When can academic researchers rest? An event history analysis on researchers’ research productivity and promotion in academia from 1980 to 2016 in Japan

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ABSTRACT

This study analyzed the factors required for a researcher to become a professor in the humanities and sociology, science and engineering, medicine and biology, and general studies fields. The study focuses on research productivity and analyzes the impact of hiatuses in research production on promotion in universities as well as the time at which such hiatuses have the least impact on promotions. I divided the factors required for promotion into three categories: academic performance (the number of published articles, books, and competitive grants and funding sources acquired), social elements (gender), and elements related to the duration of periods with no research output and their timing. The results show that the probability of promotion to professorship increases as the number of papers in Scopus, the number of books published, and the amount of acquired competitive funds increase. As expected, longer declines in research productivity reduce the probability of promotion. However, it is not always necessary for researchers to publish continuously throughout their careers; the results show that a decline in research productivity other than during the first five years and the period from 20 to 30 years after the start of the research career has no influence on academic promotions.

INTRODUCTION

Promotional factors are an important concern for many people. Various prior studies of this topic have been conducted in both industrial (Datta & Rajagopalan, 1998; Hambrick & Mason, 1984) and academic (Lutter & Schröder, 2016; Sanz-Menendez, Cruz-Castro, & Alva, 2013) fields. There is no doubt that results and productivity are required for promotion. However, it is unclear whether researchers must publish their research results continuously throughout their careers. In other words, when researchers adjust their work-life...
balance by taking maternity leave or childcare leave (Hakim, 2006; Smithson & Stokoe, 2005), will their opportunities for academic advancement decrease?

In particular, various problems have been pointed out in Japanese universities concerning how young researchers work in recent years. One of them is that it is difficult to find a job after obtaining a doctorate in Japan, and many young researchers always feel anxiety about whether they cannot get posts. This is because most of the posts prepared for young researchers at Japanese universities have a term of about one to three years (Okamoto & Okamoto, 2015). As young researchers have to forcibly post a short term until they get a position of tenure, it is regarded as a problem that young researchers tend to avoid research that takes time to get results. Also, as pointed out by Okamoto and Okamoto (2015), universities are highly likely to give posts to graduates, so young Japanese researchers do not want to go abroad or go to childbirth / childcare leave. However, university reform has always been discussed as an important issue in Japan’s educational policy. For example, the management of universities was transformed from government-led to university-led. In addition, many universities have been trying to diversify teachers by positively adopting female researchers and individuals with practical experience in companies. According to the research which carried out the empirical analysis on the university reform, it is certain that the probability that an individual having a work experience at a company is adopted as a professor has increased compared with before the university reform. However, it has been pointed out that female researchers’ promotion difficulties have improved somewhat after university reform but the results of reforms are not statistically significant (Fujiwara, 2017).

So, is the university in Japan a workable working environment? How can we achieve a work-life balance such as childbirth and child rearing while continuing research at university, and to further improve career? In order to find the answer, in this research, I decided to use huge researcher data and to analyze what kind of elements the researchers currently in the professor has raised the probability of promotion. The characteristic of this research is that when evaluating researchers, not only research results such as the number of papers, the number of conference presentations, the award history, but also the length of the period of absence of research presentation and the time of absence were added. I analyzed the influence that these factors had on promotion using the method of event history analysis.

Many previous studies have analyzed the impact of productivity, social capital, and human capital, among others, on promotion. In academia, the concept of the number of publications is widely accepted as an index for measuring productivity (Hix, 2004; Long, 1978), and this measure is considered to be suitable for analysis (Lutter & Schröder, 2016). Many previous studies on academic careers and promotion are based on surveys, single-year studies, or cross-sectional datasets; consequently, they have encountered challenges such as insufficient data, the failure to consider the impact of time, and weak results. These issues can cause endogeneity and survivor bias problems due to bias towards subjects who are already successful in their academic careers. Therefore, for this study, I created a unique longitudinal career dataset for all disciplines and used an event history analysis to analyze the factors that influence the odds of becoming a professor. Much of the previous literature is been based on survey research, single-year studies, or cross-sectional datasets; moreover, most previous studies analyzed academic promotion only for specific fields, such as the biology, science and engineering fields in

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Spain (Sanz-Menendez et al., 2013), sociology in Germany (Lutter & Schröder, 2016), and science in the US (Ginther & Kahn, 2006; Long, Allison, & McGinnis, 1993). However, this field-specific focus does not elucidate the differences among the factors required for promotion in different fields in the same country or at the same time. In this research, I divide all academic fields into four sectors: humanities and sociology, science and engineering, medicine and biology, and general studies.

