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Takahashi, Ana Maria
Takahashi, Shingo

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Ana Maria Takahashi
Shingo Takahashi

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Abstract

Using a unique data set from our survey of academic economists in Japan, we present the first detailed study of gender promotion gaps in Japanese academia. The length of time from initial appointment to promotion to associate professor is greater for women than men, largely due to women spending more time as lecturer, the lowest academic rank. The gender gaps in promotions from associate professor to full professor are more complex. Childless women are promoted *faster* than childless men. However, since the burden of parenting disproportionately falls on women, this 'reverse' gender gap disappears after a first child is born, and women's time to promotion becomes significantly longer than men's if they have a second child.

Ana Maria Takahashi: Assistant Professor, Graduate School of Economics, Kobe University, Rokkodai cho 1-1, Nada-ku, Kobe, 6578501, Japan E-mail: takahashi_a@econ.kobe-u.ac.jp

Shingo Takahashi: Associate Professor, International University of Japan, Graduate School of International Management, 777 Kokusai-cho, Minami Uonuma-shi, Niigata 949-7277 Japan. Email: staka@iuj.ac.jp

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1 Introduction

Studies on gender promotion differences in academic labor markets reports have found substantial gender promotion differences in universities in both the US and UK. McDowell et al. (2001) used a sample of economists from the American Economic Association (AEA) directory and found that female academics have an approximately 12% lower probability than males of being promoted to full professor after controlling for various characteristics including publication quality. Ginther and Kahn (2004) also used a sample from the AEA directory and found that the probability of receiving tenure is 13.5% lower for women. Ginther and Hayes (2003), using a sample from the US Survey of Doctorate Recipients (SDR) in the humanities, showed that being female decreases the probability of achieving tenure by 6.8%. Ward (2001), using a sample of academics from the UK, showed that the probability that

a male academic becomes a full professor is 10% higher than a comparable female, after controlling for numerous personal, job, and human capital characteristics.[1]

In contrast to the abundance of literature in the US and the UK, there have been few empirical studies about the gender promotion gap within Japanese universities despite a growing public interest in gender equality in Japan. In 1999, the Japanese government enacted *the Basic Law for Gender Equal Society.* Consequently, in 2000, the Association of National Universities set out an *Action Plan* stipulating that each national university should increase the proportion of female academics to 20% by 2010. In 2008, the Ministry of Education, Sports, Science and Technology (MEXT) announced that selected universities would receive 6 million yen for each female academic they hire.[2] Despite such interest in achieving gender equality in academia, little is known about gender differences within Japanese academia. A study conducted by the EPMEWSE[3] (2008, 51-52) showed that women on average have lower ranking posts than men after controlling for age. However, the study did not control for any other differences between male and female academics. Therefore, a detailed study of gender promotion differences is called for.

We conducted the first detailed study of gender promotion differences in Japanese academia by using data that we collected via a mail survey administered in 2008. Our data set contains complete information on the year of each promotion, the exact timing of job mobility, and the types of universities where each respondent previously worked. In addition, data have personal information such as when respondents married and the ages of their children. Furthermore, our data set contains detailed information on the publication record of each academic. Thus, we are able to conduct a duration analysis of promotion while

[1]Earlier studies include Kahn (1993) and Broder (1993). Kahn (1993) used an SDR sample in the fields of economics and management, and found that women's 'hazard' of promotion is lower than that of men. Broder (1993) estimated a simultaneous equation model to show the determinants of rank attainment for a sample of 362 male and 30 female US academic economists. She obtained a lower predicted rank for females, although the result was not statistically significant.

[2]Asahi News, October 5, 2008.

[3]Japan Inter-Society Liaison Association Committee for Promoting Equal Participation of Men and Women in Science and Engineering (annex.jsap.or.jp/renrakukai/2007enquete/h19enquete_report_v2.pdf).

controlling for important time-varying covariates such as the number of young children and marital status at each point in time during the interval prior to promotion.

The academic labor market in Japan is of interest to researchers for the following reasons. According to our conversations with several academics, there seems to be some belief that promotions are granted almost automatically based on age, experience, and education. If promotions are decided deterministically in line with this belief, then there should be little room for gender differences. However, no empirical study to date has tested whether this common wisdom is in fact true. Therefore, whether or not there are gender promotion differences in Japanese universities is still an open empirical question.

Second, there are important institutional differences between Japanese and US universities. Unlike the US, in Japan the 'up or out' tenure-track system is almost non-existent, and the majority of employment contracts are on an unlimited term basis (that is, lifetime employment). Consequently, we expect to see a very different picture of gender promotion differences between Japanese and US universities.

The academic labor market is particularly well-suited for the study of gender promotion differences due to the presence of well-defined job ranks that are common across universities. Many past empirical studies that used cross-industry samples typically did not have well-defined ranks that are homogeneous across observations. Consequently, these studies used proxies for job ranks. For example, Winter-Ebmer and Zweimuller (1997) used skill requirements as proxies for job ranks. The use of such proxies always leaves the question of how comparable the job ranks are across observations. Due to well-defined job ranks in academia, we are able to avoid such problems.

The remainder of the paper is organized as follows: Section 2 presents an overview of academic careers in Japan. Section 3 explains our data source, and Section 4 describes the construction of each variable. Section 5 presents summary statistics and provides an initial

look at the data. Section 6 presents our main results. Section 7 concludes with discussions of the results.

2 Background

There are two types of universities in Japan: public (national, prefectural, and city) and private. National universities are funded by the central government, and include prestigious universities such as the University of Tokyo and Kyoto University. Prefectural and city universities are established by local governments and funded by them and the central government. Private universities are established by private entities and are largely self-supporting.

In 2004, the National University Corporatization Law was passed, and it took effect in April 2006. This law brought significant change as the 'corporatization' eliminated the public employee status of academics at national universities, and thus allowed these universities greater freedom in various personnel decisions, including salary and promotion determination.[4] For example, before corporatization, the experience and age necessary to be promoted from an assistant professor to an associate professor in public universities were set by civil service laws. In addition, according to these laws, national university employees were considered civil servants and therefore had job security until they reached retirement age, although it has been possible to hire academics on fixed term contracts since 1997.[5] Lifetime employment requirement no longer applied to faculty at national universities after 'corporatization' took effect. The Prefectural and City University Corporatization Law was passed and took effect at the same time. This law, however, did not force these institutions to 'corporatize', and instead provided them with the option to corporatize if they wished to do so.

Corporatization was supposed to facilitate the adoption of new hiring and promotion

[4]For the details of the National University Corporatization Law, see Yamamoto (2004).

[5]In 1997, the *Law Regarding the Duration of the Contract of University Employees* passed, and allowed universities to hire academics under fixed term contracts.

systems, such as the 'up-or-out' tenure track system, that could increase the competitiveness of universities. In fact, in 2006, MEXT began to encourage public and private universities to adopt this system by providing financial support for introducing and maintaining this system. However, this tenure system has not spread widely yet, at least in economics departments. According to the MEXT website[6], in 2014 only three economics departments received this grant.[7]

Therefore, it is not clear how much promotion practices have changed since 2006. However, our analysis must take into account the possibility that the promotion system changed drastically. For this reasons, our empirical analyses will provide estimation results (1) that restrict the sample up to 2005, and (2) that use the entire sample up to 2008.

There are four academic ranks in Japan. They are, from the highest to the lowest rank, full professor (*kyouju*), associate professor (*jun-kyouju*), assistant professor (*koushi*), and lecturer (*joshu* or *jokyo*). Academics typically start their careers either as lecturers or assistant professors, then move up the ladder to full professor. However, it is not uncommon for people to start their careers as associate professors. Some faculty start their academic careers as full professors after a long non-academic career, often in various ministries. Universities hire them for the expertise they acquired in their respective fields. Those who are hired directly into academia as full professors are not included in our duration analyses.

The lecturer position requires some explanation. Prior to 2007, a lecturer was called a *joshu*, the literal translation of which is an 'assistant'. Despite the name, many *joshu* conducted research independently, and often taught courses independently. According to Kato (1996), who investigated the role of *joshu* using a department level survey, 67 percent of the surveyed departments in social science fields answered that *joshu* were hired to conduct

[6] www.jst.go.jp/tenure

[7] Departments can introduce a tenure track system without receiving MEXT financial support. Certainly, more than three economics departments would have introduced tenure track system. However, the paucity of universities accessing MEXT support indicates that the tenure track system is not wide-spread yet.

their own research while at the same time serving as teaching and research assistants. In addition, Kato showed that 19 percent of public universities and 2 percent of private universities answered that *joshu* were hired to independently teach courses. These results also mean, however, that 33 percent of departments hired *joshu* solely as teaching and research assistants. In fact, research assistant *joshu* were often doctoral students hired by their own universities to work part-time.[8]

In April 2007, MEXT modified university regulations to separate *joshu* who independently conduct research and teach from those who are strictly assistants. The former are now called *jokyo*, and the latter continued to be called joshu. In our data, nobody was *joshu* at the time of survey.

