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Labor Market Outcomes of Highly Educated Women in Japan: The Role of Field of Study and STEM Degrees

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Abstract

This study investigates gender differences in labor market outcomes among highly educated individuals in Japan, emphasizing heterogeneity by fields of study, with a focus on STEM. Using data from the Japanese Panel Study of Employment Dynamics (JPSED), we find that women with STEM degrees begin their careers with earnings comparable to men with at least a bachelor's degree in any field; yet the gap widens to 24.4 percent six to ten years after graduation. Penalties are especially large for mothers and remain sizable for childless women. Field differences are stark: six to ten years out, women with STEM bachelor's degrees, Social Sciences, or Humanities degrees earn less than men with high-school or junior-college education. In contrast, women with STEM advanced degrees or Medicine/Pharmacy degrees earn more than men with a high-school or junior-college education, and women with Medicine/Pharmacy degrees maintain wage parity with men holding at least a bachelor's degree in any field. These findings indicate that family responsibilities matter, but structural barriers against women also contribute to persistent gender gaps, with holders of advanced degrees in STEM, Medicine, or Pharmacy as notable exceptions

JEL classification

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Keywords

STEM, field of study, female, Japan

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1 Introduction

STEM education and careers are widely recognized as key drivers of economic growth, yet women remain significantly underrepresented—particularly in Japan. As of 2021, women constitute only 19 percent of STEM degree holders in Japan—the lowest proportion among OECD countries, and significantly below the OECD average of 32 percent. This underrepresentation contributes to Japan's persistent gender wage gap, given the higher earnings typically associated with STEM occupations relative to non-STEM fields (e.g., Kahn and Ginther, 2018; Altonji and Zimmerman, 2019; Jiang, 2021, among others). This paper investigates how differences in the field of study among Japanese individuals with at least a bachelor's degree shape labor market outcomes. Specifically, it examines how career progression differs between men and women across academic disciplines, focusing on the career paths of women educated in STEM fields.

From high school through mid-career, women encounter multiple points at which they exit the STEM "pipeline" more than men do. Using data from the United States, Speer (2023) finds that women leave the STEM pipeline before, during, *and* after college, with no single stage accounting for most of the attrition. A growing body of literature highlights substantial "leakage" of women from STEM fields *after* college, which contributes to gender disparities in labor outcomes among STEM graduates (Hunt et al., 2017; Cech and Blair-Loy, 2019; Jelks and Crain, 2020; Delaney and Devereux, 2022). We extend this literature to Japan, where prior research has been limited by the absence of nationally representative government data on individuals' fields of study in higher education.

Using data from the Japanese Panel Study of Employment Dynamics (JPSED), we first document gender imbalances across fields—focusing on the categories of Humanities, Social Studies, STEM, and Medicine/Pharmacy—and examine associated wage differentials. We find that, compared with women who hold degrees in Social Science, women with advanced STEM degrees earn 18.6 percent more, and those with degrees in Medicine/Pharmacy earn 21.9 percent more. In contrast, women with only a bachelor's degree in STEM earn just 0.7 percent more than women with any degree in Social Sciences—a difference that is marginal and statistically insignificant. Among men, the corresponding wage premiums are 20.7 percent, 26.8 percent, and 0.3 percent, respectively. These broadly similar patterns across genders suggest that advanced STEM degrees and degrees in Medicine/Pharmacy are associated with substantial wage premiums relative to Social Science degrees, whereas a STEM bachelor's degree alone does not confer a significant earnings advantage for either gender.

We then examine gender wage disparities across post-university career stages—focusing on the early-career transition—and by field of study. Benchmarking women's earnings to those of men with at least a bachelor's degree in any field, we find small initial gaps (under 4.2 percent) within two years of graduation, except in Humanities, where women earn 14.7 percent less. By six to ten years after graduation, these gaps widen markedly: women with advanced STEM degrees earn 13.8 percent less, those with STEM bachelor's degrees, 28.1 percent less; those with Social Sciences degrees, 23.0 percent less; and those with Humanities degrees, 34.5 percent less than the average college-educated male. In contrast, women with Medicine/Pharmacy degrees earn a 6.1 percent premium within two years of graduation while facing a modest 6.6 percent penalty six to ten years after graduation. Using a lower benchmark—men with a high-school or junior-college education—women's outcomes six to ten years after graduation are as follows: –9.6 percent for STEM bachelor's, –3.4 percent for Social Sciences, and –15.2 percent for Humanities. Only advanced STEM and Medicine/Pharmacy yield premiums for women using this lower benchmark (+8.9 percent and +13.5 percent, respectively). While disparities are especially severe among mothers, significant gaps persist even for childless women. Among childless women six to eight years after graduation, those with STEM bachelor's degrees earn 19.3 percent less than college-educated men; with Social Sciences degrees, 15.3 percent less; and with Humanities degrees, 27.3 percent less, whereas childless women with advanced STEM degrees show a statistically insignificant –3.0 percent.

One significant factor behind these wage discrepancies is the transition many women make from their initial, typically regular employment to nonregular positions with shorter working hours—a pattern more pronounced among mothers. Despite working fewer hours, women with medical or pharmaceutical degrees experience only a modest wage penalty compared with men holding at least a bachelor's degree in any field. The fact that shorter work schedules impose a smaller earnings penalty on women in Medicine/Pharmacy highlights the more limited labor market opportunities available to women educated in other disciplines.

Although STEM fields typically involve rigorous coursework and attract students with strong quantitative and scientific skills (Altonji, 1995; Delaney and Devereux, 2021), these advantages do not necessarily translate into higher earnings or improved career outcomes for workers of either gender with only a bachelor's degree in a STEM field. Women with advanced degrees in STEM fields fare better than women with only a STEM bachelor's or a degree in the Humanities or Social Sciences, yet they still lag behind women with Medicine/Pharmacy degrees. It is critical to expand women's opportunities to enter science-track education early in the pipeline, given that entry into STEM and Medicine/Pharmacy programs requires substantial quantitative preparation and tends to attract students with a strong career orientation.[1] At the same time, improving labor-market conditions to reduce penalties associated with nonregular employment and shorter working hours remains essential. Together, these changes will be crucial for narrowing persistent gender disparities, particularly in fields beyond medicine and pharmacy.

The paper is structured as follows. Section 2 describes the data from the Japanese Panel Study of Employment Dynamics (JPSED). Section 3 provides descriptive statistics. Section 4 examines gender differences in labor market outcomes by field of study. Section 5 analyzes how the gender gaps evolve over early-career stages. Section 6 compares mothers and non-mothers to assess how family formation shapes these disparities. Section 7 concludes.

2 Data

We use data from the Japanese Panel Study of Employment Dynamics (JPSED), a panel survey conducted annually by the Recruit Works Institute since 2016.[2] The initial 2016 sample included approximately 50,000 individuals aged fifteen and older. The survey is conducted

[1] Advanced STEM and Medicine/Pharmacy programs are highly selective. For instance, Kawai Juku (2025) reports that the passing thresholds for the Common Test for University Admissions at the University of Tokyo are 87 percent for Science and Engineering and 90 percent for Medicine and Pharmacy, compared with about 86 percent for Humanities and Social Sciences; the comparable numbers for Kyoto University are 85 percent, 89 percent, and 84 percent. In addition, at private universities, many STEM programs require four entrance-exam subjects, whereas humanities programs often require only two or three, reducing the academic burden for students preparing for humanities tracks. Because entry into STEM and Medicine/Pharmacy typically requires placement in a science track during high school, strengthening math and science preparation well before these track decisions are made is essential, especially for girls (e.g., Matsukura et al., 2025).

[2] The Recruit Works Institute conducts JPSED in collaboration with eight established economics researchers who contribute to its survey design (Professors Masahiro Abe, Soichi Abe, Yuji Genda, Masahiro Higo, Daiji Kawaguchi, Yukinobu Kitamura, Tetsu Miwa, Hiroshi Teruyama, and Isamu Yamamoto).

annually each January, and we use data through 2025, the latest available wave.[3] The survey collects information on respondents' employment, living conditions, and well-being during the prior calendar year. Additionally, the JPSED includes information on respondents' academic fields of study for their highest degree (whether at the undergraduate or graduate level), data that Japanese government surveys do not collect. This information, combined with the JPSED's large sample size, makes it one of the only suitable sources for analyzing employment outcomes by academic training in Japan.

For respondents with a bachelor's degree or higher, the survey asks for their field of study at their highest degree, as follows: (1) Humanities (e.g., Literature, History, Philosophy, Psychology, and Education), (2) Social Sciences (e.g., Economics, Business Administration, Commerce, Law, and Political Science), (3) Natural Sciences (e.g., Engineering, Science, Agriculture, and Information Technology), (4) Medicine and Pharmacy, (5) Architecture, (6) Arts (e.g., Music, and Fine Arts), (7) Welfare, and (8) Other.[4] For our analysis, we classify respondents who selected (3) Natural Sciences and (5) Architecture as having a degree in a STEM field. We then focus on comparing respondents who studied in one of these four categories: (1) Humanities, (2) Social Sciences, (3) STEM, and (4) Medicine and Pharmacy, as these collectively encompass most key academic disciplines.[5] We exclude from our sample respondents who studied (6) Arts (2.1 percent of the sample with a bachelor's degree or higher), (7) Welfare (3.3 percent), or (8) Other (7.3 percent). We restrict our sample to individuals who were between the ages of 22 and 50 in the survey year, who are no longer enrolled in school, and who left school within the past twenty-five years.

3 Data Overview

We begin by documenting gender differences in fields of study within higher education.

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[3] The raw data are publicly available through the Social Science Japan Data Archive at the University of Tokyo. For our analysis, we use data up to 2025, the most recent year available as of February 2026.
[4] The question about the field of study was introduced only after the 2017 wave. Therefore, for respondents in the 2016 wave who had already graduated, we assign the field of study they reported in the 2017 wave.
[5] Delaney and Devereux (2022) examined the career trajectories of women in the U.K. who had received a STEM bachelor's or master's degree. They found that women with STEM undergraduate degrees are more likely than comparable men to pursue a non-STEM master's degree. In Japan, professional programs such as law, medicine, and pharmacy are offered at the undergraduate level, making it more common for individuals in these fields to continue their graduate studies in the same discipline.

Table 1 reports women's representation by academic field and degree level. Women constitute 18 percent of all STEM degree holders—the lowest share across fields—compared with 53 percent in Medicine/Pharmacy, 60 percent in Humanities, and 26 percent in Social Sciences.[6] Among those whose highest credential is a bachelor's degree, women account for 20 percent of STEM graduates. This share falls to 11 percent at the master's level and rises slightly to 12 percent at the doctoral level, indicating that fewer women than men advance to graduate study in STEM. These trends highlight women's significant underrepresentation in STEM fields, particularly at advanced degree levels.[7]

Appendix Table 1 summarizes key variables by gender and field. Within STEM fields, 31 percent of men and 18 percent of women hold advanced degrees. In contrast, in non-STEM fields, more than 75 percent of men and 90 percent of women hold only a bachelor's degree. Accordingly, we will henceforth refer to STEM degree holders as STEM-BS (bachelor's only) and STEM-Advanced (master's or doctorate).

For both men and women, average annual salary is highest in Medicine/Pharmacy (5.35 million yen for men and 3.25 million yen for women), followed by STEM-Advanced (5.23 million yen for men and 3.39 million yen for women). Salaries are lower in Social Sciences (4.13 million yen for men and 2.56 million yen for women) and STEM-BS (4.05 million yen for men and 2.52 million yen for women), and lowest in Humanities (3.56 million yen for men and 2.24 million yen for women). Across fields, gender differences are substantial: on average, women earn roughly 60 percent of men's salary.