In this study, I classified the factors affecting the odds of becoming a professor into three categories: academic performance, social elements, and research productivity elements. Academic performance includes the number of published papers and books, conference presentations, awards, and competitive grants and funding sources acquired. Social elements include gender. Research productivity elements include the duration of a decline in research productivity and its career-relative position.

The purpose of this research is two-fold: to clarify the factors necessary for promotion in academia, particularly the impact of a decline in research productivity on promotion, and to verify the point at which researchers can minimize the negative impact of a decline in research productivity on promotion.

The remainder of this paper is organized as follows. In Section 2, I review previous research relevant to this study. In Section 3, I summarize the data and methods used in the present study. In Section 4, I describe the results and findings. Finally, Section 5 provides conclusions.

**Theory**

**Academic performance**

Research productivity measured by publication performance is a primary indicator of academic performance and is said to play an important role in promotion in academic careers (Fox, 1983; Long et al., 1993). Jungbauer-Gans and Gross (2013) analyzed promotion decision factors in the academic labor market for sociology in Germany and found that publications increased the odds of promotion to professor. Additionally, researchers have noted that the number of published scholarly papers and books plays a major role in promotions in academia (Lutter & Schröder, 2016).

Academic awards are associated with researcher reputation and indicate academic potential (Christmas, Kravet, Durso, & Wright, 2008). Some previous studies have reported that academic awards affect promotion in academia (Bagilhole & Goode, 2001; Simpson, Hafler, Brown, & Wilkerson, 2004).

The number of competitive grants and funding sources acquired is also an important indicator used to measure academic performance. Competitive grants are often allocated based on peer review (Coaldrake & Stedman, 1999) and are used as an index to measure research quality. Researchers who have obtained a substantial number of competitive grants tend to have high research productivity and high impact (as measured by citations) (Coaldrake & Stedman, 1999). In Japan, the primary source for competitive funds is Grant-in-Aid for Scientific Research (abbreviated as ‘KAKENHI’). Numerous researchers apply to the government for ‘KAKENHI’ funding every year; of these, approximately 25% are accepted based on anonymous peer reviews. Therefore, the academic reputations of researchers who have acquired a large number of competitive grants are considered to be high.
**Social elements**

Originally, academia was male-dominated (Fotaki, 2013), and research has found that females face discrimination and substantial obstacles in academia (Knobloch-Westerwick, Glynn, & Huge, 2013; Lincoln, Pincus, Koster, & Leboy, 2012; Long, 1990; Long et al., 1993). These obstacles include fewer opportunities to collaborate with mentors because of the need to care for small children, fewer opportunities to collaborate with industry (Tartari & Salter, 2015), marital status, and structural position (Xie & Shauman, 1998). Long et al. (1993) found that females have a lower promotion probability than males. Previous studies have also found that the publications and academic achievements of female scholars are more likely to be evaluated at a lower level than those of males, which is known as the ‘Matilda effect’ (Knobloch-Westerwick et al., 2013; Lincoln et al., 2012; Rossiter, 1993). As many previous studies have demonstrated, the proportion of females in academia declines as the career stage advances (Long et al., 1993; Rosenfeld, 1981), and this phenomenon is referred to as the ‘leaky pipeline effect’ (Leemann, Dubach, & Boes, 2010). However, some recent studies in the German sociology field demonstrated that the proportion of female researchers is increasing due to the influence of gender equality policies and that females have greater chances of achieving tenure than males after controlling for publications (Jungbauer-Gans & Gross, 2013; Lutter & Schröder, 2016).

**Research productivity elements**

Some studies have reported that research productivity has a significant influence on promotion in academia (Fox, 1992; Wanner, Lewis, & Gregorio, 1981). It is important to maintain sustained research productivity to improve the chances of promotion (Fox, 1983; Long et al., 1993). However, research may be temporarily suspended due to illness or to provide care for family members (Beauregard, 2007). In particular, for female researchers may temporarily stop research activities due to maternity leave or childcare leave. Studies have cited the difficulty of achieving promotion in academia while maintaining work-life balance and in situations involving childcare leave (Fox, Schwartz, & Hart, 2006). Therefore, regarding researcher promotions, the length and timing of a period with no research activity is important.