Ideally we should treat only the 'independent research' joshu post as the beginning of one's academic career. However, our analyses use retrospective information of respondents' past career, and prior to 2007, we are not able to distinguish 'independent researcher' *joshu* from 'research assistants' *joshu*. Thus, we have decided to simply treat all *joshu* as equal and at the beginning of their careers, and we simply refer to both *joshu* and *jokyo* as 'lecturers'. Kato's (1996) results that a majority of joshu was hired as independent researchers justifies our decision. Nonetheless, as a robustness check, we will provide an analysis that discards the duration of being a lecturer.

Promotion decisions within Japanese universities are made at the department level, usually by faculty personnel committees. In our survey, we asked who has the greatest influence on promotion decisions at the respondent's university. 66% of the respondents said it was the faculty personnel committee, 10.5% said that it was the department chair, 6.4% answered individual faculty members, 4.16% said it was the president of the university, and

[8] According to a survey conducted by Waseda University in 2007, 53 percent of *joshu* at Waseda University officially worked less than 25 hours per week (Office of Promotion for Gender Equality, Waseda University, 2007). Waseda University, a prestigious private university, hires only its own graduate students to work as *joshu*.

1.9% said that it was the chairman of the board of trustees.

To our knowledge, there are no rigorous empirical studies about how promotion decisions are made in Japanese academia. Thus, let us describe what we know from our conversations with Japanese academics, and from our own experience. For typical permanent positions, who nominates the candidates for promotion? We know that in some universities, candidates nominate themselves, while in other universities, their colleagues or the chair of the department nominates candidates. In one author's university, once a nomination is made, a faculty personnel committee writes a recommendation letter to the entire faculty, who then either approve or reject the promotion at the faculty meeting. There is no requirement to submit outside recommendation letters for promotion. However, the author is not aware of any promotions being denied at his university, and we assume that promotion denials would also be rare in other universities once the candidate is nominated.

The picture is quite different for the universities that adopted up-or-out tenure systems. Candidates on the tenure track are assessed based on their publications and on outside recommendation letters. They can be denied promotion, and we heard that there were actual cases of tenure denials. If candidates are denied promotion, they will have to find jobs in other universities.

Although few universities have adopted a tenure track system, the use of fixed term contracts has been increasing rapidly (Yamanoi et al. 2003). Fixed term contracts are usually used for lecturer and assistant professor posts. Although some fixed term positions allow a limited number of contract renewals, once their contracts expire, these lecturers and assistant professors will have to find other jobs.[9] Thus, for them, promotion is equivalent to finding a permanent position elsewhere. In our sample, 4.6 percent of respondents were working under fixed term contracts when surveyed.

[9]One may be able to apply for a permanent position in the same university if there is an opening. However, some universities do not allow *joshu* to apply for internal positions.

3 Data

The data utilized in this project were obtained from a survey we administered via a postal questionnaire. The original questionnaire (in Japanese), and its English translation are in the web appendix. The majority of prior studies used publicly available data (Kahn 1993; McDowell et al. 2001; Ginther and Hayes 2003; Ginther and Kahn 2004), but some studies undertook independent surveys (Ward 2001). In Japan there are no government or private statistics on academics that allow detailed promotion analysis, which is why we conducted a survey.

The details of the survey methods can be found in our earlier work (Takahashi and Takahashi 2011). We collected 4353 names of faculty in economics departments in Japan from universities websites. Given our financial resources and time constraints, we selected 1863 individuals and sent questionnaires to their university addresses. Ideally, the selection method would have been random, but in our case this could have led to a very small female sample. Therefore, to increase the number of female observations, we selected all the female-sounding names (287 names). The rest (1576 names) were randomly chosen. Questionnaires were sent from April to June 2008 and participants could reply either by mail or online.

By the end of our survey period, we received 362 responses in all (299 males and 63 females) for a response rate of 19.4%. This response rate is not high but not too low either, when compared to other studies employing mail surveys. For example, Moore et al. (2007) achieved a response rate of 13%, while Ward (2001) achieved 30%. Assuming that the female-sounding names were indeed all women, the response rates for men and women are 19% and 22%, respectively. The response rates are not statistically different between genders (p-value=0.19).

The percentage of women in our sample is 16.9%. Based on the statistics provided by the MEXT Statistics of School Education (*Gakkou Kihon Chousa*), the percentage of

females in economics departments in Japan was 12.6% in 2007. Thus, we over-sampled females. Over-sampling of women was purposely done in order to increase the precision of the estimates. In the labor market discrimination literature, over-sampling of minority groups is not uncommon. For example, McDowell et al. (2001) and Kahn (1993) used data which over-sampled females.

The cover letter of the questionnaire listed the three purposes of the survey: (1) analysis of the determinants of wages and promotion, (2) investigation of research, teaching, and administrative workloads, and (3) gender differences in wages, promotions, and perceptions of the work environment. Thus, although we did not present measuring the gender promotion gap as the sole purpose of the survey, we should worry about respondent bias. For example, if only those who felt that gender promotion inequality was an important issue participated, our estimates would be biased. To check for such bias, we asked respondents if they had ever felt discriminated against in terms of work environment, salary, or promotion. 90.58% of the respondents (88.10% female respondents) replied that they had not felt discriminated against in promotion decisions. Therefore, we believe that our data is not significantly contaminated by this type of selection bias. However, our results should be interpreted with caution.

In studies of academic labor market that use survey data, full professors are often over-represented (Blackaby et al. 2005; Moore et al. 2007). However, our data do not seem to have this type of non-random responses. In our sample, 63% of respondents are full professors. However, according to the MEXT Statistics of School Education data, 60% of academics in economics departments in Japan were full professors in 2007. Thus, the difference is relatively minor for our sample.[10]

[10]In Blackaby et al. (2005) 28.5% of their sample are full professors, while the share of full professors in the (UK) population is only 18.8% (p.3). Similarly, Moore et al. (2007) have 37.3% full professors in their sample from the UK, while the percentage of full professors in the population was only 18.8% (p.4-5).

4 The constructions of the variables

We utilize hazard function estimation to examine the gender differences in the following three promotion spells: (1) time to first promotion–the length of time from initial academic appointment to promotion to associate professor; (2) time to second promotion–from associate professor to full professor; and (3) to have a longer term view of promotion, time from the initial appointment to becoming a full professor. Let us explain how the survey questions were used to compute the duration of these three spells.

The questionnaire asked two sets of questions that can be used to find and cross-verify the year of initial appointment in academia. The first set of questions asked about respondents' history of university changes. For each university a respondent worked in the past, the survey asked the year they were hired (start-year) and the year they left the university (end-year). The second set of questions asked which year the respondent obtained the following ranks: full professor (*kyouju*), associate professor (*jun-kyouju*), assistant professor (*koushi*), and lecturer (separately for *joshu* and *jokyo*). As noted above, the jokyo position was created in 2007. No respondents were *joshu* when surveyed. All those who entered academia as *joshu* prior to 2007 and who had not been promoted to assistant professor at the time of survey were reclassified as *jokyo* in 2007.[11]

The duration of the first promotion spell (from initial appointment to associate professor), and the second promotion spell (from associate professor to full professor) are then computed using the year of initial entry and the years respondents obtained each academic rank.

[11]There are 5 respondents whose reported years of initial academic ranks came before the reported start-years of their first universities. For all the 5 cases, the initial academic rank was *joshu*, and the years at which they obtained their second academic ranks corresponded to the start-years of their first universities. Therefore, we judged that their josh positions were likely to be of 'research assistant type', and were likely be part time positions. Thus we treated the start-years of their first universities as their years of their initial appointments. There are two respondents whose years of their initial ranks came after the start-years of their initial universities. For them, we used the year of initial academic rank as the beginning of the academic career, assuming that the inconsistency arose due to incompleteness of responses in the university-year questions.

In the empirical analysis, data are split into one-year increments to allow for time varying variables. The first time varying variable is the private university dummy (public university as the excluded category). This variable was constructed from the question on the start- and end-years of employment at all the universities where respondents had worked. This question also asked respondents to identify the type of university (public or private) that had employed them, enabling us to create a time varying private university dummy. In case the university type is missing, we include a dummy indicating that it is missing.