We compare regular-employment trajectories between labor-market entry and the current job for STEM-Advanced and STEM-BS graduates. Among men, regular employment remains high and relatively stable for STEM-Advanced degree holders, declining only slightly from 91.2 percent in the first job to 89.6 percent in the current job. The decline is larger for STEM-

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6 We report first-wave attrition in the JPSED, defined as respondents who participated in wave 1 but did not return in any subsequent waves. The first-wave attrition rate is 19.7 percent for men and 17.4 percent for women. By field, attrition is highest in Medicine/Pharmacy—27.7 percent for men and 19.1 percent for women—where the gender gap is particularly pronounced. In contrast, advanced STEM degree holders exhibit lower attrition, at 18.2 percent for men and 14.7 percent for women.

7 We compared our data with the Basic School Survey conducted by the Ministry of Education, Culture, Sports, Science, and Technology, which provides comprehensive administrative statistics on educational attainment. In 2000, women accounted for 15 percent of STEM undergraduate degree recipients in Japan, while the corresponding shares at the master's and doctoral levels were 12 percent and 11 percent, respectively—figures that are similar to those observed in the JPSED.

BS men, from 86.8 percent in the first job to 80.1 percent in the current job. Among women, declines are substantially greater: regular employment falls from 79.3 percent to 58.6 percent for STEM-Advanced women and from 77.8 percent to 49.4 percent for STEM-BS women.

Employment in professional or technical occupations shows a similar pattern. Among men, 69.3 percent of STEM-Advanced degree holders begin their careers in professional or technical occupations, compared with 44.3 percent of STEM-BS graduates; by the current job, the gap widens: 67.1 percent of STEM-Advanced men work in professional/technical positions, compared with 39.8 percent of STEM-BS men. Among women, the corresponding figures are 53.0 percent at the first job and 37.9 percent at the current job for STEM-Advanced graduates, and 37.8 percent and 23.1 percent, respectively, for STEM-BS graduates. These patterns indicate that advanced STEM training is more strongly linked to specialized professional or technical roles, and that men are more likely than women to deploy their STEM skills directly on the job. They are also consistent with the possibility that many female STEM-BS graduates enter general-track positions and are subsequently assigned to nonprofessional roles.

4 How Wages and Employment Vary Across Fields of Study

4.1 Wages, Work Hours, and Employment Characteristics by Field of Study

To investigate how hourly wages and employment characteristics vary across academic fields, we estimate separate regression models by gender as follows:

$$y_{it} = \beta_0 + \beta_1 STEM\_BA_i + \beta_2 STEM\_ADV_i + \beta_3 MED/PHARM_i + \beta_4 HUM_i + X'_{it}\gamma + \varepsilon_{it} \quad (1)$$

where y_{it} denotes the outcome of interest (e.g., wages, hours worked, or employment characteristics) for individual i in survey year t.[8] The variables $STEM\_BA_i$, $STEM\_ADV_i$, $MED/PHARM_i$, and HUM_i are binary indicators for the respondent's field of study, with Social Sciences as the reference category. The vector X_{it} includes controls for age and age squared, birth-cohort dummy variables defined in 5-year intervals, and survey-year dummies. We use ε_i as an idiosyncratic error term.[9] Throughout the analysis, we report robust standard

[8] We measure hourly wages as annual salary divided by annual hours, where annual hours are approximated as usual weekly hours at the primary job × 50. Because the JPSED does not collect information on weeks worked per year, we approximate weeks worked per year as 50. We drop observations with hourly wages below 200 yen or above 14,000 yen.

[9] In line with Bertrand, Goldin, and Katz (2010) and Delaney and Devereux (2022), we restrict controls

errors clustered at the individual level.

Table 2 presents the regression results. For hourly wages, Medicine/Pharmacy degree holders receive the largest premium: men earn 26.8 percent more and women earn 21.9 percent more than their Social Science counterparts. In contrast, Humanities graduates earn significantly less than their Social Science counterparts (–9.6 percent for men and –9.4 percent for women). Turning to STEM fields, separating by degree level shows minimal wage advantages for those with only a bachelor's degree (0.3 percent for men and 0.7 percent for women, both statistically insignificant), whereas advanced STEM degree holders earn substantially more (20.7 percent for men and 18.6 percent for women; both significant at the 1 percent level).[10] Thus, any STEM wage premium is largely attributable to advanced degree attainment.[11]

Turning to weekly working hours, women with Social Science degrees work an average of 35.6 hours and Social Science men 42.7 hours. Relative to these baselines, women with STEM bachelor's degrees work just 0.54 hours more per week than Social Science women, while women with advanced STEM degrees work 3.2 hours per week more and Medicine/Pharmacy women work 1.6 hours more per week. Differences among men are modest

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to characteristics determined prior to educational attainment. In principle, individual fixed-effects models can account for time-invariant unobserved heterogeneity. However, in Japan the key regressors of interest—highest degree attainment and field of study—are typically determined before labor-market entry and rarely change thereafter. Within-person variation in the JPSED is limited: only 1.2 percent of respondents report changes in degree attainment and 5.1 percent report changes in major field of study. As a result, a fixed-effect specification would be identified primarily by a small group of "switchers," potentially including reporting error, and would not be informative for estimating the effects of field or degree. Identifying the mechanisms behind the gender gap—and why it varies across fields—would require additional sources of exogenous variation or research designs that more directly address selection into fields and degrees.

[10] Individuals who pursue Medicine/Pharmacy and advanced STEM degrees may be positively selected on unobserved characteristics, such as ability, motivation, or preferences for specialized careers (see, e.g., Jiang, 2021; Gemici and Wiswall, 2014). In particular, women who anticipate balancing career and family responsibilities may also be more likely to select into Medicine/Pharmacy, where childbirth-related career interruptions may be less costly. Accordingly, our estimates capture the combined influence of selection and institutional structures, and disentangling these channels would require research designs that more directly isolate each mechanism.

[11] We also examine wage differences within non-STEM fields by degree level. Among men, those with an advanced Social Science degree earn 14.3 percent more than men with a Social Science bachelor's degree, whereas men with an advanced Humanities degree earn 7.5 percent *less* than men with a Social Science bachelor's (significant at the ten percent level). Among women, those with an advanced Social Science degree earn 42.1 percent more than women with a Social Science bachelor's degree, while women with an advanced Humanities degree earn 9.1 percent *more* than women with a Social Science bachelor's.

across fields: advanced STEM men work 0.81 hours more, STEM bachelor's men work 0.40 hours more, and Medicine/Pharmacy men work 0.34 hours more than Social Science men. These patterns imply that women's earnings advantages in advanced STEM and Medicine/Pharmacy reflect both higher hourly wages *and* longer working hours, whereas men's earnings differences across fields are driven primarily by hourly wage differentials rather than hours worked.

Consistent with these findings, annual salary premiums are larger than hourly wage premiums for women with advanced STEM degrees or Medicine/Pharmacy degrees: the annual salary premium is 32.8 percent for advanced STEM women and 31.4 percent for Medicine/Pharmacy women. In contrast, the annual salary premium for women with STEM bachelor's degrees is small (4.9 percent) and not statistically significant. For men, the annual salary premium for holders of STEM bachelor's degrees is 2.4 percent, which is larger than the hourly wage premium but far smaller than the 27.5 percent salary premium for holders of advanced STEM degrees. Taken together, these findings indicate that the labor-market advantage of a STEM degree in Japan is concentrated among advanced degree holders. The returns to a STEM bachelor's degree alone are limited and, even when present, arise primarily through longer working hours rather than higher hourly wages.

Among Social Science graduates, regular employment rates are 79.8 percent for men and 52.8 percent for women. Relative to these baselines, advanced STEM degree holders have notably higher rates of regular employment: 11.0 percentage points higher for men and 12.4 percentage points higher for women. The corresponding differences for STEM bachelor's degree holders are smaller: 3.0 percentage points higher for men and 2.6 percentage points higher for women. Medicine/Pharmacy graduates display larger differences than Social Sciences graduates, with men being 7.4 percentage points and women 10.8 percentage points more likely to hold regular employment positions. In contrast, Humanities graduates are *less* likely to have regular employment jobs than their Social Science counterparts, with men being 6.6 percentage points and women 7.8 percentage points less likely.

When large firms are defined as those with at least one thousand employees, advanced STEM degree holders are much more likely to work in large firms than their Social Science counterparts: 26.3 percentage points higher for men and 12.9 percentage points higher for women. In contrast, STEM bachelor's degree holders show minimal differences: 0.4 percentage points higher for men and 0.6 percentage points lower for women.[12]

4.2 Occupational Choices by Field of Study

We next examine how occupations vary by field of study, focusing on employment in professional or technical occupations. Among Social Science graduates, only 13.3 percent of men and 8.1 percent of women hold such jobs. Advanced STEM degree holders are far more likely to work in professional or technical occupations than their Social Science counterparts (by 54.3 percentage points for men, and 35.5 percentage points for women), whereas the increase is smaller for STEM bachelor's degrees (28.3 percentage points for men, and 15.8 percentage points for women). At both degree levels, women with STEM degrees are substantially less likely than men to work in professional or technical occupations.

Medicine/Pharmacy graduates are even more likely to hold professional or technical jobs (65.5 percentage points for men and 62.7 percentage points for women relative to Social Science), and the gender gap is much narrower (2.8 percentage points) than in STEM (18.8 percentage points for advanced degrees and 12.5 percentage points for bachelor's degrees). This pattern is consistent with greater attrition of STEM-educated women from professional or technical occupations over the life course—a pattern that appears less pronounced in Medicine/Pharmacy.

We also consider education and public-sector employment, often viewed as offering fewer gender-based barriers and a more predictable work-life balance. Among Social Science graduates, 3.9 percent of men and 4.1 percent of women work in the education sector. Against these benchmarks, men with advanced STEM degrees are 2.8 percentage points more likely, and women with advanced STEM degrees are 8.4 percentage points more likely, to work in the education sector. Humanities graduates of both genders show a strong tendency toward

[12] As a robustness check, we re-estimate our main specifications excluding observations potentially affected by the COVID-19 pandemic. Because the JPSED gathers its data in January but records labor-market outcomes as of the previous December, we restrict the analysis to waves that capture outcomes through December 2019 (i.e., the 2016-2020 waves). In this pre-COVID sample, the estimated wage premium for Medicine/Pharmacy relative to Social Science is 29.1 percent for men and 31.0 percent for women. In our main sample (2016–2025), the corresponding estimates are 26.8 percent for men and 21.9 percent for women (Table 2). These results indicate that the Medicine/Pharmacy advantage was not inflated during the pandemic years; if anything, the estimated premiums are larger when the COVID period is excluded, suggesting that our main findings are not driven by pandemic-specific dynamics in the healthcare sector.

employment in education: 16.7 percentage points higher for men and 7.9 percentage points higher for women relative to their Social Science counterparts. Therefore, women with advanced STEM degrees are about as likely as Humanities graduates to work in education, whereas men with advanced STEM degrees are considerably less likely to do so than their Humanities counterparts.

As for the public sector, men with advanced STEM degrees are 5.6 percentage points *less* likely to work there compared to their male Social Science counterparts, while women with advanced STEM degrees are 3.0 percentage points *more* likely to work there compared to their female Social Science counterparts. These results suggest that women with advanced STEM degrees gravitate more toward education and the public sector than do similarly educated men.

In sum, the STEM wage premium in Japan arises primarily from the attainment of an advanced STEM degree, which is associated (especially for women) with longer working hours, a higher likelihood of regular employment, and a higher likelihood of employment in professional or technical occupations. By contrast, STEM bachelor's graduates tend to enter positions that more closely resemble those of Social Science graduates; this implies that the STEM-related labor-market advantages are concentrated among workers in advanced, professional roles. Accordingly, women's underrepresentation among advanced STEM degree holders is an important contributor to the gender pay gap within STEM fields.