**Data and methods**

This study uses an event history analysis of a unique panel dataset covering all the research fields in Japanese universities. I drew from the researcher database ‘Researchmap,’ maintained by the JST (Japan Science and Technology Agency). Researchmap is the largest researcher database in Japan; it replaced the Research and Development Support Integrated Directory (ReaD), which collected comprehensive information about domestic researchers, research institutes and research resource information since 1998. Researchmap contains data for approximately 250,000 researchers in Japan, including doctoral students, postdoctoral fellows, and tenured and untenured faculty members. Because the database is publicly accessible, it also provides introductions to various researchers. The database includes various pieces of information about the researchers, such as the names of their institutions and their education history, employment history,
specialty fields, papers and books, and academic society affiliations. Researchmap operates in conjunction with the J-global database operated by JST; therefore, I supplemented information on the researchers’ academic performances, such as published papers and books, using data from the interlocking J-global database. Information about articles and books is designed to be retrieved from ORCID, Amazon, and Scopus, etc., but because such information is not automatically updated, individual researchers or their research institutes must provide those updates. The Researchmap database also includes data on researchers who have not been updated for a long period of time. In addition, it is possible to make some data inaccessible, such as gender. Therefore, I selected the data for this study using the following rules. First, I removed records for researchers whose gender was unknown. Next, researcher data that had not been updated since January 2015 was removed. I also excluded researchers with no reported papers. In addition, based on previous research (Lutter & Schröder, 2016), I removed researchers who published their first paper before 1980. Although the database also includes researchers from both research institutes and industry, the present study is limited to researchers currently working in universities. I also eliminated records that did not include an employment history and those that did not explicitly state the researcher’s academic field. After removing ambiguous data and data unsuitable for analysis as described above, data for 14,014 researchers remained. Based on the field classifications defined by the Ministry of Education, Culture, Sports, Science and Technology, I classified all the researchers’ fields of specialization as follows. The humanities and sociology category includes history, geography, anthropology, law, political science, economics, sociology, psychology, and pedagogy. The science and engineering category includes physics, mathematics, astronomy, chemistry, mechanical engineering, electrical and electronic engineering, and civil engineering. The medicine and biology category includes neuroscience, oncology, biology, agriculture, forestry, animal life science, pharmacology, medicine, and dentistry. The general studies category includes informatics, environmental studies, and complex fields such as human medicine engineering, chemical biology, etc.

**Variables**

**Academic performance**

I measured the academic performance of researchers using the number of papers and books published, conference presentations given, awards received, and competitive grants and funding sources acquired. The number of papers reflects the cumulative number of articles at time point t. The papers were classified into Scopus journal articles and non-Scopus journal articles. While the Scopus journal articles are primarily English-reviewed papers, the non-Scopus journal articles include many unreviewed Japanese papers. Similarly, the number of books represents the cumulative number of books published at time point t. The number of conference presentations indicates the total number of cumulative academic presentations given at time point t. The number of awards reflects the cumulative number of awards received at time point t. Awards may include best paper awards and recognitions from academic societies, institutions, newspapers, and so on. The number of competitive grants and funding sources acquired reflects the cumulative number of competitive grants and funding sources a researcher had acquired at time point t.
Social elements
Social elements include female researcher dummy variables. The female researcher dummy variable is a binary variable coded 0 for male researchers and 1 for female researchers. The database also includes researcher data that does not clarify gender, but through machine learning of the first name and individuals whose gender is clear, gender was estimated from the first name for data points with unknown gender. Data that could not be identified through the machine learning technique was excluded from the data set.

Research productivity elements
The experiential elements include periods of zero academic performance and the term during which paper issue was zero. A period of zero academic performance is the number of years in which no papers were published. The term indicates a period during which a researcher published no papers in a year based on the number of years since the researcher started his or her research career. Term 1 represents the period from the start of a researcher’s career to less than 5 years, term 2 represents the period from 5 years to less than 10 years, term 3 is from 10 years to less than 15 years; term 4 is from 15 years to less than 20 years; term 5 is from 20 years to less than 25 years, term 6 is from 25 years to less than 30 years, term 7 is from 30 years to less than 35 years, and term 8 is 35 years or more. The term variables are binary dummy variables; for example, if a year exists in which no publications occur for more than 1 year, and that year is less than 5 years from the start of the research, term 1 is 1; otherwise, term 1 is 0.