The second time varying variable is the marriage dummy. We asked respondents what year they married, enabling us to construct a marriage dummy that takes 1 only for the years during which they were married. The third (set) of time varying variables are the children variables. We asked the ages of all the respondents children at the time of the survey. Using this information, we constructed variables that show the number of children who fall into two age brackets, 0–5 and 6–18.

The regressions control for respondents' age at the beginning of their academic careers.[12] We control for final academic degrees by including a dummy for the master's degree, and a dummy for PhDs from foreign universities, with PhDs from Japanese universities as the excluded category. We control for cohort dummies for those who entered the academic labor market in the 1980s, 1990s, 2000-2005, and 2006 onward. The cohort that entered academia starting in 2006 is expected to capture the possible effects of the national and public university 'corporatization' that began that year. The 2000-2005 cohort dummy captures the possible effect of the 2000 *Action Plan* that stipulates that national universities should increase the number of female academics.

In the 1990s, there was a significant convergence in the percentage of male and female PhD graduates entering academia.[13] The 1990s cohort dummy captures the effects of possible

[12]This variable was constructed as current age minus academic experience, where academic experience was computed as 2008 minus the year of initial appointment

[13]See Takahashi and Takahashi (2011).

changes in the labor market conditions that caused this convergence. The cohort dummy for the 1980s captures the effects of specific labor market conditions at that time, for example, the enactment of the *1985 Law of Equal Employment Opportunity of Men and Women.*

We also control for research productivity. In the questionnaire, we asked respondents for the total number of refereed articles and books they had published to date.[14] We converted the number of career publications into yearly publication rates by dividing the number of publications by years of academic employment. This conversion assumes that publication rates are constant over time, an assumption that is likely erroneous, but since promotions were decided in the past, converting publication into an annual rate is necessary, and failing to control for measures of productivity could confound gender differences in productivity with gender differences in promotion.

5 Summary statistics and an initial look at the data

We eliminated from the analysis the observations for which we cannot determine the years respondents entered academia (6 observations). Respondents who entered academia directly as full professors were dropped from the analysis (22 observations). Respondents who entered academia in 2008 (the year of survey) were dropped because a duration that is shorter than one is treated as zero in our one-year increment data (4 observations). Four other observations were dropped due to incompleteness or inconsistency in their responses. Eliminating these observations, we have the final sample of 326 observations.

Although the full sample contains 326 observations, this is the number of observations available only for the analysis of the spell from initial appointment to becoming full professor. The available samples are different depending on the promotion levels and on sample restrictions. Table 3 summarizes sample sizes for different intervals and for different sample

[14]In the survey, we separately asked the number of single-author articles and co-authored articles. In computing the total number of career articles, we divided the number of co-authored articles by 2 assuming that the majority of co-authored articles are written by two authors

restrictions. Appendix A details the reasons for the variations.

Table 1 shows the summary statistics for women and men in the largest sample used in this study. Because some of the variables are time varying, we show the summary statistics at the time of promotion to full professor, or at 2008 if respondents have not been promoted to full professor. There are 56 female observations, approximately 17 percent of the sample. The average age at initial appointment is 31.2 for men and 32.2 for women. As compared to male academics, greater percentages of females entered academia in the more recent cohorts (see cohorts from 1990s onward). Both *Annual refereed article rate* and *Annual book rate* are higher for female academics. While this may reflect a woman's shorter academic career if the life-cycle publication profile is concave, we did not find evidence of concavity in our data.[15] 32 percent of men and 37 percent of women's final degree is a master's degree. Thus, women have lower academic qualifications on average, which may contribute to slower promotion.

The bottom half of the table also provides the summary statistics at the time of survey (2008) to provide another picture of the respondents. Note that these variables are not used for the analyses because the regressions use retrospective variables. The average age of respondents is 50 for men and 43 for women. 64 percent of men and only 42 percent of women are full professors. Thus, women are under-represented in the highest academic rank and over-represented in all the lower ranks.

Table 2 presents respondents rank at initial appointment. There appear to be some gender differences in initial rank assignment. 13.7 percent of men and 9 percent of women began their careers as associate professors. The percentage of women whose initial rank was lecturer is slightly lower (23.2 percent) than that of men (29.6 percent). We will later investigate if there are gender gaps in the initial rank assignment.

Let us now show the Kaplan-Meier survival estimates that use the restricted sample

[15]We regressed career publications on academic experience and its squared term. However, the squared experience did not have a statistically significant effect.

up to 2005. Figure 1A plots the survival curves for the first promotion–from the initial appointment to associate professor, separately for males and females. Women's survival curve lies slightly above that of men, indicating that women may be promoted more slowly than men. Figure 1B plots the survival curves for the second promotion–from associate professor to full professor. Interestingly, women's survival curve lies slightly below that of men, indicating that female academics may be promoted more quickly than male academics. Finally, Figure 1C shows the survival curves from the initial appointment to full professor. Women's survival function lies slightly above that of men, but the difference seems to be fairly small.

6 Empirical results

6.1 The gender differences in the initial rank at hiring

As described in Table 2, there is considerable variation in initial academic rank. Before presenting our duration analyses, it is useful to see whether there are any gender differences in initial rank assignment. Table 4 column 1 shows an ordered probit regression where the dependent variable takes the value 3 if the initial rank is associate professor, 2 if it is assistant professor, and 1 if it is lecturer. The regression controls for age at hiring, and includes a dummy indicating if the respondents were married when hired.

The female coefficient is negative, but is insignificant. The marginal effects of *Female* for the probability of being hired as an associate professor, an assistant professor, and a lecturer are approximately -3%, -5%, and 8%, respectively. Thus, women are more likely to be hired as lecturers than men. However, all the marginal effects are not statistically significant.

Columns 2 and 3 show the multinomial probit results. The marginal effects of *Female* on starting their careers as associate professors, assistant professors, and lecturers are -3%, 0.6%, and 4%, respectively. Thus, women are more likely to start their careers as lecturers, though the estimated gender gaps are not statistically significant.

6.2 Hazard function analysis for the first promotion

Now we show the result of Weibull hazard function estimation for the first promotion spell: the spell from the initial appointment to associate professor. As noted earlier, Japanese academia underwent a significant change in 2006 when national universitas were 'corporatized'. Thus, the promotion patterns might have changed since then. Therefore, we run regressions on two different samples, one ending in 2005 and the other one ending in 2008. Table 5 Models 1, 2 and 3 show the estimated hazard ratios for the restricted sample up to 2005.

Model 1 is the most parsimonious model and controls only for age at hiring. In this model, females' hazard ratio is about half that of males, and is statistically significantly different from 1 at the 5 percent level. Model 2 contains all other explanatory variables. The female hazard ratio is almost unchanged, and it is statistically significant even at the 1 percent level. The hazard ratio for *Age at hiring* is greater than one, indicating that those who enter into academia at an older age are promoted more quickly. Those whose final degree is a master's degree have lower hazard of promotion than those who have PhDs from Japanese universities. Having a PhD from a foreign university does not have a significant effect on promotion. The children variables do not show significant effects either. Promotion is slower at private universities.

Model 3 includes interactions between *Female* and the children variables, as well as an interaction between *Female* and *Married*, to capture the possibility that children and marriage have more negative impacts on promotion for women. However, the hazard ratio for *Female* is almost unchanged, although its statistical significance decreased. Unexpectedly, the numbers of children in all age categories are positively associated with the likelihood of promotion, both for males and females. The effects are even greater for female academics.

While children can increase the probability of promotion through motivation effects[16], a more likely explanation is that children capture unobserved job differences. For example, suppose that there are two types of employers–one type promotes automatically while the other promotes on merit. Further suppose that the automatic type promotes employees more quickly on average than the merit type. Then, academics in the former type of universities are more likely to have a child during the first promotion interval, while academics in the latter type of university may wait until they have met their promotion criteria, hence causing children to be positively associated with promotion probability. In fact, as will be shown later, children have negative effects on the second promotion.

Models 4, 5 and 6 simply re-estimate Models 1, 2 and 3 by using the full sample up to 2008. To capture the possible 'structural change' starting in 2006, we include the interaction between *Female* and the dummy indicating that the observations are after 2006.[17] All the models exhibit qualitatively similar results as the previous models, although the statistical significance of the female hazard ratio for Models 6 increased. All of the hazard ratios for the interaction between *Female* and *After 2006* are greater than 1, although they are statistically insignificant.