5 Evolution of Gender Differences in Early Career

We examine how gender differences in wages and work characteristics evolve over the early career, following Delaney and Devereux (2022). For each women's field of study f, we estimate the following regression separately by event time t (years since graduation), using a pooled sample of (i) women whose highest degree is in field f and (ii) a male comparison group:

$$y_{it} = \beta_{0ft} + \beta_{1ft}\, Female_i + X_{it}'\delta_{ft} + \varepsilon_{it}, \quad (2)$$

$Female_i$ is an indicator for women, and X_{it} includes age and age squared, birth-cohort indicators, and survey-year indicators. We estimate equation (2) separately for each event time t, so β_{1ft} measures the gender gap at each event t within field f. We then plot the resulting profile over the first ten years after graduation. Because the JPSED respondents are followed for at most nine years, the cohort composition of the estimating sample varies with t: observations close to graduation tend to come from younger (more recent) cohorts, while observations many years after graduation are drawn mainly from older cohorts. To reduce this compositional bias and maintain comparability across event times, we restrict the analysis window to ten years after graduation.[13]

We benchmark women's outcomes in each field against two male reference groups: (1) men with at least a bachelor's degree (in any field), and (2) men whose highest education is high school or junior college. We deliberately do not compare women to men in the same major to emphasize that, in Japan, the earnings of college-educated women can approach—or even fall below—those of men with lower educational attainment. For each field, we plot the estimated coefficients (β_{1t}) by years since graduation to show how women's outcomes evolve relative to these two male benchmarks.

5.1 Wage Differences

We examine wage differences at three intervals within the first decade after graduation—two years, three to five years, and six to ten years—comparing women in each field of study with men who hold at least a bachelor's degree in any field (Figure 1). For women with a STEM bachelor's degree, wages at career start (two years post-graduation) are statistically indistinguishable from the male benchmark (4.2 percent lower), but the gap widens to –12.3 percent at three to five years and –28.1 percent at six to ten years. A similar pattern is observed for Social Science women: the wage gap begins at –4.1 percent and grows to –8.4 percent and –23.0 percent over the same intervals. Humanities women fare even worse: their initial gap is –14.7 percent and expands to –20.3 percent and –34.5 percent, yielding the largest penalty within the first ten years.

In contrast, women with advanced STEM degrees experience no statistically significant wage gap at career start (2.7 percent lower). Although a gap emerges later (–13.8 percent at six to ten years), it remains smaller than in other fields.[14] Medicine/Pharmacy women (bachelor's

[13] Altonji, Kahn, and Speer (2016) also focus on the first ten years since graduation to avoid the impacts of sample composition.

[14] The confidence intervals for the advanced STEM group in Figure 1 are relatively wide because the number of women with advanced STEM degrees is small when the sample is stratified by years since graduation. In our data, the cell sizes for women with advanced STEM degrees are 179 for 0–2 years since graduation (men with a BA+: 4,549), 144 for 3–5 years (men with a BA+: 5192), and 197 for 6–10 years (men with a BA+: 14,250). These small cell sizes increase standard errors, resulting in wider

degree or higher) are unique in experiencing an early-career wage *premium* (6.1 percent above the average man), followed by only a modest penalty later (6.6 percent lower at six to ten years), demonstrating near parity over the decade.

We then benchmark women against men with high-school or junior-college education (Figure 2). Women with a STEM bachelor's degree earn more than the average man at career start (7.3 percent higher) but face a penalty by six to ten years (9.6 percent lower). Humanities women exhibit a sustained wage penalty from early on: 2.2 percent lower at two years—statistically insignificant—followed by 3.5 percent lower at three to five years, and 15.2 percent lower at six to ten years.

Conversely, women with advanced STEM degrees experience an early wage premium (14.0 percent at two years and 21.7 percent at three to five years). For Medicine/Pharmacy women, a sizable wage premium is observed consistently over time (17.6 percent at two years, 18.8 percent at three to five years, and 11.7 percent at six to ten years).

5.2 Difference in Work Hours and Regular Employment

Figure 3 shows the differences in weekly hours worked between women in each field of study and college-educated men in any field during the first ten years after graduation. Within two years of graduation, women with advanced STEM degrees work 1.2 fewer hours per week than college-educated men (not statistically significant). By six to ten years post-graduation, this gap widens to 4.4 hours. Women with STEM bachelor's degrees display a similar pattern (1.0 hours and 5.1 hours, respectively). Medicine/Pharmacy women show a negligible early difference (0.2 hours) and a gap of 4.1 hours by six to ten years. Despite comparable reductions in hours, Medicine/Pharmacy women exhibit only a limited wage penalty relative to men. Women in Social Sciences and Humanities show large declines of 5.8 hours and 6.8 hours, respectively, by six to ten years after graduation.

Figure 4 presents the evolution of regular employment status relative to college-educated men in any field. Gender differences are small early in the career, except in Humanities, where women are already 10.3 percentage points less likely to hold regular employment positions within two years of graduation. For most fields, declines become apparent at between three and five years: the gap reaches 9.6 percentage points in Social Sciences and 12.3 percentage points

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confidence intervals and low statistical power.

among STEM bachelor's degree holders, while it is smaller and statistically insignificant for women with advanced STEM degrees (2.4 percentage points) or Medicine/Pharmacy degrees (3.0 percentage points). By six to ten years after graduation, substantial disparities emerge across all fields—26.0 percentage points in Social Sciences and 26.3 percentage points among STEM bachelor's degree holders. Even for women with advanced STEM degrees or Medicine/Pharmacy degrees, the gaps widen to 7.8 percentage points and 16.7 percentage points, respectively.

In summary, gender differences in work hours and regular employment—relative to college-educated men—are modest early in women's careers but widen significantly over time, particularly during the years when many women form families. These widening gaps are less pronounced among women with advanced STEM degrees or Medicine/Pharmacy degrees. In the next section, we investigate how family formation— specifically motherhood—interacts with these patterns to shape women's wage and career trajectories across academic fields.

6 Heterogeneous Effects: Presence of Children

In this section, we examine how the patterns documented above differ by motherhood status. Prior research shows that many women reduce their labor supply after childbirth, which contributes substantially to the gender wage gap (Bertrand, Goldin, and Katz, 2010; Goldin, 2014; Blau and Kahn, 2017; Kleven et al., 2019; Delaney and Devereux, 2022; Kikuchi, 2025). Building on this literature, we assess the magnitude of the "child penalty" and how it varies across women's fields of study.

Following Delaney and Devereux (2022), Figures 5 (benchmark: college-educated men) and 6 (benchmark: men with a high-school or junior-college education) plot the estimated wage gaps at three event-time intervals—six to eight, nine to eleven, and twelve to fifteen years since graduation—separately for women without children (left panels) and with children (right panels). Each figure compares women in a given field with the corresponding male benchmark (combining fathers and nonfathers).[15] We focus on the window from six to fifteen years post-

[15] Differences in the timing of having children among women by field of study are relatively small. Within five years of graduation, 7.5 percent of women in Humanities, 7.7 percent in Social Sciences, 10.0 percent in STEM, and 6.1 percent in Medicine/Pharmacy have children. These proportions increase to 32.0 percent, 34.5 percent, 35.6 percent, and 38.1 percent, respectively, six to ten years after graduation, showing only modest variation across fields of study.

graduation, which aligns with the typical timing of first childbirth among Japanese women (average age 31—roughly nine years after graduation for college graduates), centering the analysis on the period when transitions into motherhood are most likely to occur.

Among childless women with a Medicine/Pharmacy degree, the wage gap (relative to college-educated men) is essentially zero at six to eight years (–0.2 percent) and becomes a modest premium by twelve to fifteen years (9.1 percent). In contrast, *mothers* with a Medicine/Pharmacy degree experience a 9.9 percent penalty at six to eight years, which widens to a 21.7 percent penalty by twelve to fifteen years. When benchmarked against men with a high-school or junior-college education, these mothers' wage penalty is 2.4 percent at twelve to fifteen years (not statistically significant), indicating that even in Medicine/Pharmacy, motherhood is associated with a meaningful wage loss.

For women with advanced STEM degrees, the patterns differ. Among childless women, there is no significant gap at six to eight years (3.0 percent penalty), but their wages fall to 21.4 percent less than college-educated men by twelve to fifteen years post-graduation. When compared with men with a high-school or junior-college education, childless women with advanced STEM degrees earn 19.7 percent more at six to eight years but only 0.3 percent more by twelve to fifteen years. For mothers with advanced STEM degrees, the wage penalties are far larger: 38.5 percent less relative to college-educated men and 14.4 percent less relative to men with a high-school or junior-college education at six to eight years post-graduation—showing a sharp motherhood-related divergence.

For Social Sciences, Humanities, and STEM bachelor's, not only mothers but also nonmothers face substantial penalties early in comparison to college-educated men. At six to eight years post-graduation, mothers' gaps are 32.4 percent (Social Sciences), 45.1 percent (Humanities), and 44.0 percent (STEM bachelor's), reaching 48.9 percent, 57.2 percent, and 37.7 percent, respectively, by twelve to fifteen years. When benchmarked against men with a high-school or junior-college education, childless women still earn less by twelve to fifteen years in Social Sciences (10.7 percent less), Humanities (21.3 percent less), and STEM bachelor's (8.5 percent less).

We next examine gender differences in weekly working hours among women with and without children, as shown in Figure 7 (benchmark: college-educated men). Between twelve and fifteen years after graduation, mothers work substantially fewer hours per week than college-educated men: 13.3 hours less in Social Sciences, 14.8 hours less in Humanities, 13.1 hours less in Medicine/Pharmacy, and 12.3 hours less for those with a STEM bachelor's degree. The reduction is smaller for mothers with advanced STEM degrees (9.7 hours per week less). Childless women also work fewer hours during this interval: 6.7 hours in Social Sciences, 6.3 hours in Humanities, and 6.4 hours for those with a bachelor's degree in STEM; in contrast, childless women with advanced STEM degrees work only 1.9 fewer hours and those in Medicine/Pharmacy, 3.4 fewer hours.

We also examine gender differences in regular employment among women with and without children, benchmarked against college-educated men (Figure 8). Even women without children are less likely than college-educated men to hold regular employment at six to eight years after graduation: the gap is 16.0 percentage points less for women with a bachelor's degree in STEM and 15.4 percentage points for women with Social Science degrees. By contrast, the gap is much smaller for women in Medicine/Pharmacy (2.7 percentage points) and for those with advanced STEM degrees (1.1 percentage points). These patterns indicate that substantial gender gaps in regular employment persist even among women without children, except in Medicine/Pharmacy and advanced STEM, suggesting that these disparities are caused not only by motherhood.[16]

Taken together, these results show that even among women without children, significant wage penalties persist *unless* they hold an advanced STEM degree or a Medicine/Pharmacy degree—and those wage penalties are considerably larger for mothers. Childless women in Medicine/Pharmacy are the only group with wages comparable to the average college-educated man. While childless women in Medicine/Pharmacy—and, early in their career, those with

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[16] We compare regular-employment rates at first job for women who are observed to become mothers by 2025 ("mothers") and women who are not observed to have a child through 2025 ("nonmothers"). Because the nonmother group includes women who may become mothers after 2025, they are, on average, about five years younger than mothers. With this caveat, first-job regular employment is similar for mothers and nonmothers across fields, suggesting limited selection on this observable dimension at career entry (e.g., STEM bachelor's: 78.1 percent for nonmothers vs. 77.3 percent for mothers (men: 86.8); STEM advanced: 77.0 vs. 84.1 (men: 91.2); Medicine/Pharmacy: 87.0 vs. 86.2 (men: 85.4); Social Science: 76.2 vs. 78.6 (men: 83.5)). In contrast, gaps in *current* regular employment are large: across fields, mothers are about 20–28 percentage points less likely than nonmothers to be in regular employment. Among STEM bachelor's: 59.5 percent of nonmothers are regular employees compared with 31.5 percent of mothers (men: 80.1); among STEM advanced: 65.2 vs 44.4 (men: 89.6); Medicine/Pharmacy: 73.1 vs. 48.6 (men: 86.0); Social Science: 59.2 vs. 31.4 (men: 77.1). Moreover, even among nonmothers, rates of regular employment decline substantially relative to their first job and remain well below men's current regular-employment rates.

advanced STEM degrees—avoid or delay wage gaps, mothers and even nonmothers in Social Sciences, Humanities, and STEM bachelor's face large and widening penalties by twelve to fifteen years post-graduation. These shortfalls persist even when compared with men who have lower educational attainment.