Control variables
I control for the reputation of a degree-granting university using the deviation value measuring the difficulty of the college entrance examination. Because universities in Japan have two entrance exams, the passing level is high; therefore, it is considered best to assess the difficulty of the entrance examination to measure the level of the university. Furthermore, I also control for the academic field. As mentioned above, academic fields are classified into four fields: science and engineering, medicine and biology, humanities and society, and general studies.

Methods
To analyze the longitudinal data for faculty members, I use a continuous-time event history analysis to verify the hypotheses. An event history analysis is a multivariate analysis method used to analyze how quickly an event or phenomenon is likely to occur based on a length of time (Allison, 1984; Yamaguchi, 2001). In this study, I regard events as being promoted to professors for researchers belonging to university as ‘events’, and estimate how the occurrence probability changes with time over time. Because the time to promotion to a professorship can be measured as the duration from a researcher’s first publication to the time that they attain the status of professor (Lutter & Schröder, 2016; Sanz-Menendez et al., 2013), an event history analysis is appropriate. I used the Stata software package for the analysis, which can compute both parametric and non-parametric
analyses. The survival function used in the event history analysis represents the probability that an event will not occur until at least a certain point in time, represented as \( t \); it constitutes a complement of the cumulative distribution function \( F(t) \) of \( f(t) \) and can be expressed as follows:

\[
S(t) = \Pr(T > t) = 1 - F(t) = \int_t^\infty f(x)dx.
\]

Under the survival function \( S(t) \) thus defined, the probability that an individual who was not a professor at time \( t \) will be promoted at the next time point \( t + \Delta t \) is expressed as follows:

\[
h(t) = \frac{1}{S(t)} \lim_{\Delta t \to 0} \frac{\Pr(t < T < t + \Delta t)}{\Delta t} = \frac{f(t)}{S(t)}.
\]

When analyzing the determinants of time, non-parametric and semi-parametric models perform coefficient estimations without assuming a baseline hazard function, while a parametric model assumes a specific functional form. In an event history analysis, it is critical to evaluate and select the most appropriate model for the data.

Because it is difficult to assume a specific distribution of survival time – that is, the elapsed time until becoming a professor – I adopt the Cox proportional hazard model used in a previous study (Lutter & Schröder, 2016). Academic performance, such as the number of articles and the number of books, is a value that varies with the passage of time and is a time-dependent variable. Therefore, I estimate the Cox proportional hazard model by using time-dependent variables as covariates.

Results

Table 1 shows descriptive statistics of the data used in this study, where (1) shows descriptive statistics for all researchers, and (2) shows data only for those researchers who became professors. Table 1 (2) shows that researchers required an average of 16.84 years from their first publication to become a professor. Table 1 also indicates the statistically significant differences between males and females for the different variables. On average, the time to professorship is 17.05 years for male researchers and 15.61 years for female researchers, and the difference is statistically significant \((p < 0.01)\). On average, the total number of Scopus journal articles researchers publish before becoming professors is 11.64 overall, 12.75 for male researchers, and 4.96 for female researchers, indicating that, on average, males publish 2.5 times more than females before attaining the status of professor \((p < 0.01)\). The number of books published before becoming a professor is 9.71 on average; here, however, the difference between males and females is not statistically significant. The average number of academic conference presentations given before becoming a professor is 31.95 overall: 33.91 for male researchers, and 20.08 for female researchers. Thus, male researchers present at conferences 1.7 times more often than do females before becoming professors \((p < 0.01)\). The number of awards received before attaining the status of professor is 1.62 for male researchers and 0.95 for female researchers, indicating that male researchers receive 1.5 times more awards than do female researchers before becoming a professor \((p < 0.01)\). The average number of competitive grants and
Table 1. Descriptive statistics in this study.