What are the magnitudes of the estimated gender promotion gaps? Figure 2A shows the survival curves for women and men, based on Model 2.[18] As can be seen, there is a fairly large gender promotion gap. At 5 years of experience, the probability of not being promoted is 31.6 percent for men, while it is 51.7 percent for women. The expected time to promotion is 4.1 years for men, compared to 6.2 years for women, a difference of approximately 2 years. Figure 2B compares the survival curves of males who entered in academia at age 31 (the mean), and of males who entered in academia at age 39 (the 95^{th} percentile). Although those

[16]see Krapf et al. (2014) for a discussion.

[17]One may expect that policy change would affect all the coefficients, not just gender. However, given the lack of observations, we decided to capture only the structural change with respect to gender.

[18]We computed for those who are married without children, have PhDs from Japanese universities, and entered academia in the 1990s. Other variables are held at the average.

who enter at age 31 have a higher survival probability as compared to those who entered at age 39, the difference appears to be minor. In fact, the expected time to promotion is 4.1 years if entering at age 31 while it is 4.6 years if entering at age 39. Thus, while age is apparently factored into promotions, experience is a more important factor.

6.3 Discarding the duration of lecturer from the first promotion

As discussed earlier, some lecturers (*joshu*) are part-time research assistants who are graduate students. Ideally, we would not place these 'research-assistant type' lecturers on the first rung of the academic career ladder, a place that should be occupied only by full-time researchers and lecturers with considerable discretion. However, we are not able to distinguish between these two groups prior to 2007. This ambiguity could lead to an under-estimation of the gender promotion gap. For example, suppose that labor market discrimination operates through the decision to appoint PhD course students to 'research assistant type' lecturer positions. If male students are more likely to be appointed as 'research assistant type' lecturers, including the years spent as a research assistant in the first promotion interval will make the gender promotion gap appear smaller.

To test this possibility, we now re-estimate all the models by discarding the time spent as a lecturer from the initial promotion interval, that is, we treat the year a respondent became an assistant professor as his or her initial appointment in academia. Table 6 shows the results. The size of our sample is reduced either because some respondents were lecturers at the time of survey, skipped the assistant professor position, or because some of them became assistant professors in the year of censoring.[19] Although all the female hazard ratios are less than 1, they are much closer to 1 than the earlier results, and all of them are statistically insignificant. Thus, the estimated gender promotion gap *decreased*. The fact that the promotion gap is significantly reduced indicates that the gender gap in the first promotion is largely due to

[19]Although all of the respondents who were lecturers at the time of the survey were *jokyo*, we excluded them for consistency.

women remaining lecturers for longer periods, and perhaps partly due to the possibility we found earlier that women are more likely than men to start their careers as lecturers.

6.4 Hazard function analysis for the second promotion

Now, we provide the Weibull hazard regression results for the second promotion: the spell from promotion to associate professor to becoming a full professor. Models 1, 2, and 3 of Table 7 show the results that use the restricted sample up to 2005. The results are significantly different from the analysis of the first promotion. For Models 1 and 2, the hazard ratios for *Female* are nearly 1, and they are not statistically significant. According to Model 2, having one child age 0 to 5 would decrease the hazard of promotion by the multiplicative factor of 0.74, and it is statistically significant. The effect of children ages 6 to 18 on promotion is small and statistically insignificant. Interestingly, second promotion is faster in private universities, a result opposite to the first promotion analysis.

Model 3 includes interactions between *Female* and the children variables, as well as the interaction between *Female* and *Married*. Children age 0 to 5 reduce the hazard of promotion both for women and men, although the effect is much larger for women and is significant only for them (p-val=0.06). Children age 6 to 18 also decrease the hazard of promotion both for men and women. Again, the effect is larger for women and is significant only for them (p-val=0.06). Interestingly, single women and married women without children have greater hazard of promotion than their male counterparts.

Models 4 through 6 re-estimate Models 1 through 3 by using the unrestricted sample up to 2008. These models simply confirm the results of Models 1 to 3. In sum, for the second promotion, childless women are promoted more quickly than men. The expected promotion interval for a childless woman is 9.6 years, while it is 11.8 years for their male counterparts.

However, when we take the effects of children into account, this 'reverse' promotion gap completely disappears with one child, and women's time to promotion becomes significantly

longer with two children. Figure 3 shows the survival probabilities separately for: (1) married men with one child, (2) married women with one child, and (3) childless married women. The graphs assume that the child was born in the third year of the spell. As can be seen, a woman with one child has a higher probability of not been promoted until the child becomes 6 years old. After that, the survival probabilities of male and female academics with one child are almost identical. Note also that a married woman without children has a much lower survival probability than a married man with one child.

Figure 4 shows the survival probability of married men and women with two children. We assume that the first child was born in the third year, and the second child was born in the sixth year of the spell. As can be seen, the survival curve for women lies much above that for men. The expected duration for men in this case is 11.3 years while it is 14.4 years for women. Thus, although childless women have faster promotions than their male counterparts, the negative effects of children that disproportionately fall on women make their promotion eventually slower than males.

6.5 Hazard function estimation from the initial appointment to full professor

Now, we provide the analysis for the spell from initial appointment to becoming full professor to take a longer term view of promotion. Table 8 Models 1 to 3 show the estimation results that use the restricted sample up to 2005. Models 1 and 2 show that the hazard ratios for *Female* are about half that for males, although a significant level is achieved only for Model 2. When we include the interaction terms between *Female* and the children variables, as well as the interaction between *Female* and *Married*, the hazard ratio for *Female* becomes much closer to 1, and is no longer statistically significant. This confirms our previous findings that the female academics (both single and married) have slower first promotions, but that single women have faster second promotions, so that there is no gender promotion gap.

Models 4 through 6 use the unrestricted sample up to 2008. The results are qualitatively and quantitatively similar to Models 1 to 3. Overall, the results are consistent with our previous analyses about first and second promotions.

6.6 Probit promotion analyses

Small sample size is a concern for this study given that our results could be sensitive to randomness in the data. Thus, we provide additional and simpler analyses of promotion duration using probit models to see if we could confirm our hazard function results.

First, we analyze the first promotion. As shown in the Kaplan-Meier survival graph (Figure 1A), nearly 50 percent of male academics are promoted to associate professor within three years. Thus, we estimate the probability of being promoted to associate professor within 3, 4, and 5 years, separately. Note that the regressions do not include observations that are censored before these threshold experiences. We analyze only the restricted sample up to 2005.

Table 9 shows the results. Columns 1 to 3 are the simple models that do not control for the gender differentiated effects of children and marriage. The gender coefficients are negative and significant for promotion within 3 years and within 5 years. The estimated effects are relatively large. The marginal effect of *Female* coefficient for promotion within 3 years is a 16.7 percentage point reduction in the promotion probability. For promotion within 4 years, the gender coefficient is small and insignificant, indicating that the gender promotion gap estimates are perhaps sensitive to the randomness in the data.

Columns 4 to 6 show the models that control for the gender differentiated effects of children and marriage. The female coefficients are fairly large for promotion within 3 years and 5 years, although the statistical significance decreased. The marginal effect is -0.21 in case of promotion within 3 years. Again, the female coefficient is small and insignificant for promotion within 4 years. However, the results generally confirm our hazard function results

that there is a gender promotion gap for the initial promotion.

Next, we re-examine the gender promotion gap for the second promotion. The Kaplan-Meier survival curve for this spell (Figure 1B) shows that approximately 50 percent of male academics are promoted to full professor within 8 years. Thus, we estimate the probability of being promoted to full professor within 8, 9, and 10 years.

Table 10 shows the results. Columns 1 through 3 show the results that do not control for the gender differentiated effects of children and marriage. The female coefficient for promotion within 8 years is positive but not significant. The female coefficients for promotion within 9 years and within 10 years are negative, although they are not statistically significant. However, the marginal effects are large–approximately -0.12 for promotion within 9 and 10 years.

Column 4 shows the model that controls for the gender differentiated effects of children and marriage. Since the interactive terms perfectly predicted several outcomes for promotion within 8 years and 9 years, we present results only for promotion within 10 years. As can be seen, the female coefficients dropped considerably in absolute value with the marginal effect being -0.04. The interactive term between *Female* and the number of children is negative and highly significant while the coefficient for the number of children alone is small and insignificant. These results confirm our hazard function analysis that the negative effects of children on promotion disproportionately fall on women. The interactive term between *Female* and *Married* is positive and significant, which is inconsistent with our earlier hazard function analysis.