7 Discussion

Women with Medicine/Pharmacy degrees or advanced STEM degrees are an important exception in our results: on average, they maintain wage parity with university-educated men. Understanding the mechanisms underlying this pattern is therefore critical for identifying policies and institutional changes that could improve women's earnings in other fields.

Women in these fields are more likely to work in professional or technical occupations that rely on specialized skills. In contrast, holders of other degrees tend to enter broader career tracks in which skills accumulated through experience are less portable across employers. Limited skill portability may help explain why women with a STEM bachelor's degree earn wages similar to women in Social Science. A second plausible mechanism is professional licensure. Licensure in medicine and pharmacy provides a standardized credential and restricts entry, thereby raising wages (Kleiner and Krueger, 2013). Moreover, occupations characterized by greater substitutability among workers and more standardized tasks—pharmacy being a leading example—tend to exhibit smaller gender pay gaps because work can be reorganized without substantial productivity losses (Goldin, 2014, 2021).[17] Viewed through this lens, one policy direction would be to expand and strengthen professional certification systems in other fields. Credentials for professional engineers and registered architects, as well as vendor certifications in the IT sector, could be more broadly recognized and valued in the labor market.

To assess whether women with Medicine/Pharmacy or advanced STEM degrees face smaller motherhood penalties through greater employment continuity, we examine transitions in regular employment from the first job to the period surrounding first childbirth. Because the JPSED panel spans 2016–2025 (10 waves) and attrition limits long-term follow-up, we analyze within-person changes in regular employment in the first job, one year prior to first childbirth, and the most recent post-birth observation while the first child is ages 0–7 (average follow-up:

[17] Goldin (2016) demonstrates that expansion of hospital employment and large retail pharmacy chains made pharmacists more substitutable, reducing the penalties associated with part-time work.

2.3 years; women N = 590). We find that transitions out of regular employment begin well before family formation. Among mothers with Medicine/Pharmacy degrees, regular employment falls from 81.0 percent in the first job to 65.1 percent one year prior to childbirth and 57.1 percent post-birth (N = 63). Similar declines are observed for women with degrees in STEM (72.9, 48.2, 45.9 percent; N = 85), in Social Sciences (80.9, 54.8, 51.6 percent; N = 157), and in Humanities (70.9, 46.0, 38.3 percent; N = 285). In contrast, regular employment among fathers remains consistently high (91.6, 95.1, 96.0 percent; N = 951). The decline is smallest in Medicine/Pharmacy, consistent with licensure supporting employment continuity.

These employment patterns motivate a closer look at earnings. Because the transition from regular to nonregular employment is associated with substantially lower pay, we restrict the sample to individuals who remain in regular employment before and after childbirth. This restriction allows us to isolate changes in earnings that occur *within* regular employment. Even among regular employees, women earn substantially less than men: average annual salary is 3.27 million yen for childless women (average age: 30.8) and 3.56 million yen for mothers (average age: 36.7), compared with 4.61 million yen for men (average age: 33.6), suggesting that a glass-ceiling[18] mechanism may operate even prior to motherhood. We then exploit the panel structure of the JPSED to compare earnings before and after the first birth among individuals who remain in regular employment. Mothers' earnings decline from 3.85 million yen in the year prior to first birth to 3.31 million yen after childbirth (N = 226). In contrast, comparable fathers' earnings increase from 4.85 million yen to 5.62 million yen (N = 867). These patterns indicate a substantial earnings penalty associated with childbirth for mothers, even those who maintain regular employment, while fathers experience continued earnings growth over the same period.

Finally, we examine gender differences in wage growth over job tenure using individual fixed-effect models. We regress log wages on tenure and experience, allow the tenure and experience profiles to vary by gender, and estimate the models separately for women with and without children. The Female × Tenure coefficient measures whether women's wages grow more (or less) steeply with tenure than men's wages, net of time-invariant individual heterogeneity. Among women with advanced STEM degrees or Medicine/Pharmacy degrees,

[18] The glass ceiling effect is not limited to the final stages of a career. It often emerges earlier as a "broken rung" at the first promotion to a managerial or senior technical role (McKinsey & Company and LeanIn.Org, 2019).

we find more favorable tenure-related wage growth for women without children than for women with children: for advanced STEM, the Female × Tenure coefficient is 0.034 for women without children (significant at the five percent level) versus 0.004 for women with children; for Medicine/Pharmacy, the corresponding estimates are 0.016 and 0.004, respectively. In contrast, for women with Humanities, Social Sciences, or STEM bachelor's degrees, the Female × Tenure coefficients are small and similar across motherhood status. Tenure-related wage growth is limited for women in most fields, with the gains concentrated among childless women in advanced STEM fields and Medicine/Pharmacy.

8 Conclusion

This study investigates gender differences in labor market outcomes among highly educated individuals in Japan, focusing on how outcomes vary by field of study and educational attainment. Using the Japanese Panel Study of Employment Dynamics (JPSED), which reports both academic fields and careers, we analyze wages, labor supply, and employment characteristics for women in STEM fields, Medicine/Pharmacy, Social Sciences, and Humanities, and compare these outcomes to two male benchmarks: (i) men with at least a bachelor's degree in any field and (ii) men with a high-school or junior-college education.

Three findings stand out. First, relative to college-educated men, women with a STEM bachelor's, Social Sciences, or Humanities degree face sizable and widening wage penalties over the first decade after graduation, alongside growing gaps in weekly hours and regular-employment status. These gaps are smaller for women with advanced STEM degrees and for those in Medicine/Pharmacy. Second, relative to the lower-education male benchmark (men with a high-school or junior-college education), many gaps persist: by six to ten years after graduation, women with Social Sciences, Humanities, and STEM bachelor's degrees earn less on average than these men. Third, motherhood amplifies these disparities: mothers work substantially fewer hours and experience larger wage penalties across all fields; even in Medicine/Pharmacy—where childless women are closest to parity with college-educated men—mothers' wages are comparable to those of men in the lower-education benchmark (high school/junior college).

Taken together, these results indicate that motherhood is an important driver of gender inequality. It does not, however, fully account for the observed penalties, since sizable shortfalls remain—even relative to lower-education men—among women without children in several fields. The combination of reduced hours and lower rates of regular employment likely contributes to persistent earnings gaps.

Our findings demonstrate a clear need for policies designed to address the multifaceted nature of gender disparities facing highly educated women in the Japanese labor market. Effective measures should include initiatives to create equitable career pathways, to foster supportive and predictable work environments without penalty for flexibility, and to promote a more balanced division of family responsibilities between men and women. Addressing these issues is essential not only for achieving gender equality but also for maximizing the economic contributions of highly educated individuals and encouraging more women to pursue and remain in STEM fields.

Finally, even for men, having a STEM degree is not as financially rewarding as having a degree in Medicine/Pharmacy. This pattern points to deeper structural features of the Japanese labor market that merit further exploration. Future research should therefore focus on uncovering the mechanisms behind these patterns and informing policy discussions to build a more inclusive and equitable workforce.

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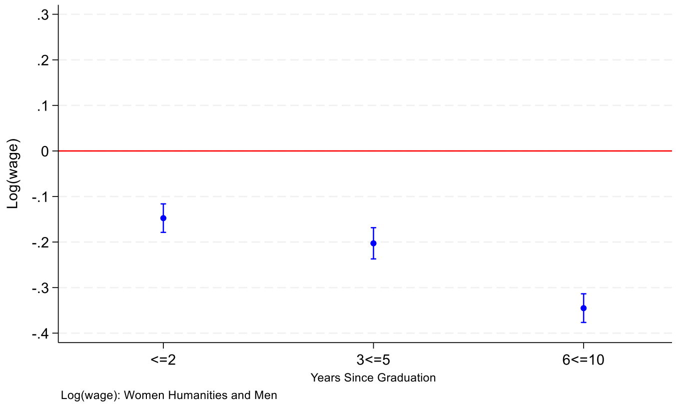
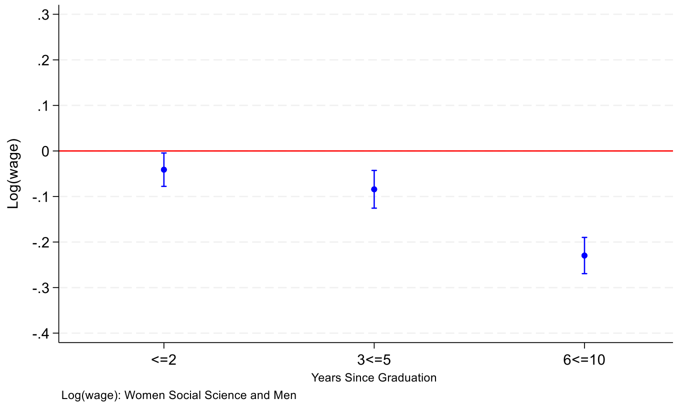
Figure 1: Gender Differences in Log Hourly Pay by Women's Field of Study, Relative to Men with a Bachelor's Degree or Higher in Any Field

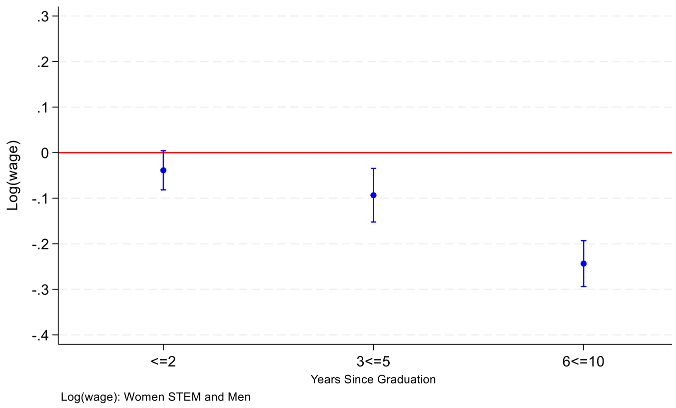
Humanities vs. Men (BA+)



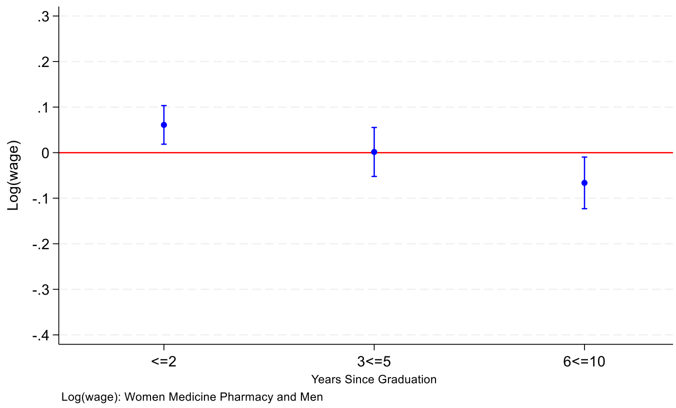
Social Sciences vs. Men (BA+)