|                          | (1) Descriptive statistics of all variables | (2) Descriptive statistics of researchers who get professor |
|--------------------------|---------------------------------------------|-----------------------------------------------------------|
|                          | Overall Mean (St.Dev.) | Male Mean (St.Dev.) | Female Mean (St.Dev.) | T-test  | Overall Mean (St.Dev.) | Male Mean (St.Dev.) | Female Mean (St.Dev.) | T-test  |
| Tenure                   | 17.057 (8.198)         | 17.382 (8.251)     | 15.503 (7.756)        | ***     | 16.844 (6.931)         | 17.049 (6.884)     | 15.608 (7.093)        | ***     |
| Scopus journal articles  | 10.543 (25.510)        | 12.012 (27.357)    | 3.529 (11.179)        | ***     | 11.643 (25.213)        | 12.751 (26.487)    | 4.958 (13.675)        | ***     |
| Non-Scopus journal articles | 50.814 (75.787)     | 54.958 (81.025)    | 31.019 (36.715)       | ***     | 60.555 (83.436)        | 64.711 (88.309)    | 35.486 (34.454)       | ***     |
| Books                    | 7.704 (15.489)         | 7.878 (16.189)     | 6.875 (11.543)        | ***     | 9.714 (20.205)         | 9.779 (20.989)     | 9.318 (14.631)        | ***     |
| Conference presentation  | 39.533 (94.317)        | 42.140 (100.283)   | 27.080 (56.256)       | ***     | 31.946 (86.900)        | 33.913 (92.646)    | 20.080 (34.230)       | ***     |
| Awards                   | 1.819 (4.229)          | 1.955 (4.442)      | 1.171 (2.926)         | ***     | 1.525 (3.769)          | 1.622 (3.949)      | 0.945 (2.336)         | ***     |
| competitive research funding | 4.047 (7.109)         | 4.115 (7.377)      | 3.720 (5.646)         | ***     | 5.329 (8.129)          | 5.357 (8.337)      | 5.164 (6.751)         | ***     |
| Period of academic performance | 4.236 (4.201)     | 4.153 (4.191)      | 4.631 (4.227)         |         | 5.502 (5.012)          | 5.405 (5.026)      | 6.087 (4.893)         |         |
| N                        | 14,014                | 11,588             | 2,426                 |         | 2,187                  | 1,876               | 311                  |         |
funding sources acquired before becoming a professor is 5.33 overall: 5.36 for male researchers, and 5.16 for female researchers; this difference is not statistically significant. Before becoming a professor, on average, males have an average period without publishing for 5.4 years, while the same period for female is 6.1 years; the difference is not statistically significant.

Figure 1 shows the average academic performance per year for all researchers. Interestingly, it was found that research productivity is higher in the latter half of a researcher’s career. The number of books issued peaks in the 24th year after the start of research; the number of conference presentations peaks in the 28th year; and the number of papers published peaks in the 25th year. Together with Table 1 and Figure 1, it can be seen that most academic researchers publish papers every year with no breaks and gradually increase their research productivity.

Table 2 presents the results of the event history analysis using the Cox proportional hazard model to facilitate interpreting the results. A hazard ratio above 1 indicates that the effect is positive, whereas a hazard ratio below 1 indicates that the effect is negative. The models show the results only for the control model. Model 2 shows the results of analyzing the influence of academic performance on the chances of becoming a professor. Model 3 displays the results after adding social elements, and Model 4 displays the results after adding the research productivity elements.

As observed in Model 2, in terms of academic performance, the strongest predictor of the chances of becoming a professor is acquiring competitive grants and funding sources. When the other factors are held constant, a 1-unit increase in the number of competitive grants and funding sources acquired increases the chances of becoming a professor by 1.03 – that is, by 3% ($p < 0.01$). In contrast, as the number of published books increases by 1, the chance of becoming a professor increases by only 1% ($p < 0.01$), and a one-article increase in the number of Scopus journal papers also increases the chances of becoming a professor by 1% ($p < 0.01$). However, the number of non-Scopus journal articles does not have a significant influence on promotion to professorship. Model 3 shows a model with the female dummy variable added. The result shows that the hazard ratios for the female dummy are below 1; however, gender was not statistically significant. Model 4 shows the result of adding the number of years in which the researcher did not publish a paper. As expected, the hazard ratio for the period of zero academic performance

![Figure 1. Average number of research results per year by researchers.](image)
performance is less than 1. In other words, this result indicates that longer periods without publication reduce the opportunity for promotion to a professorship. When the other factors are held constant, a 1-year increase in the period of zero academic performance reduces the chances of becoming a professor by 0.985 – that is, by −0.15% (p < 0.05).

