.05*** (0.01)	0.04*** (0.01)
System research	0.16** (0.07)	0.08* (0.04)	0.11** (0.05)	0.09** (0.04)	0.04** (0.02)
Institution FE	+	+	+	+	+
Year FE	+	+	+	+	+
Observations	12,996	4,604	12,698	12,277	11,057
R-squared	0.06	0.08	0.05	0.04	0.02

NOTES: This table reports coefficients from regressions of the form described in equation 2. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of working papers (WPs) per year. Table A.3 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.

TABLE A.12
GENDER AND PRODUCTIVITY OVER TIME - PUBLICATIONS PER YEAR

	1	2	3	4
	Baseline	Publications>0	Publications<3 (99%)	Publications<2 (95%)
Female	-0.08*** (0.02)	-0.12** (0.05)	-0.05*** (0.01)	-0.03*** (0.01)
Tenure	0.01 (0.00)	0.01 (0.01)	0.01** (0.00)	0.00** (0.00)
Policy reports	0.03*** (0.01)	0.01 (0.02)	0.03*** (0.01)	0.02*** (0.01)
System research	0.10** (0.04)	0.09** (0.04)	0.06** (0.03)	0.04** (0.02)
Institution FE	+	+	+	+
Year FE	+	+	+	+
Observations	12,996	2,015	12,830	12,398
R-squared	0.05	0.06	0.04	0.02

NOTES: This table reports coefficients from regressions of the form described in equation 2. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of publications per year. Table A.3 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.

TABLE A.13
GENDER AND PRODUCTIVITY OVER TIME - SYSTEM RESEARCH AND POLICY REPORTS PER YEAR

	1	2	3	4	5	6
	Sys. research (baseline)	Sys. research>0	Policy (baseline)	Policy>0	Policy<4 (99%)	Policy<2 (95%)
Female	-0.02 (0.01)	-0.26** (0.10)	0.03 (0.02)	-0.06 (0.07)	0.04** (0.01)	0.02** (0.01)
Tenure	0.00 (0.00)	-0.00 (0.01)	0.01 (0.01)	0.03 (0.02)	0.00 (0.00)	0.00 (0.00)
Policy reports	0.05** (0.02)	0.02 (0.01)				
System research			0.11* (0.06)	0.14* (0.08)	0.05* (0.02)	0.02** (0.01)
Working papers	0.05** (0.02)	0.01 (0.02)	0.06* (0.03)	-0.01 (0.08)	0.04* (0.02)	0.02** (0.01)
Institution FE	+	+	+	+	+	+
Year FE	+	+	+	+	+	+
Constant	0.10** (0.03)	1.50*** (0.13)	0.14 (0.09)	1.45*** (0.33)	0.15*** (0.02)	0.07*** (0.01)
Observations	14,635	1,481	14,635	2,162	14,419	13,756
R-squared	0.12	0.10	0.18	0.21	0.14	0.06

NOTES: This table reports coefficients from regressions of the form described in equation 2. The sample consists of all economists at the Federal Reserve System, with at least 3 years of tenure in the System, and spans 2004 to 2021. This table examines the relationship between gender and productivity, as measured by the number of policy reports and System research publications per year. Table A.4 shows the list of research working papers within each of the Federal Reserve Banks. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. FE is fixed effects.