The probit analyses of the time to second promotion suggest that there is no promotion difference among single academics. There is no gender promotion gap for married academics with one child because the negative effect of children is completely offset by the positive effects of marriage for females. However, a gender promotion gap emerges among academics

with two or more children.

Thus, the results of probit promotion analyses are broadly consistent with the major findings of the earlier hazard function analysis: (1) there are gender promotion gaps for time to first promotion (for academics with and without children); (2) single women are not promoted more slowly than men for the second promotion; and (3) there are negative effects of children both for men and women, but the negative effects are much larger for women. One inconsistency is that, while childless women are promoted more quickly for the second promotion according to the hazard function analyses, the probit analyses did not find such a 'reverse' gender promotion gap.

7 Discussions and conclusion

By using a unique survey data set of academic economists from Japanese universities, we have conducted the first detailed study of gender differences in time to promotion within Japanese academia. Our results suggest that women have a longer first promotion spell (from their initial rank to associate professor), and that this gender promotion gap appears to stem largely from women staying as lecturers longer, the lowest academic rank. The gender gaps for the second promotion were somewhat complex. Childless women are promoted from associate to full professor *faster* than childless men. However, the negative effects of children on promotion disproportionately fall on women, so that male and female academics with one child have almost identical promotion rates, and that women with more than two children have significantly longer promotion spells than comparable men. Nonetheless, we also note that we did not find a 'reverse' gender promotion gap among childless academics in our simpler probit analyses.

What explains the finding that women must wait longer for promotion to associate professor but are promoted equally or even faster than men to full professor? One possibility is that some women might have dropped out of the academic labor market before they became

associate professors. Although Japanese universities rarely use the up-or-out tenure track system, the number of fixed term positions has been on the rise, especially for lecturer and assistant professor positions. For fixed term employees, a promotion is often equivalent to receiving a permanent position elsewhere after their contracts expire. If female academics faced tougher criteria for being hired into permanent positions, and if those who could not find a permanent job dropped out of the academic labor market, only the most productive female academics would remain in the upper academic ranks, possibly making female promotion appear faster than male promotion.

We can speculate how likely this scenario is. Every three years, MEXT surveys all the entire faculty in all the universities in Japan about their basic job characteristics such as their monthly salary and the number of courses taught.[20] In addition, MEXT also conducts a survey of every job leaver in every university about their reasons for leaving (questionnaires ask about the quits that occurred in the year prior to the survey).[21] Questionnaires are sent to the university administrators, not to individual faculty, and the universities are legally obliged to respond to the survey.

Summary statistics from these surveys from 1989 to date are available online. We used these statistics to compute the approximate dropout rates in Japanese academia and plotted them in Figure 5. The definition of a dropout is a quit that falls into one of the following categories in the survey: (1) entering a university (as a student), and (2) 'other reasons'. In other words, a dropout is a quit with reasons *other than* moving to another university, retirement, or death. Therefore, these people have likely left the academic labor market. As can be seen, men's dropout rates range between 1.5 percent to 2 percent, while women's dropout rates hover between 4 percent and 5 percent–more than twice that of men. Note that these are average dropout rates, and therefore the dropout rates for younger employees

[20]MEXT Kyouin Kihon Chosa.
[21]MEXT Koyuin Idou Chousa.

are likely to be much higher. Thus, given the higher female dropout rates, we speculate that the above scenario is a real possibility.

In conclusion, to achieve gender promotion equality, our results suggest that a close monitoring of gender promotion gaps in the earliest career stages is important. In addition, further research into the reasons for and the extent of academic labor market dropouts will provide a more accurate picture of gender promotion gaps in Japanese universities. Finally, the negative effects of children on promotion that disproportionately fall on female academics is potentially the largest factor contributing to the gender differences in promotion in Japanese academia. While one should be cautious in making causal interpretations of the children effects due to the fact that family planning decisions are endogenously determined based on unobserved individual traits, the negative association is large enough to warrant attention, and policies to alleviate the negative career effects of raising children are likely to be highly beneficial for the advancement of female academics.

Appendix A Sample sizes by spells and by sample restrictions

Table 3 summarizes sample sizes for different regressions. Let us first discuss the sample sizes for the regressions that use the unrestricted sample up to 2008. For the first promotion (initial appointment to an associate professor), we can only use respondents that entered academia either as lecturers (93) or assistant professors (191). Among them, 11 who are currently full professors did not report the year of promotion to associate professor. Thus, the available sample size is 273 observations.

For the second promotion (an associate professor to a full professor), we can only use observations who had already become associate professor or full professor at the time of survey (301 observations). However, among them, 11 respondents did not report the year they became associate professor. Another 11 respondents became associate professors in 2008, the survey year, and thus cannot be used in the analysis. This leaves us with 279

available observations

When we restrict the sample years up to 2005, we can only use respondents who entered academia in 2004 or earlier because the duration of employment for the respondents who entered academia in 2005 is less than 1, which is treated as zero in the one-year increment data. This reduces the available observations to 290 for the spell from initial appointment to full professor. For the first promotion, 36 out of 290 respondents started their careers as associate professors, so they cannot be included in the analysis of this duration. Another 10 respondents who were already associate or full professors at the time of survey did not report their years of promotion to an associate professor. This leaves us with 244 observations for the spell from initial appointment to associate professor. For the second promotion, 284 (out of 290 available observations) were either associate professors or full professors at the time of survey. However, 10 of them did not report the year they became associate professor, and another 36 became associate professors on or after 2005. This leaves us with 238 observations available for the duration analysis.

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TABLE 1: Summary statistics

	Male #Obs=270	Female #Obs=56
Summary stat at the time of promotion to full professor or at the censoring		
Female	0	1
	-	-
Age at initial appointment	31.274	32.232
	(4.940)	(5.553)
Married	0.830	0.714
	(0.377)	(0.456)
Final degree=Masters	0.326	0.393
	(0.470)	(0.493)
Final degree=Ph.D from foreign univ	0.119	0.071
(Excluded =Ph.D from Japanese univ)	(0.324)	(0.260)
Private universities	0.526	0.625
(Excluded=natial, city, prefectural univ)	(0.500)	(0.489)
University type missing	0.026	0.000
	(0.159)	(0.000)
# Kids aged 0-5	0.300	0.232
	(0.574)	(0.539)
#kids aged 6-18	0.852	0.357
	(1.020)	(0.672)
Annual refereed article rate	0.541	0.740
	(0.715)	(0.918)
Annual book rate	0.117	0.147
	(0.174)	(0.213)
Cohort 1980s	0.267	0.143
	(0.443)	(0.353)
Cohort 1990s	0.244	0.339
	(0.431)	(0.478)
Cohort 2000-2005	0.196	0.375
	(0.398)	(0.489)
Cohort 2006-2008	0.059	0.107
(Excluded=Cohort before 1979)	(0.237)	(0.312)
Below: Summary stat at the time of survey: Not used for duration analysis		
Age at the survey	50.111	43.321
	(11.128)	(8.731)
Academic experience	18.837	11.089
	(11.658)	(8.651)
Experience at current univ	14.019	8.929
	(10.739)	(8.579)
Full professor	0.652	0.411
	(0.477)	(0.496)
Associate professor	0.289	0.429
	(0.454)	(0.499)
Assistant professor	0.052	0.107
	(0.222)	(0.312)
Lecturer	0.007	0.054
	(0.086)	(0.227)

Inside brackets are standard deviations.