Table 3 shows the results of analyzing the influence of timing when the researchers did not publish a paper in a year on a promotion to professorship. From Table 3, the hazard ratios of term 2 and term 7 are greater than 1, while the hazard ratios for the other terms are less than 1. However, the hazard ratios of term 2 and term 7 are not statistically significant. The statistically significant results were term 1, term 5 and term 6, and these values are all less than 1. This suggests that reducing research efficiency in terms 1, 5 or 6 has a negative effect on promotion to professorship. In other words, this result means that the opportunities for promotion to professorship will be smaller if research efficiency falls during the period less than 5 years from the start of the research or between the 20th and 30th years.

Several common factors affect the chances of becoming a professor across all academic fields. The factor with a positive influence include the number of published papers in Scopus, published books, and acquiring competitive grants and funding sources. In particular, the number of competitive grants and funding sources acquired is most likely to facilitate promotion to a professorship. Regarding gender, female researchers are somewhat less likely to become professors than are male researchers, although the difference is not statistically significant. In my previous research (Fujiwara, 2017), the results indicate that compared with male researchers, female researchers’ odds of becoming a professor are approximately 80% in humanities and sociology, approximately 50% in science and
Table 3. Analysis on the influence of the timing of research pauses.

| Term = Period of absence | (1)          | (2)          | (3)          | (4)          | (5)          | (6)          | (7)          | (8)          |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                          | Haz. Ratio   | Haz. Ratio   | Haz. Ratio   | Haz. Ratio   | Haz. Ratio   | Haz. Ratio   | Haz. Ratio   | Haz. Ratio   |
|                          | (Std. Err.)  | (Std. Err.)  | (Std. Err.)  | (Std. Err.)  | (Std. Err.)  | (Std. Err.)  | (Std. Err.)  | (Std. Err.)  |
| Term 1                   | 0.853 (0.049)*** |             |              |              |              |              |              |              |
| Term 2                   | 1.017 (0.058) |              |              |              |              |              |              |              |
| Term 3                   |              | 0.990 (0.059) |              |              |              |              |              |              |
| Term 4                   |              |              | 0.947 (0.059) |              |              |              |              |              |
| Term 5                   |              |              |              |              |              |              |              |              |
| Term 6                   |              |              |              |              |              |              |              |              |
| Term 7                   |              |              |              |              |              |              |              |              |
| Term 8                   |              |              |              |              |              |              |              |              |
| Scopus journal articles  | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** |
| Non-Scopus journal articles (time-t) | 0.999 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 0.999 (0.000) | 0.999 (0.000) | 1.000 (0.000) | 1.000 (0.000) |
| Books (time-t)           | 1.006 (0.002)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.002)*** | 1.006 (0.002)*** | 1.006 (0.001)*** | 1.006 (0.001)*** | 1.006 (0.001)*** |
| Conference presentation (time-t) | 0.999 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 1.000 (0.000) | 1.000 (0.000) |
| Awards (time-t)          | 1.005 (0.007) | 1.005 (0.007) | 1.005 (0.007) | 1.005 (0.007) | 1.004 (0.007) | 1.004 (0.007) | 1.005 (0.007) | 1.005 (0.007) |
| Competitive research funding (time-t) | 1.026 (0.002)*** | 1.026 (0.002)*** | 1.026 (0.002)*** | 1.026 (0.002)*** | 1.026 (0.002)*** | 1.026 (0.002)*** | 1.026 (0.002)*** | 1.026 (0.002)*** |
| Female                   | 0.983 (0.084) | 0.975 (0.083) | 0.977 (0.083) | 0.979 (0.083) | 0.984 (0.084) | 0.978 (0.083) | 0.976 (0.083) | 0.975 (0.083) |
| Academic field (reference: General Studies) |              |              |              |              |              |              |              |              |
| Science and engineering  | 0.712 (0.059)*** | 0.718 (0.060)*** | 0.717 (0.060)*** | 0.716 (0.060)*** | 0.715 (0.060)*** | 0.717 (0.060)*** | 0.718 (0.060)*** | 0.718 (0.060)*** |
| Medical and biological   | 0.753 (0.060)*** | 0.753 (0.060)*** | 0.753 (0.060)*** | 0.753 (0.060)*** | 0.752 (0.060)*** | 0.748 (0.059)*** | 0.753 (0.060)*** | 0.753 (0.060)*** |
| Humanities and Social Sciences | 1.161 (0.094)* | 1.149 (0.093)* | 1.152 (0.094)* | 1.157 (0.094)* | 1.164 (0.095)* | 1.157 (0.094)* | 1.151 (0.093)* | 1.151 (0.093)* |
| Prestige graduation      | 1.021 (0.004)*** | 1.020 (0.004)*** | 1.020 (0.004)*** | 1.020 (0.004)*** | 1.020 (0.004)*** | 1.020 (0.004)*** | 1.020 (0.004)*** | 1.020 (0.004)*** |
| Log likelihood           | −11073.75     | −11077.63    | −11077.27    | −11073.73    | −11073.73    | −11073.73    | −11073.65    | −11073.38    |
| AIC                      | 22171.49      | 22179.21     | 22178.72     | 22170.26     | 22171.45     | 22179.29     | 22178.77     | 22178.25     |
| BIC                      | 22290.98      | 22298.69     | 22298.75     | 22298.01     | 22289.74     | 22298.94     | 22298.77     | 22298.25     |
| Number of Events         | 1,360         | 1,360        | 1,360        | 1,360        | 1,360        | 1,360        | 1,360        | 1,360        |
| N (Persons)              | 14,014        | 14,014       | 14,014       | 14,014       | 14,014       | 14,014       | 14,014       | 14,014       |
| N (Persons-Year)         | 2,39,132      | 2,39,132     | 2,39,132     | 2,39,132     | 2,39,132     | 2,39,132     | 2,39,132     | 2,39,132     |
engineering, and approximately 70% in the medical and biology fields, and these results were statistically significant. In this analysis, I believe that the inclusion of researchers from comprehensive subjects explains why gender dummy was negative but not statistically significant. This is because many comprehensive subjects include fields in which female researchers play a central role, such as children’s studies, dietary science, clothing/housing life science, and home economics. In this paper, I analyzed the data without separating fields, but the female researcher dummy is negative, suggesting that female researchers have lower promotion probability than male researchers do.