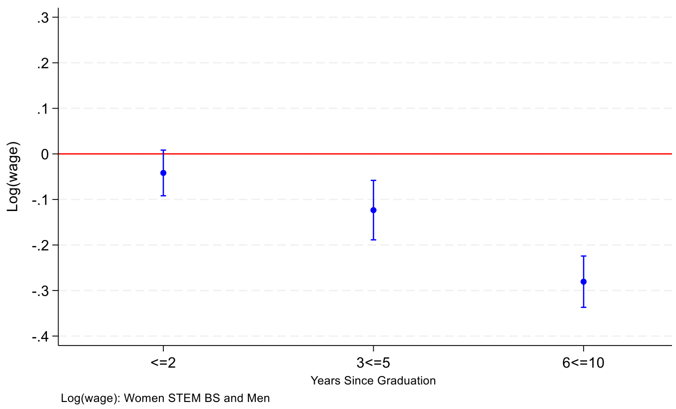
STEM vs. Men (BA+)



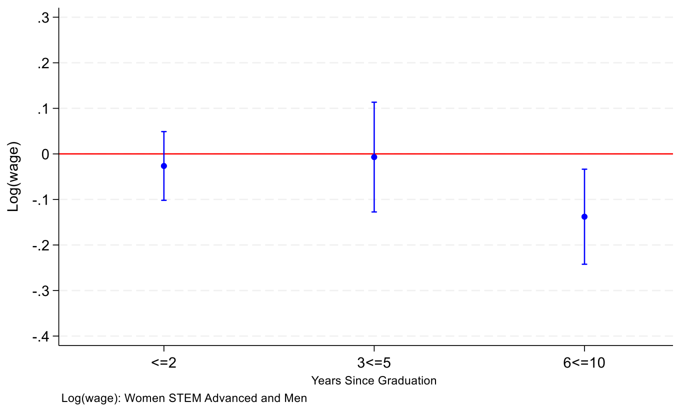
Medicine/Pharmacy vs. Men (BA+)



STEM Bachelor's vs. Men (BA+)

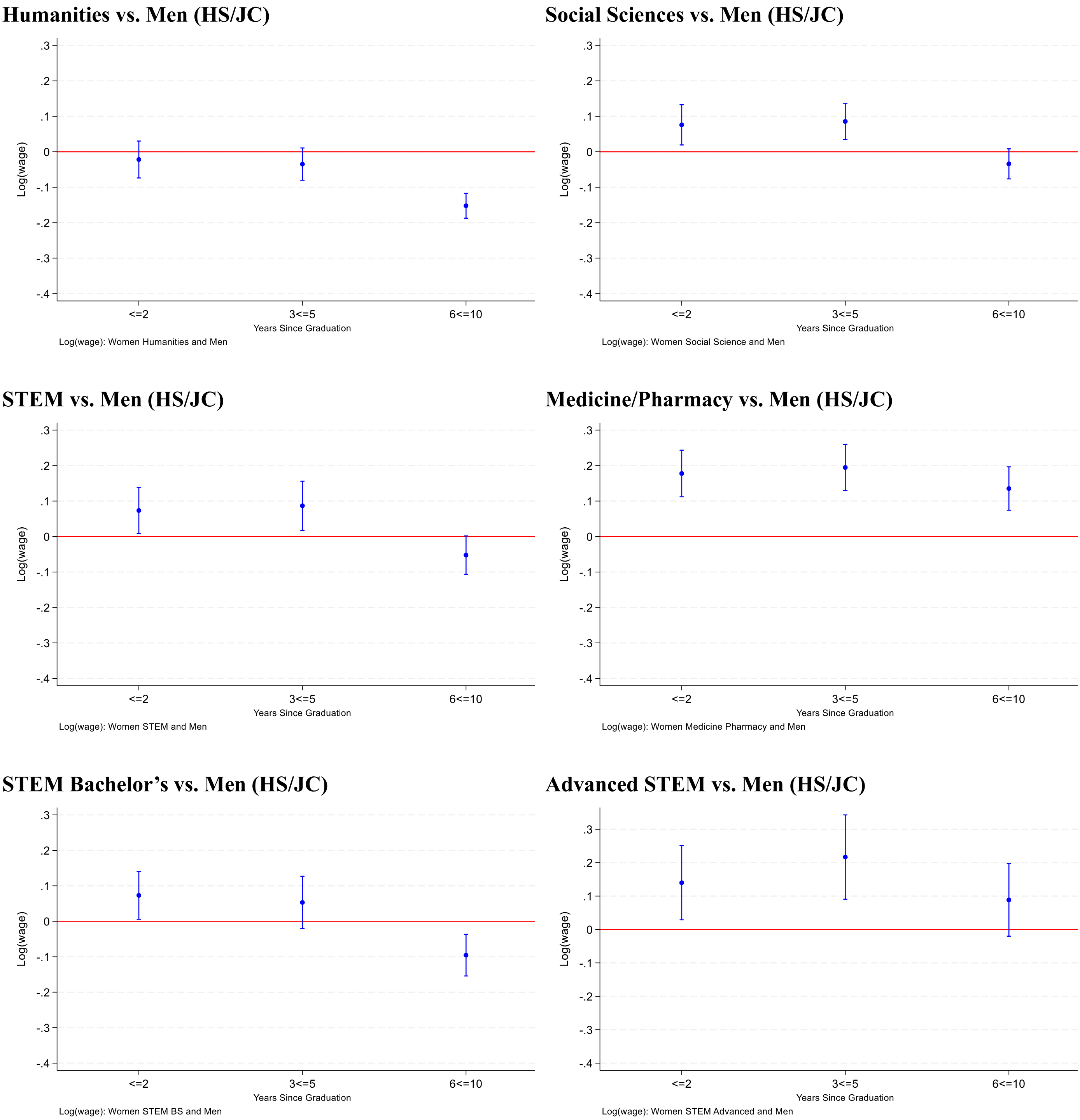


Advanced STEM vs. Men (BA+)



Notes: Each point represents the female coefficient from the regression in equation (1); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 0–2, 3–5, and 6–10.

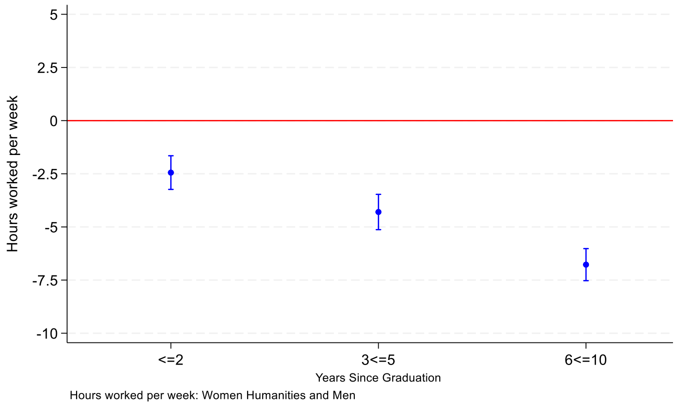
Figure 2: Gender Differences in Log Hourly Pay by Women's Field of Study, Relative to Men with a High-School or Junior-College Education



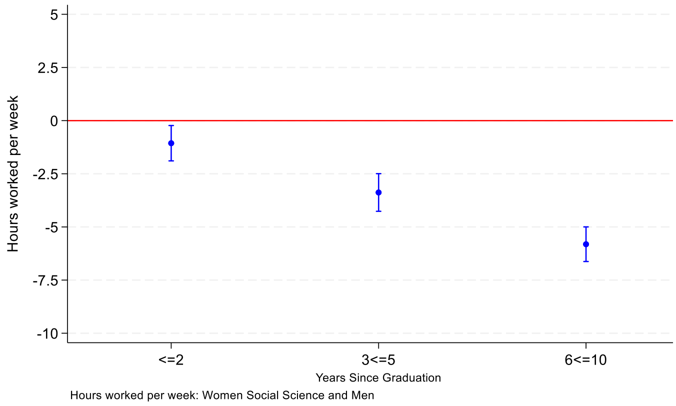
Notes: Each point represents the female coefficient from the regression in equation (1); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 0–2, 3–5, and 6–10.

Figure 3: Gender Differences in Hours Worked Per Week by Women's Field of Study, Relative to Men with a Bachelor's Degree or Higher in Any Field

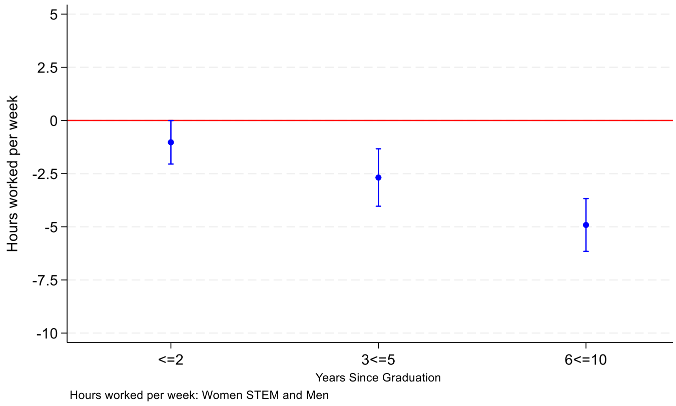
Humanities vs. Men (BA+)



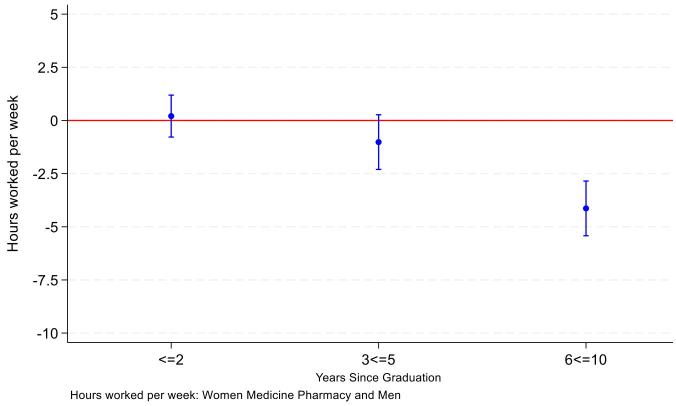
Social Sciences vs. Men (BA+)



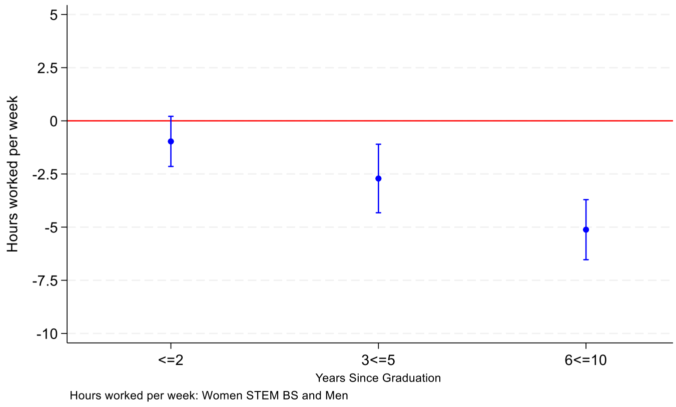
STEM vs. Men (BA+)



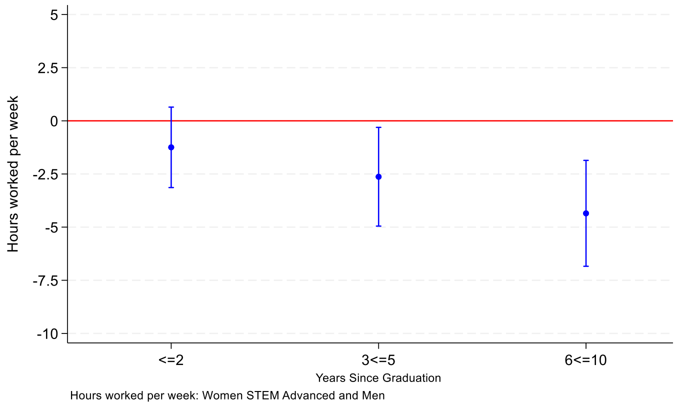
Medicine/Pharmacy vs. Men (BA+)



STEM Bachelor's vs. Men (BA+)