TABLE 2: Academic rank at the initial appointment

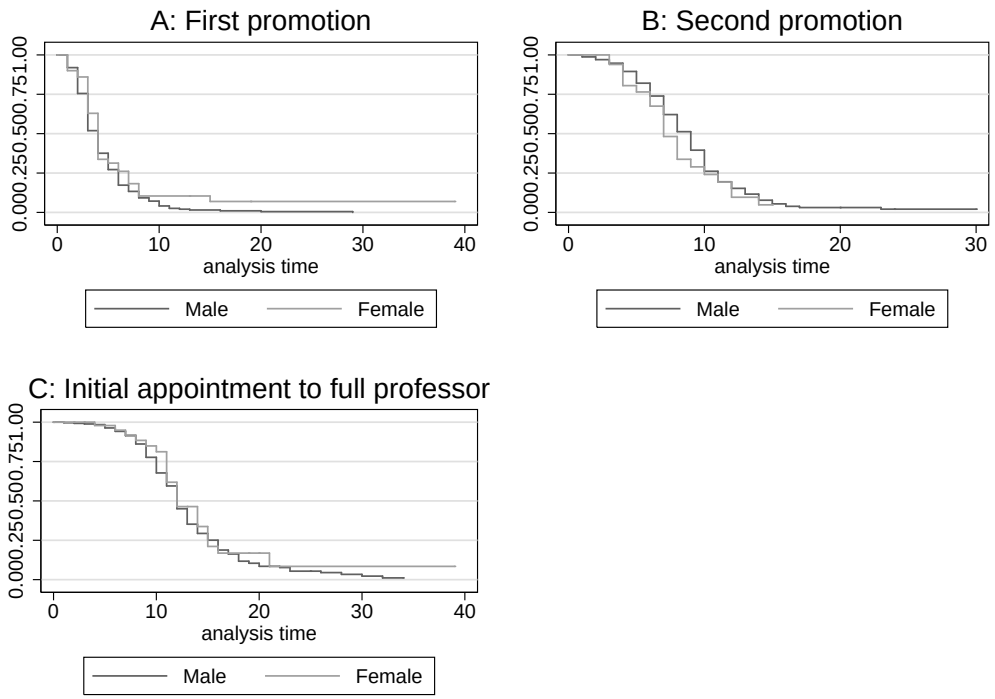
	Male #Obs (Percent)	Female #Obs (Percent)
Associate professor	37 (13.7%)	5 (8.9%)
Assistant professor	153 (56.7%)	38 (67.9%)
Lecturer (both Joshu & Jokyo)	80 (29.6%)	13 (23.2%)

TABLE 3: Available samples by spells and by the sample restrictions

	The first promotion	The second promotion	From the initial appointment to a full professor
Unrestricted sample up to 2008	273	279	326
Restricted sample up to 2005	244	238	290

Initial promotion: from the initial appointment in academia to an associate professor. Second promotion: from an associate professor to a full professor.

FIGURE 1: Kaplan-Meier survival curves



Initial promotion: from the initial appointment in academia to an associate professor. Second promotion: from an associate professor to a full professor.

TABLE 4: Initial Rank Regressions (Restricted sample up to 2005)

	Ordered probit	Multinomial Probit	
		Outcome=FullProf	Outcome=Lecturer
	(1)	(2)	(3)
Female	-0.231	0.109	-0.456
	(0.202)	(0.341)	(0.498)
Age at initial appointment	0.135***	-0.0863**	0.250***
	(0.0198)	(0.0368)	(0.0445)
Married at initial appointment	0.0249	-0.0720	-0.192
	(0.149)	(0.244)	(0.352)
Private univ at initial appointment	0.0666	-0.750***	-1.309***
	(0.150)	(0.249)	(0.395)
Final Degree=MA	-0.0750	0.0686	-0.194
	(0.158)	(0.256)	(0.387)
Final Degree=PhD Abroad	0.346	-0.401	0.439
(Excluded=PhD from Japan)	(0.236)	(0.434)	(0.442)
Cohort 80s	0.116	-0.354	-0.263
	(0.215)	(0.336)	(0.589)
Cohort 90s	0.0974	-0.507	-0.850
	(0.224)	(0.351)	(0.655)
Cohort 2000-2005	0.600**	-1.116***	-0.0482
(excluded=Cohort before 1979)	(0.244)	(0.408)	(0.613)
Cut 1	3.784***		
	(0.539)		
Cut 2	5.868***		
	(0.598)		
Constant		2.878***	-8.462***
		(1.008)	(1.300)
#Obs	290	290	290
Margial effects of Female	Oprobit results	Mprobit results	
Outcome=Assoc prof	-0.029	-0.034	
	(0.023)	(0.028)	
Outcome=Assist prof	-0.049	-0.006	
	(0.049)	(0.086)	
Outcome=Lecturer	0.078	0.040	
	(0.071)	(0.087)	

Inside brackets are the robust standard errors clustered at the individual level. *,**,*** significant at the 10,5,1 percent levels.

TABLE 5: First promotion: From the initial appointment to an associate professor (Hazard ratios)

	Restricted Sample up to 2005			Unrestricted Sample up to 2008		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Female	0.494**	0.486***	0.533	0.498**	0.501***	0.483*
	(0.158)	(0.129)	(0.227)	(0.158)	(0.124)	(0.191)
Age at initial appointment	1.060**	1.040*	1.042*	1.054***	1.035*	1.038*
	(0.0244)	(0.0236)	(0.0245)	(0.0209)	(0.0207)	(0.0217)
Married		0.881	0.927		0.877	0.892
		(0.178)	(0.201)		(0.163)	(0.175)
Married×Female			0.680			0.832
			(0.399)			(0.444)
#Kids aged 0-5		1.213**	1.172		1.233**	1.196*
		(0.116)	(0.119)		(0.107)	(0.111)
#Kids aged 0-5×Female			1.487			1.389
			(0.394)			(0.343)
#Kids aged 6-18		1.048	1.017		1.071	1.014
		(0.149)	(0.155)		(0.141)	(0.158)
#Kids aged 6-18×Female			1.285			1.361
			(0.698)			(0.550)
Private univ		0.686**	0.673**		0.795	0.785
		(0.117)	(0.116)		(0.124)	(0.122)
Final Degree=MA		0.636**	0.636**		0.603***	0.597***
		(0.116)	(0.117)		(0.102)	(0.103)
Final Degree=PhD Abroad		0.927	0.910		0.931	0.905
(Excluded=PhD Japan)		(0.225)	(0.224)		(0.200)	(0.199)
Annual refereed article rate		0.692*	0.680*		0.836	0.829
		(0.154)	(0.150)		(0.143)	(0.144)
Annual book rate		2.083	2.355*		2.084	2.190*
		(1.091)	(1.209)		(0.958)	(1.012)
Cohort 80s		1.572**	1.571**		1.645**	1.639**
		(0.332)	(0.333)		(0.362)	(0.361)
Cohort 90s		2.199***	2.181***		2.245***	2.207***
		(0.546)	(0.555)		(0.545)	(0.548)
Cohort 2000-2006		2.591***	2.553***		3.042***	2.940***
		(0.805)	(0.797)		(0.912)	(0.886)
Cohort after 2006					0.928	0.936
(Excluded cohort: Before 1979)					(0.262)	(0.264)
After 2006				1.010	1.425	1.454
				(0.381)	(0.512)	(0.527)
After 2006 × Female				1.649***	7.004***	6.731***
				(0.317)	(4.108)	(3.891)
Constant	0.0143***	0.0173***	0.0158***	0.0172***	0.0163***	0.0151***
	(0.00986)	(0.0108)	(0.0103)	(0.0101)	(0.00907)	(0.00873)
α	1.534***	1.744***	1.753***	1.528***	1.745***	1.758***
	(0.0885)	(0.0814)	(0.0811)	(0.0826)	(0.0812)	(0.0817)
#Subject-year observations	1,101	1,101	1,101	1,212	1,212	1,212
#Subjects	244	244	244	273	273	273
#fails	216	216	216	248	248	248

Inside brackets are the robust standard errors clustered at the individual level. *,**,*** significant at the 10,5,1 percent levels. Regressions use the Weibull baseline hazard. Regressions also include the dummy for university type missing.

FIGURE 2: Survival curve estimates for the first promotion

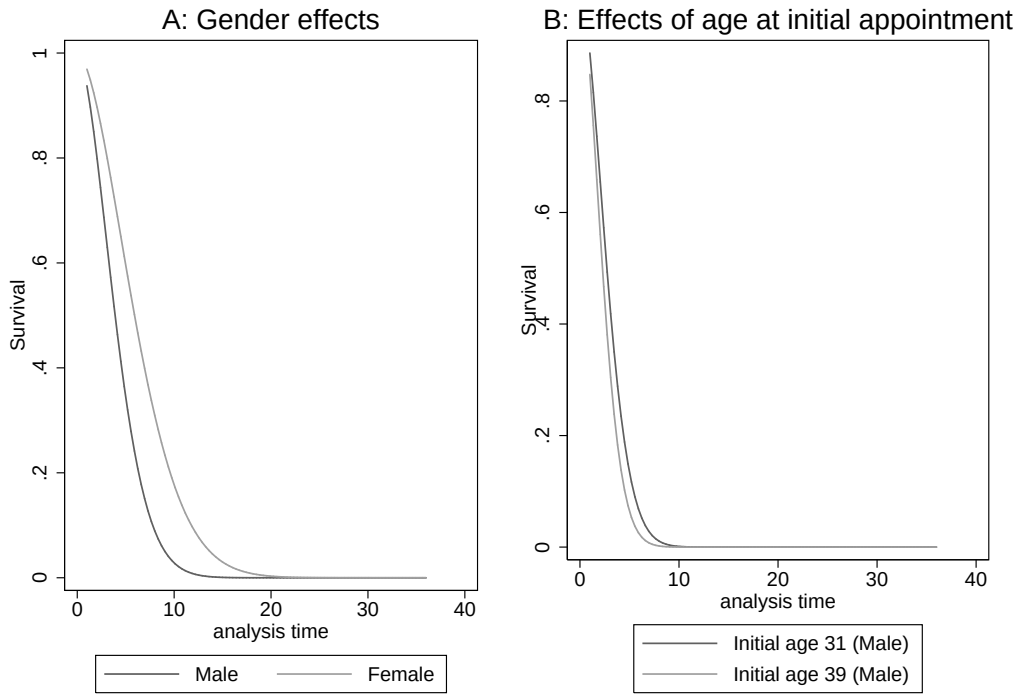


TABLE 6: Discarding the duration of a lecturer from the first promotion (Hazard ratios)