This result is consistent with previous studies (Fotaki, 2013), which could lead to the conclusion that the ‘Matilda effect’ exists in Japanese academia (Rossiter, 1993). In fact, according to data released by the Ministry of Internal Affairs and Communications in Japan, the proportion of female researchers among total researchers in 2016 is 15.3%, which is significantly lower than the proportion of female researchers in Europe and the United States. Thus, Japanese universities should increase their efforts to attract female researchers.

Regarding research productivity, as expected, the results showed that longer periods with no published research results reduce the chances of promotion to professorship. However, additional analyses showed that when researchers maintain high research productivity throughout their lives, the opportunities for promotion to professorship do not decline. It is important to maintain research productivity during the first 5 years from the start of research and from the period between 20 and 30 years, but a reduction in research productivity in other periods does not affect promotion to professorship. For this reason, it is thought that continuous, uninterrupted research productivity during the first five years of one’s career can have an important effect on researchers’ future academic careers even after the 5-year period. In addition, the results for the period between 20 and 30 years from the start of the researchers’ careers suggest that many research achievements are required at the time when promotion to professorship is decided.

Conclusions

These findings are important in considering the success and work-life balance in academia. Some female researchers hesitate to marry and have children in consideration of their desired success in academia. However, a temporary drop in research productivity after the first five years from the start of their research career does not necessarily affect the chances of promotion to a professorship.

Young researchers in particular often feel pressure to continue to produce results until they acquire tenure. However, if they know in advance that promotion will not be affected even if they have periods with no research achievements, it may allow them to better concentrate on research by reducing pressure. I think that this result is useful in particular for female researchers, because as long as research results such as papers are issued in the first 5 years, there is no need to excessively fear taking breaks from work for a while for the purpose of marriage, childbirth, and child rearing. There are several limitations to this research that offer potential avenues for further research. First, in the present study, papers published by a researcher are measured according to quantity, not quality. It would be even more meaningful to measure the quality of papers using various impact factors. Second, I used a period with no research achievement as a variable, but this
period does not necessarily coincide with maternity leave or childcare leave. If I were instead to ask each researcher about the reason for the decrease in his or her research output, I could analyze the relationship between the work-life balance and success in academic life more accurately.

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No potential conflict of interest was reported by the author.

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