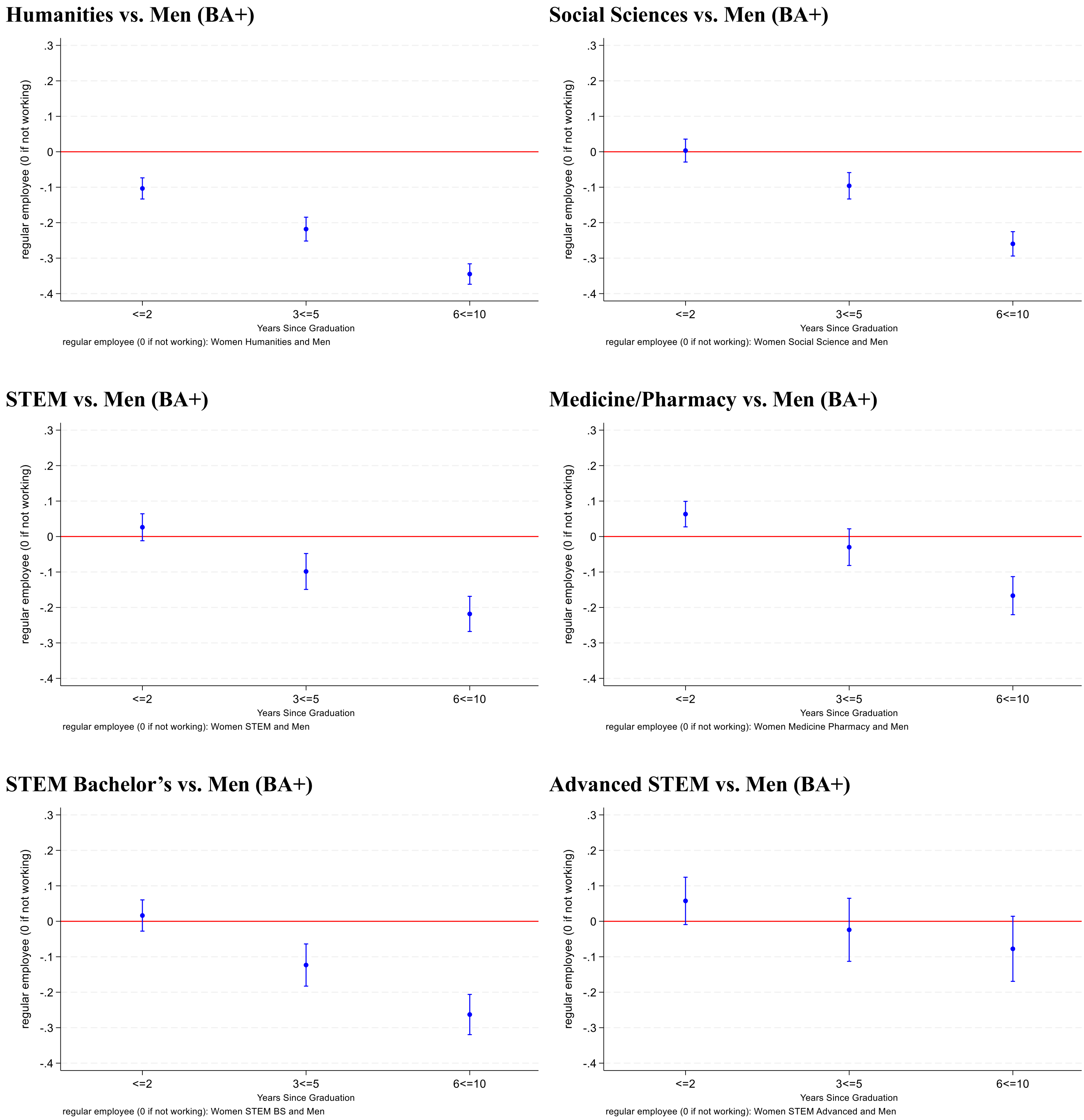


Advanced STEM vs. Men (BA+)



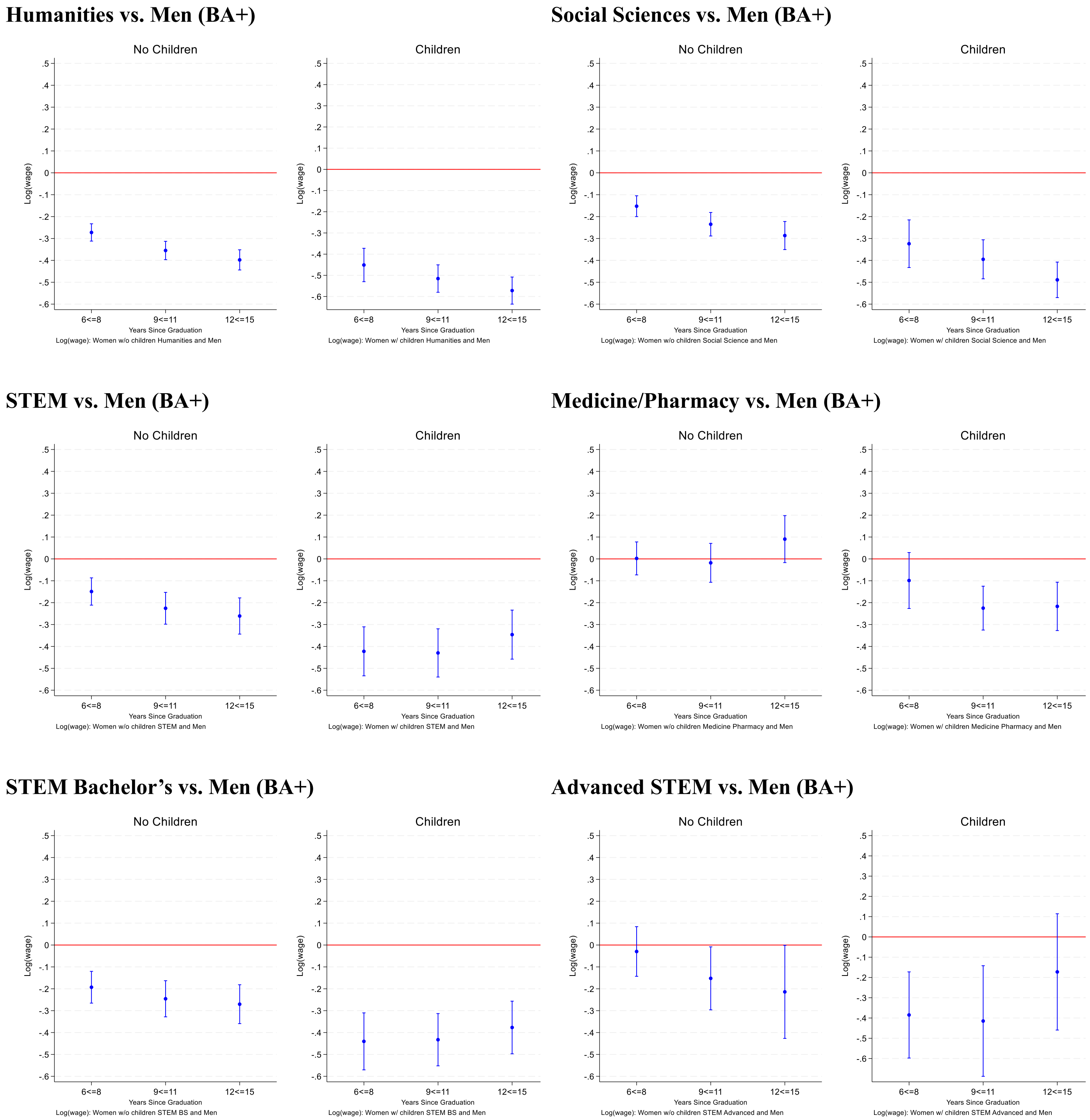
Notes: Each point represents the female coefficient from the regression in equation (1); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 0–2, 3–5, and 6–10.

Figure 4: Gender Differences in Likelihood of Working in Regular Employment by Women's Field of Study, Relative to Men with a Bachelor's Degree or Higher in Any Field



Notes: Each point represents the female coefficient from the regression in equation (1); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 0–2, 3–5, and 6–10.

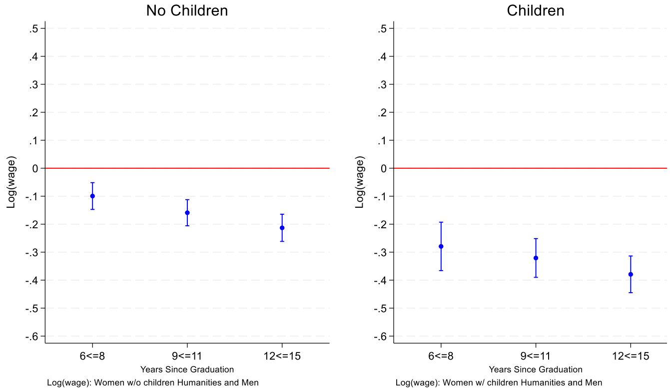
Figure 5: Gender Differences in Log Hourly Rate of Pay by Women's Field of Study, Relative to Men with a Bachelor's Degree or Higher in Any Field: Presence or Absence of Children



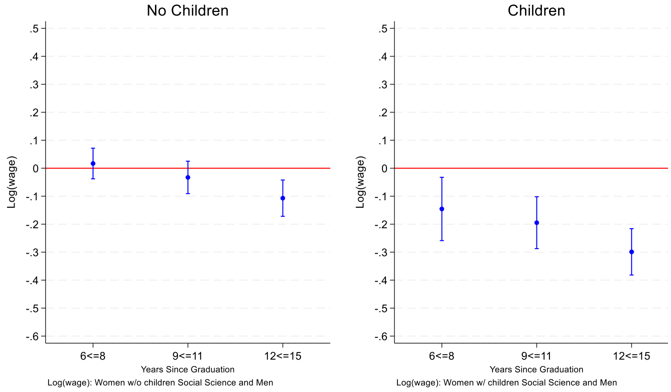
Notes: Each point represents the female coefficient from the regression in equation (2); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 6–8, 9–11, and 12–15.

Figure 6: Gender Differences in Log Hourly Rate of Pay by Women's Field of Study, Relative to Men with a High-School or Junior-College Education: Presence or Absence of Children

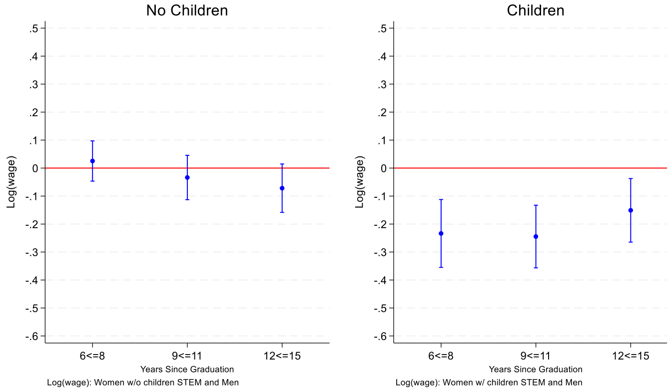
Humanities vs. Men (HS/JC)



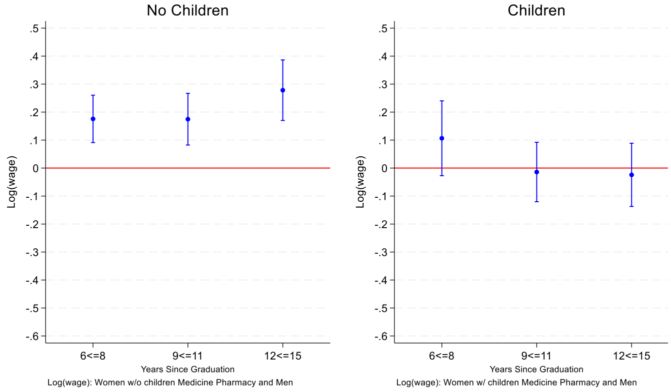
Social Sciences vs. Men (HS/JC)