	Restricted Sample up to 2005			Unrestricted Sample up to 2008		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Female	0.881	0.897	0.952	0.849	0.861	0.788
	(0.205)	(0.183)	(0.301)	(0.215)	(0.187)	(0.237)
Age at initial appointment	0.963	0.962	0.963	0.972	0.976	0.976
	(0.0250)	(0.0246)	(0.0244)	(0.0206)	(0.0203)	(0.0206)
Married		0.915	0.973		0.895	0.886
		(0.183)	(0.232)		(0.162)	(0.191)
Married×Female			0.656			0.924
			(0.319)			(0.383)
#Kids aged 0-5		1.009	0.981		1.027	1.003
		(0.103)	(0.108)		(0.0994)	(0.105)
#Kids aged 0-5×Female			1.277			1.286
			(0.327)			(0.343)
#Kids aged 6-18		1.337**	1.225		1.290**	1.180
		(0.178)	(0.156)		(0.161)	(0.151)
#Kids aged 6-18×Female			2.403***			1.731*
			(0.769)			(0.557)
Private univ		0.510***	0.510***		0.575***	0.578***
		(0.0784)	(0.0831)		(0.0809)	(0.0833)
Final Degree=MA		0.761*	0.779		0.724**	0.729**
		(0.120)	(0.128)		(0.110)	(0.114)
Final Degree=PhD Abroad		0.909	0.948		0.924	0.909
(Excluded=PhD Japan)		(0.224)	(0.243)		(0.206)	(0.210)
Annual refereed article rate		0.998	0.974		1.136	1.126
		(0.161)	(0.152)		(0.131)	(0.135)
Annual book rate		0.798	0.910		0.748	0.750
		(0.419)	(0.451)		(0.360)	(0.351)
Cohort 80s		1.239	1.265		1.177	1.190
		(0.275)	(0.283)		(0.263)	(0.269)
Cohort 90s		1.496	1.505		1.420	1.392
		(0.404)	(0.424)		(0.373)	(0.383)
Cohort 2000-2006		1.718*	1.734*		1.674*	1.632
		(0.515)	(0.530)		(0.490)	(0.493)
Cohort after 2006					3.479**	3.573**
(Excluded cohort: Before 1979)					(2.107)	(2.163)
After 2006				1.919***	1.079	1.081
				(0.317)	(0.291)	(0.295)
After 2006 × Female				0.976	1.070	0.992
				(0.352)	(0.375)	(0.360)
Constant	0.220*	0.232**	0.214**	0.156***	0.132***	0.135***
	(0.176)	(0.163)	(0.151)	(0.104)	(0.0793)	(0.0809)
α	1.842***	2.027***	2.049***	1.887***	2.089***	2.109***
	(0.0882)	(0.110)	(0.110)	(0.0875)	(0.108)	(0.109)
#Subject-year observations	778	778	778	867	867	867
#Subjects	219	219	219	248	248	248
#fails	199	199	199	231	231	231

Inside brackets are the robust standard errors clustered at the individual level. *,**,*** significant at the 10,5,1 percent levels. Regressions use the Weibull baseline hazard. Regressions also include the dummy for university type missing.

TABLE 7: Second promotion: From an associate professor to a full professor (Hazard ratios)

	Restricted Sample up to 2005			Unrestricted Sample up to 2008		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Female	1.124	1.139	2.364**	1.104	0.978	2.210***
	(0.309)	(0.311)	(0.911)	(0.295)	(0.254)	(0.655)
Age at initial appointment	1.109***	1.059**	1.055**	1.103***	1.053**	1.049**
	(0.0197)	(0.0254)	(0.0252)	(0.0174)	(0.0222)	(0.0226)
Married		1.442	1.733*		1.162	1.490
		(0.368)	(0.503)		(0.254)	(0.373)
Married×Female			0.769			0.446*
			(0.411)			(0.192)
#Kids aged 0-5		0.740**	0.796		0.768**	0.809
		(0.109)	(0.120)		(0.0995)	(0.107)
#Kids aged 0-5×Female			0.291			0.423
			(0.233)			(0.229)
#Kids aged 6-18		1.062	1.089		1.071	1.087
		(0.0908)	(0.0954)		(0.0830)	(0.0891)
#Kids aged 6-18×Female			0.527**			0.847
			(0.161)			(0.176)
Private univ		2.312***	2.447***		2.571***	2.750***
		(0.508)	(0.542)		(0.529)	(0.580)
Final Degree=MA		0.823	0.857		0.859	0.873
		(0.181)	(0.187)		(0.173)	(0.174)
Final Degree=PhD Abroad		1.824***	2.017***		1.548**	1.744***
(Excluded=PhD Japan)		(0.368)	(0.421)		(0.290)	(0.333)
Annual refereed article rate		0.867	0.886		1.103	1.127
		(0.173)	(0.179)		(0.173)	(0.187)
Annual book rate		7.765***	7.883***		5.952***	5.872***
		(3.619)	(3.640)		(2.366)	(2.335)
Cohort 80s		1.227	1.262		1.263	1.294
		(0.284)	(0.295)		(0.302)	(0.309)
Cohort 90s		1.618*	1.753**		1.874***	2.030***
		(0.408)	(0.440)		(0.442)	(0.484)
Cohort 2000-2006		7.45e-07***	8.30e-07***		0.665	0.722
		(3.71e-07)	(4.18e-07)		(0.415)	(0.447)
Cohort after 2006					1.26e-05***	1.26e-05***
(Excluded cohort: Before 1979)					(9.75e-06)	(9.60e-06)
After 2006				0.611*	0.783	0.786
				(0.157)	(0.211)	(0.212)
After 2006 × Female				2.431*	1.532	1.724
				(1.154)	(0.666)	(0.702)
Constant	0.00012***	0.00011***	7.8e-05***	0.00018***	0.00015***	0.00011***
	(8.44e-05)	(8.60e-05)	(6.51e-05)	(0.000114)	(0.000106)	(8.09e-05)
α	2.552***	2.733***	2.783***	2.453***	2.672***	2.700***
	(0.186)	(0.200)	(0.206)	(0.179)	(0.194)	(0.199)
#Subject-year observations	1,707	1,707	1,707	1,986	1,986	1,986
#Subjects	238	238	238	279	279	279
#fails	165	165	165	189	189	189

Inside brackets are the robust standard errors clustered at the individual level. *,**,*** significant at the 10,5,1 percent levels. Regressions use the Weibull baseline hazard. Regressions also include the dummy for university type missing.

FIGURE 3: Effects of having one child (Second promotion)

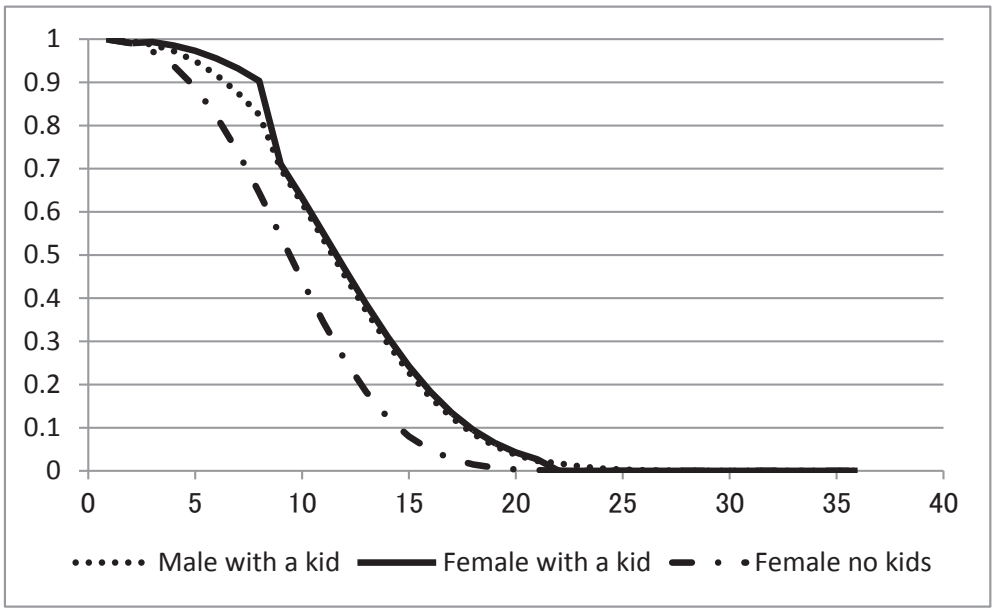


FIGURE 4: Effect of having two children (Second promotion)

TABLE 8: Duration from the initial appointment to a full professor (Hazard ratios)

	Restricted Sample up to 2005			Unrestricted Sample up to 2008		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Female	0.527	0.483*	1.250	0.541	0.466**	1.153
	(0.221)	(0.187)	(0.512)	(0.213)	(0.160)	(0.431)
Age at initial appointment	1.173***	1.136***	1.138***	1.160***	1.118***	1.122***
	(0.0256)	(0.0268)	(0.0266)	(0.0251)	(0.0239)	(0.0243)
Married		0.973	1.283		0.877	1.177
		(0.275)	(0.406)		(0.226)	(0.340)
Married×Female			0.236*			0.211**
			(0.195)			(0.147)
#Kids aged 0-5		0.901	0.890		0.911	0.891
		(0.133)	(0.135)		(0.117)	(0.118)
#Kids aged 0-5×Female			1.043			1.098
			(0.697)			(0.667)
#Kids aged 6-18		1.244**	1.219**		1.272***	1.224**
		(0.108)	(0.110)		(0.105)	(0.110)
#Kids aged 6-18×Female			1.165			1.359
			(0.559)			(0.387)
Private univ		1.331	1.384*		1.446**	1.500**
		(0.247)	(0.259)		(0.261)	(0.276)
Final Degree=MA		0.636**	0.649**		0.658**	0.669**
		(0.135)	(0.137)		(0.127)	(0.130)
Final Degree=PhD Abroad		1.573*	1.741**		1.351	1.465
		(0.399)	(0.432)		(0.338)	(0.363)
Annual refereed article rate		0.957	0.933		1.149	1.119
		(0.189)	(0.190)		(0.194)	(0.198)
Annual book rate		3.628*	4.611**		3.786**	5.068***
		(2.494)	(2.792)		(2.282)	(2.582)
Cohort 80s		1.500*	1.517*		1.543*	1.553*
		(0.357)	(0.365)		(0.369)	(0.376)
Cohort 90s		2.178***	2.205***		2.760***	2.713***
		(0.639)	(0.663)		(0.742)	(0.747)
Cohort 2000-2006		1.21e-06***	2.63e-06***		1.246	1.260
		(5.37e-07)	(1.20e-06)		(0.781)	(0.795)
Cohort after 2006					1.09e-05***	4.22e-05***
					(8.66e-06)	(3.38e-05)
After 2006				0.708	0.689	0.698
				(0.180)	(0.184)	(0.187)
After 2006 × Female				1.703	1.761	1.974
				(0.814)	(0.807)	(0.934)
Constant	1.81e-06***	1.26e-06***	8.29e-07***	3.87e-06***	2.37e-06***	1.50e-06***
	(1.77e-06)	(1.22e-06)	(7.72e-07)	(3.80e-06)	(2.09e-06)	(1.31e-06)
α	3.130***	3.390***	3.419***	2.978***	3.292***	3.320***
	(0.192)	(0.203)	(0.203)	(0.190)	(0.193)	(0.194)
#Subject-year observations	2,911	2,911	2,911	3,305	3,305	3,305
#Subjects	290	290	290	326	326	326
#fails	174	174	174	199	199	199

Inside brackets are the robust standard errors clustered at the individual level. *,**,*** significant at the 10,5,1 percent levels. Regressions use Weibul baseline hazard. Regressions also include the dummy for university type missing.

TABLE 9: Probit analysis of the first promotion: Spell from the initial appointment to an associate professor

Dep var: Promotion within⇒	3 years	4 years	5 years	3 years	4 years	5 years
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.442*	-0.0100	-0.269	-0.574	-0.0756	-0.510
	(0.264)	(0.271)	(0.265)	(0.440)	(0.422)	(0.419)
Age at initial appointment	0.0567*	0.102***	0.0755**	0.0554*	0.101***	0.0745**
	(0.0291)	(0.0371)	(0.0373)	(0.0290)	(0.0369)	(0.0371)
Married (at censoring)	-0.197	-0.215	-0.244	-0.174	-0.198	-0.293
	(0.205)	(0.217)	(0.230)	(0.221)	(0.233)	(0.255)
Married×Female				-0.205	-0.134	0.197
				(0.646)	(0.601)	(0.608)
Total#Kids (at censoring)	0.116	0.00611	-0.00166	0.0538	-0.0284	-0.0252
	(0.121)	(0.118)	(0.118)	(0.127)	(0.123)	(0.124)
Total#Kids×Female				0.678*	0.475	0.286
				(0.378)	(0.422)	(0.414)
Private university (at censoring)	-0.579***	-0.525***	-0.301	-0.580***	-0.523***	-0.298
	(0.183)	(0.190)	(0.191)	(0.186)	(0.189)	(0.191)
Final degree=MA	-0.357*	-0.423**	-0.520***	-0.369*	-0.425**	-0.531***
	(0.190)	(0.193)	(0.196)	(0.191)	(0.194)	(0.197)
Final degree=PhD abroad	0.0228	-0.182	-0.147	0.0207	-0.185	-0.189
(Excluded=PhD Japan)	(0.312)	(0.326)	(0.342)	(0.313)	(0.327)	(0.339)
Annual reference article rate	0.0279	-0.179	-0.196	1.73e-05	-0.197	-0.202
	(0.191)	(0.193)	(0.189)	(0.190)	(0.195)	(0.191)
Annual book rate	-0.0520	0.0519	0.539	-0.0977	0.0624	0.527
	(0.600)	(0.592)	(0.614)	(0.610)	(0.592)	(0.611)
Constant	-1.308	-2.111**	-1.082	-1.226	-2.071*	-0.987
	(0.829)	(1.052)	(1.071)	(0.835)	(1.059)	(1.084)
#Obs	229	224	223	229	224	223

Inside brackets are the robust standard errors. *,**,*** significant at the 10,5,1 percent levels.

TABLE 10: Probit analysis of the second promotion: Spell from an associate professor to a full professor

Dep var: Promotion within⇒	8 years (1)	9 years (2)	10 years (3)	10 years (4)
Female	0.156	-0.317	-0.385	-0.164
	(0.354)	(0.376)	(0.389)	(0.629)
Age at initial appointment	0.0796***	0.107***	0.0615**	0.0609*
	(0.0259)	(0.0327)	(0.0313)	(0.0316)
Married (at censoring)	0.127	-0.261	-0.108	-0.0809
	(0.340)	(0.417)	(0.427)	(0.510)
Married×Female				5.169***
				(1.876)
Total#Kids (at censoring)	-0.171	-0.118	-0.0883	-0.0475
	(0.107)	(0.110)	(0.111)	(0.114)
Total#Kids×Female				-5.285***
				(0.913)
Private university (at censoring)	1.018***	0.899***	0.711***	0.689***
	(0.218)	(0.227)	(0.243)	(0.247)
Final degree=MA	-0.133	-0.0562	-0.0876	-0.0519
	(0.241)	(0.265)	(0.274)	(0.279)
Final degree=PhD abroad	0.502	0.690*	0.982*	0.978*
(Excluded: PhD Japan)	(0.362)	(0.406)	(0.551)	(0.552)
Annual reference article rate	-0.0290	0.160	0.00725	0.0417
	(0.218)	(0.266)	(0.264)	(0.269)
Annual book rate	1.922**	2.401**	2.990**	2.910**
	(0.900)	(1.109)	(1.299)	(1.295)
Constant	-2.997***	-3.246***	-1.571	-1.657
	(0.839)	(1.050)	(1.009)	(1.062)
#Obs	177	174	173	173

Inside brackets are the robust standard errors. *,**,*** significant at the 10,5,1 percent levels.

FIGURE 5: Academic labor market dropout rates in Japan