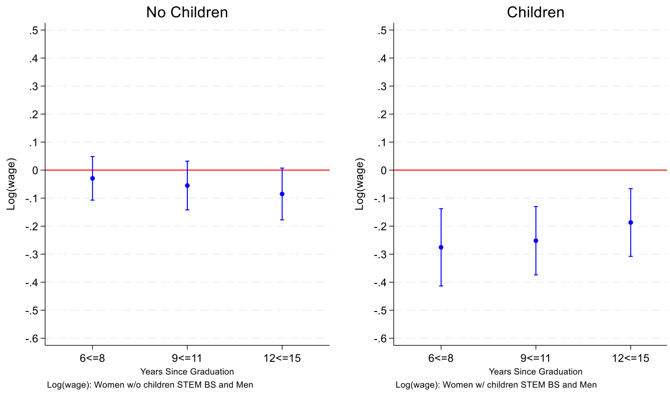
STEM vs. Men (HS/JC)



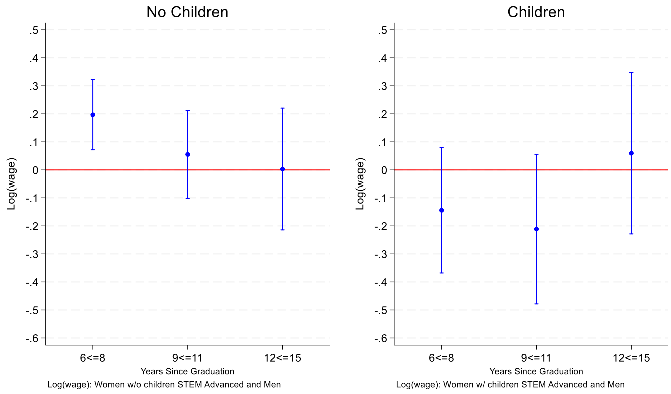
Medicine/Pharmacy vs. Men (HS/JC)



STEM Bachelor's vs. Men (HS/JC)



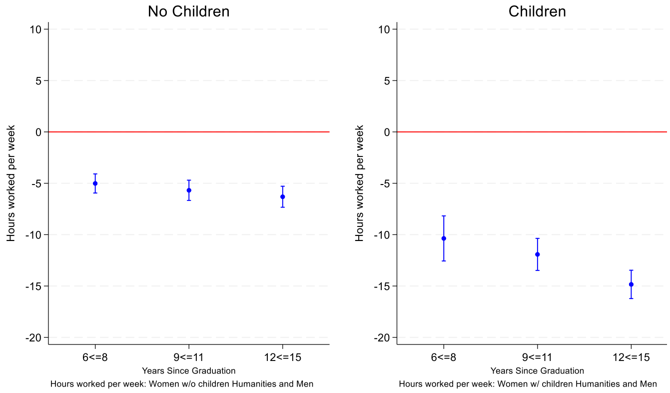
Advanced STEM vs. Men (HS/JC)



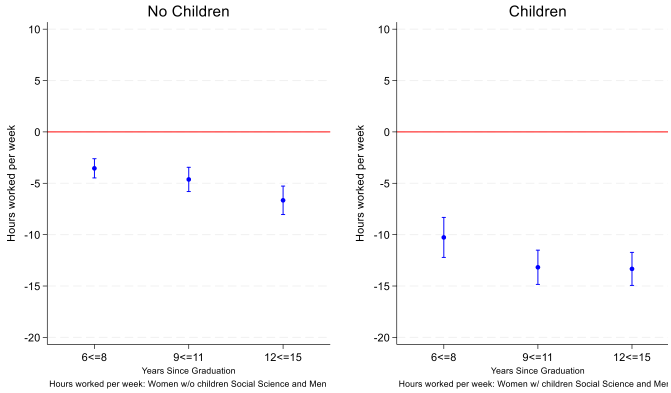
Notes: Each point represents the female coefficient from the regression in equation (2); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 6–8, 9–11, and 12–15.

Figure 7: Gender Differences in Hours Worked Per Week by Women's Field of Study, Relative to Men with a Bachelor's Degree or Higher in Any Field: Presence or Absence of Children

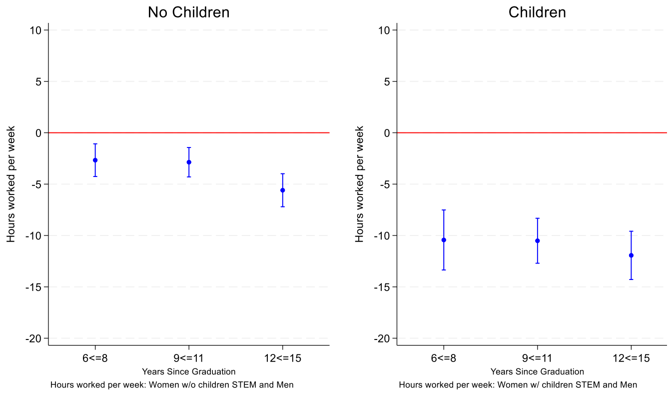
Humanities vs. Men (BA+)



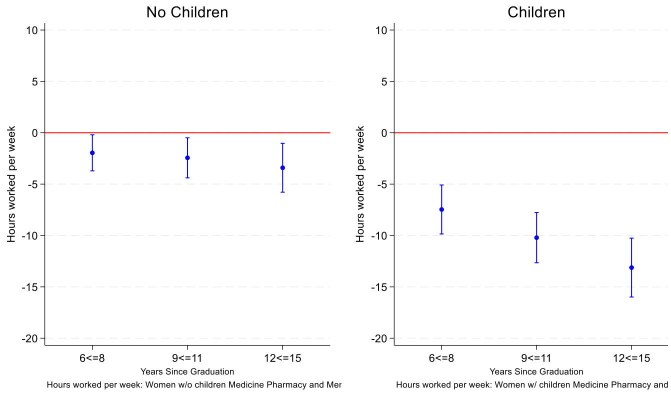
Social Sciences vs. Men (BA+)



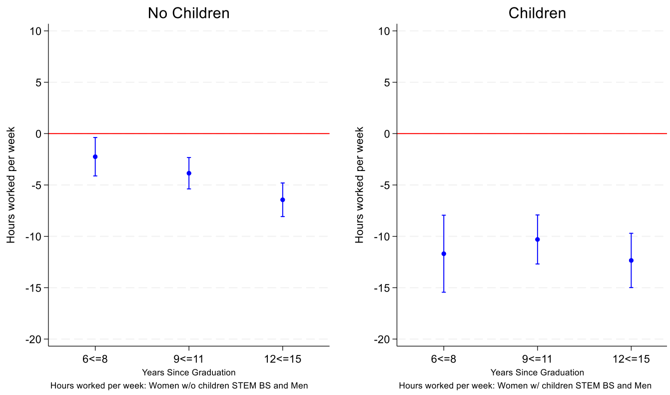
STEM vs. Men (BA+)



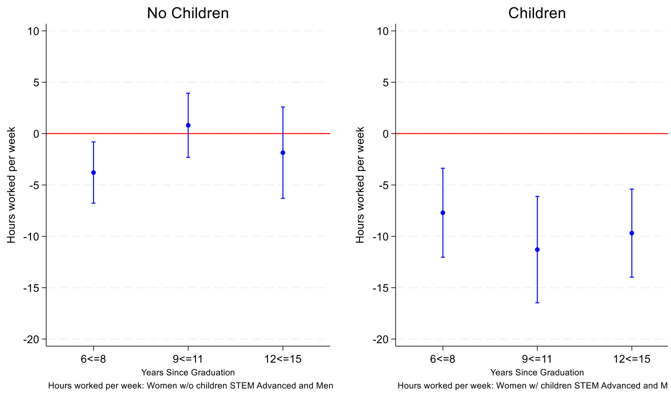
Medicine/Pharmacy vs. Men (BA+)



STEM Bachelor's vs. Men (BA+)



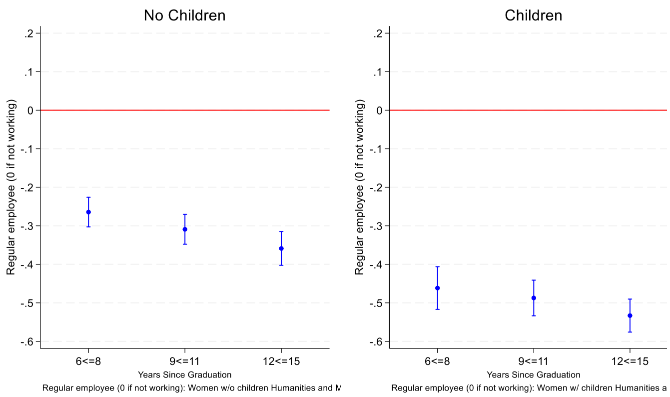
Advanced STEM vs. Men (BA+)



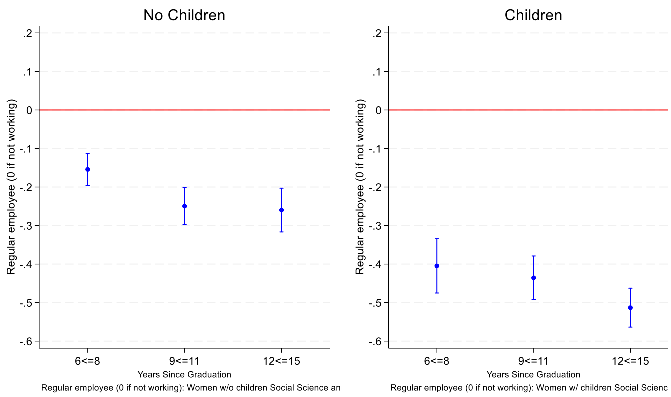
Notes: Each point represents the female coefficient from the regression in equation (2); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 6–8, 9–11, and 12–15.

Figure 8: Gender Differences in Likelihood of Working in Regular Employment by Women's Field of Study, Relative to Men with a Bachelor's Degree or Higher in Any Field: Presence or Absence of Children

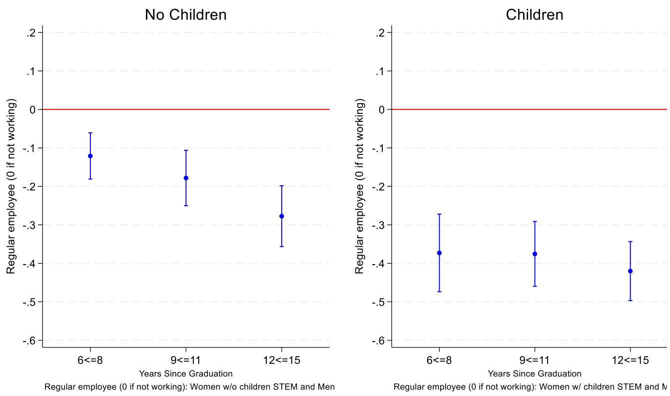
Humanities vs. Men (BA+)



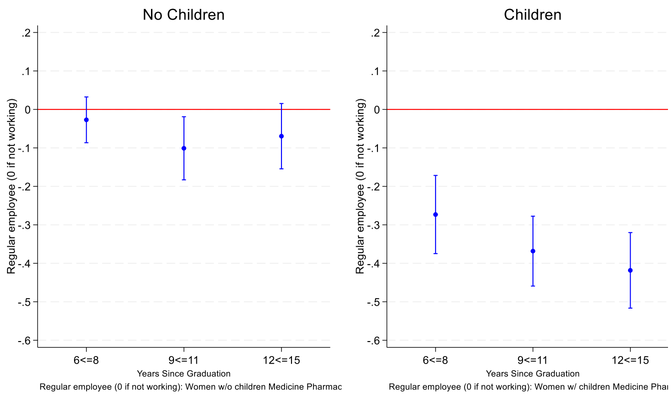
Social Sciences vs. Men (BA+)



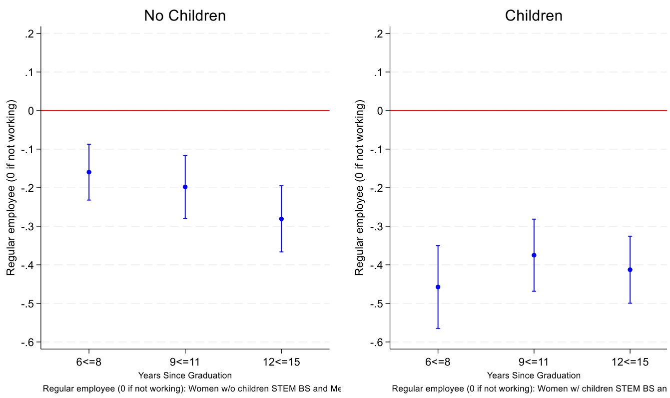
STEM vs. Men (BA+)



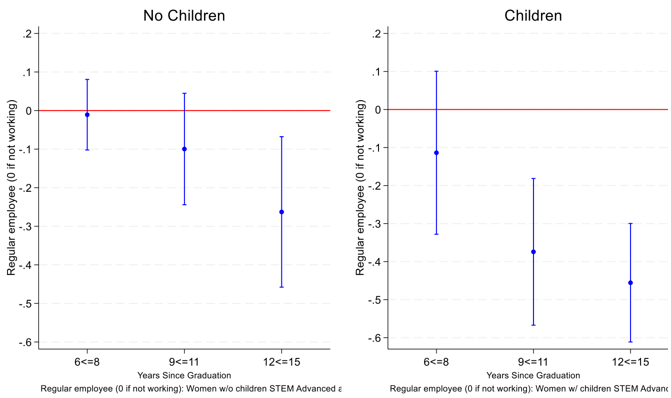
Medicine/Pharmacy vs. Men (BA+)



STEM Bachelor's vs. Men (BA+)



Advanced STEM vs. Men (BA+)



Notes: Each point represents the female coefficient from the regression in equation (2); bars show 95 percent confidence intervals. Controls include age (quadratic), birth cohort, and survey-year fixed effects. Years since graduation on the x-axis are grouped as 6–8, 9–11, and 12–15.

Table 1: Proportion of Women by Field of Study and by Final Degree Earned

Final Degree Earned:	Humanities	Social Sciences	STEM	Medicine/ Pharmacy
Bachelor's Degree	61%	26%	20%	58%
	(5883)	(8875)	(4425)	(1178)
Master's Degree	41%	20%	11%	37%
	(317)	(264)	(1606)	(161)
Doctoral Degree	35%	18%	12%	22%
	(52)	(66)	(146)	(82)
Total	60%	26%	18%	53%
	(6252)	(9205)	(6177)	(1421)

Notes: The percentages represent the proportion of women in each academic category for the specified highest degree level. The numbers in parentheses indicate the total number of individuals in each category.

Table 2: Effects of Field of Study on Wages and Work Characteristics by Gender

	Log(Wage)				Log(Salary)				Hours per Week				Regular Employee			
	Men	Men	Women	Women	Men	Men	Women	Women	Men	Men	Women	Women	Men	Men	Women	Women
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
STEM	0.071***		0.045**		0.107***		0.108***		0.510***		1.091***		0.056***		0.046***	
	(0.009)		(0.019)		(0.012)		(0.032)		(0.174)		(0.404)		(0.007)		(0.017)	
STEM BS		0.003		0.007		0.024*		0.049		0.359*		0.538		0.030***		0.026
		(0.010)		(0.020)		(0.014)		(0.034)		(0.195)		(0.440)		(0.008)		(0.018)
STEM Advanced		0.207***		0.186***		0.275***		0.328***		0.814***		3.184***		0.110***		0.124***
		(0.012)		(0.038)		(0.016)		(0.062)		(0.239)		(0.748)		(0.008)		(0.031)
Medicine/Pharmacy	0.268***	0.268***	0.219***	0.219***	0.307***	0.307***	0.314***	0.314***	0.343	0.343	1.550***	1.550***	0.074***	0.074***	0.109***	0.108***
	(0.017)	(0.017)	(0.020)	(0.020)	(0.023)	(0.023)	(0.031)	(0.031)	(0.368)	(0.368)	(0.443)	(0.443)	(0.012)	(0.012)	(0.018)	(0.018)
Humanities	-0.096***	-0.096***	-0.094***	-0.094***	-0.157***	-0.157***	-0.131***	-0.131***	0.102	0.101	-0.704**	-0.704**	-0.066***	-0.066***	-0.078***	-0.078***
	(0.012)	(0.012)	(0.014)	(0.014)	(0.018)	(0.018)	(0.023)	(0.023)	(0.271)	(0.271)	(0.289)	(0.289)	(0.010)	(0.010)	(0.012)	(0.012)
R^2	0.107	0.117	0.051	0.053	0.093	0.100	0.038	0.040	0.017	0.017	0.034	0.035	0.020	0.023	0.092	0.093
N	56447	56447	25501	25501	59251	59251	27754	27754	59099	59099	27220	27220	62438	62438	33208	33208
Mean of Dept Var for Social Science	7.547	7.547	7.223	7.223	5.887	5.887	5.273	5.273	42.73	42.73	35.56	35.56	0.798	0.798	0.528	0.528

Note: Each column in the table represents estimates from separate regressions. The dependent variable in each regression is indicated at the top of the respective column. All regressions control for age (quadratic), birth cohort, and survey year. "Mean of Dept Var for Social Science" refers to the mean of the dependent variable among graduates from social science fields, reported separately by gender. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2: Effects of Field of Study on Wages and Work Characteristics by Gender (*continued*)

	Large Firm				Public Employee				Professional or Technical Occupations				Education Sector			
	Men	Men	Women	Women	Men	Men	Women	Women	Men	Men	Women	Women	Men	Men	Women	Women
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
STEM	0.088***		0.022		-0.027***		0.014		0.367***		0.198***		0.014***		0.034***	
	(0.009)		(0.015)		(0.006)		(0.009)		(0.008)		(0.013)		(0.004)		(0.009)	
STEM BS		0.004		-0.006		-0.014*		0.010		0.283***		0.158***		0.006		0.021**
		(0.009)		(0.015)		(0.007)		(0.010)		(0.009)		(0.014)		(0.004)		(0.009)
STEM Advanced		0.263***		0.129***		-0.056***		0.030		0.543***		0.355***		0.028***		0.084***
		(0.014)		(0.031)		(0.008)		(0.020)		(0.011)		(0.030)		(0.007)		(0.024)
Medicine/Pharmacy	0.052***	0.052***	0.002	0.002	-0.079***	-0.079***	-0.007	-0.007	0.655***	0.655***	0.627***	0.627***	0.007	0.007	-0.011	-0.011
	(0.019)	(0.019)	(0.015)	(0.015)	(0.008)	(0.008)	(0.009)	(0.009)	(0.013)	(0.013)	(0.015)	(0.015)	(0.009)	(0.009)	(0.007)	(0.007)
Humanities	-0.075***	-0.075***	-0.040***	-0.040***	0.022***	0.022***	0.008	0.022***	0.034***	0.034***	0.045***	0.045***	0.167***	0.167***	0.079***	0.079***
	(0.009)	(0.009)	(0.010)	(0.010)	(0.008)	(0.008)	(0.006)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.006)	(0.006)
R^2	0.021	0.045	0.017	0.020	0.007	0.008	0.003	0.003	0.191	0.216	0.227	0.233	0.055	0.055	0.020	0.022
N	62438	62438	33208	33208	62438	62438	33208	33208	62438	62438	33208	33208	62438	62438	33208	33208
Mean of Dept Var for Social Science	0.278	0.278	0.250	0.250	0.128	0.128	0.064	0.064	0.133	0.133	0.081	0.081	0.039	0.039	0.041	0.041

Note: Each column in the table represents estimates from separate regressions. The dependent variable in each regression is indicated at the top of the respective column. All regressions control for age (quadratic), birth cohort, and survey year. "Mean of Dept Var for Social Science" refers to the mean of the dependent variable among graduates from social science fields, reported separately by gender. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Appendix Table 1: Summary Statistics of Key Variables by Gender and Field of Study

	Men				Women				Men		Women	
	Humanities	Social Sciences	STEM	Medicine, Pharmacy	Humanities	Social Sciences	STEM	Medicine, Pharmacy	STEM BS	STEM MA, Ph.D.	STEM BS	STEM MA, Ph.D.
Age	32.86	33.70	33.82	32.76	32.98	32.56	32.95	31.48	33.63	34.24	32.75	33.85
Bachelor's degree	0.912	0.961	0.695	0.750	0.961	0.973	0.818	0.898	1.000	0.000	1.000	0.000
Master's degree	0.074	0.031	0.280	0.153	0.035	0.022	0.165	0.078	0.000	0.918	0.000	0.909
Doctoral degree	0.013	0.008	0.025	0.096	0.005	0.005	0.017	0.024	0.000	0.082	0.000	0.091
Years since graduation	9.558	10.57	10.03	8.362	10.12	9.702	9.702	8.131	10.53	8.898	9.884	8.884
Annual salary (ten thousand yen)	355.8	412.9	441.6	534.6	223.5	255.6	268.1	324.6	404.8	522.7	251.9	338.6
Married	0.385	0.439	0.475	0.570	0.461	0.463	0.498	0.439	0.452	0.528	0.508	0.449
With children	0.273	0.321	0.334	0.382	0.319	0.324	0.353	0.327	0.330	0.342	0.360	0.318
Log(Wage)	7.365	7.488	7.565	7.702	7.084	7.203	7.218	7.408	7.492	7.719	7.176	7.398
Wage	1876	2114	2232	2592	1437	1622	1670	1944	2093	2530	1576	2076
Hours worked/week	42.61	42.64	43.11	42.11	34.42	35.30	35.94	36.62	42.78	43.82	35.64	37.21
Days worked/week	5.010	5.004	5.026	5.067	4.656	4.720	4.766	4.748	5.037	5.001	4.772	4.739
Work	0.918	0.928	0.940	0.967	0.786	0.791	0.792	0.878	0.928	0.968	0.783	0.833
Regular employee	0.695	0.771	0.830	0.860	0.406	0.502	0.511	0.651	0.801	0.896	0.494	0.586
Times left job	1.040	0.974	0.709	0.755	1.436	1.300	1.212	1.139	0.805	0.491	1.237	1.101
Teaching	0.209	0.038	0.052	0.053	0.127	0.038	0.070	0.042	0.048	0.063	0.056	0.131
Professional and technical	0.146	0.129	0.481	0.759	0.118	0.077	0.258	0.704	0.398	0.671	0.231	0.379
Small firm size	0.363	0.285	0.226	0.257	0.320	0.277	0.274	0.266	0.265	0.137	0.282	0.237
Medium firm size	0.227	0.243	0.257	0.331	0.201	0.205	0.220	0.279	0.271	0.226	0.223	0.207
Large firm size	0.187	0.270	0.352	0.323	0.202	0.248	0.236	0.259	0.270	0.537	0.222	0.298
Public employee	0.140	0.130	0.106	0.056	0.064	0.060	0.062	0.074	0.122	0.069	0.056	0.091
First Job: Regular Employment	0.744	0.835	0.882	0.854	0.679	0.770	0.781	0.868	0.868	0.912	0.778	0.793
First Job: Professional	0.149	0.126	0.519	0.765	0.151	0.107	0.406	0.823	0.443	0.693	0.378	0.530
First Job: Large Firm	0.219	0.315	0.381	0.377	0.260	0.343	0.309	0.382	0.304	0.555	0.292	0.389
N	2529	6813	5088	665	3723	2392	1089	756	3534	1554	891	198