Discussion Paper No. 968

# POSITIVE AND NEGATIVE EFFECTS OF SOCIAL STATUS ON LONGEVITY: EVIDENCE FROM TWO LITERARY PRIZES IN JAPAN

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April 2016
Revised May 2017

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# Positive and negative effects of social status on longevity: Evidence from two literary prizes in Japan

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May 17th, 2017

## Abstract

We show evidence that receiving Japan's Akutagawa and Naoki Prizes for literature has positive and negative effects on their recipients' longevity. Using a dataset covering both awards, we show that recipients of the Akutagawa Prize for rising novelists exhibit *lower* mortality than fellow nominees. The *increase* of longevity is estimated at 2.4 years. Recipients of the Naoki Prize for established novelists exhibit *higher* mortality than fellow nominees, and the decreased longevity is 5.1 years. These results indicate that both positive and negative causal effects run from receiving a prize to longevity. Additional analyses support the possibility that positive effects are likely to be larger than a negative effect when candidates exhibit unstable socio-economic status, and then we find a positive net effect to longevity from receiving the Akutagawa Prize. In doing so, this study contributes to clarifying why earlier studies show conflicting relationships between receiving awards and recipients' longevity.

**Keywords:** Social Status, Mortality, Health Inequality, Cox's Proportional Hazard Model, Time-dependent Covariates, Time-dependent Parameters
**JEL:** I12, H14

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# 1. Introduction

## 1.1. Background and literature review

It is widely believed that a rise in social status boosts longevity. This association is explained as follows: First, a rise in social status extends longevity by improving one's economic conditions. People with a higher social status generally have higher income, and thus access to health-enhancing goods and services, including better living conditions, quality medical care, etc. (Grossman 1972; Preston, 1975; Bloom and Canning, 2000; Marmot, 2002; Deaton, 2003; Subramanian and Kawachi, 2006). Second, a rise in social status extends longevity by reducing psychological stress and increasing job satisfaction. People with a lower social status generally have less control over their jobs, and thus tend to feel stressed from their forced and monotonous jobs (Schnall et al., 1994; Bosma et al., 1997; Marmot et al., 1997; Sapolsky, 2005; Wilkinson and Pickett, 2010). Third, a rise in social status extends longevity by improving mental health. People with a lower social status generally suffer feelings of shame, embarrassment, depression, and social anxiety from comparing their own income and status with those of peer groups (Scheff, 1988; Gorin, 2000; Dickerson and Kemeny, 2004; Sapolsky, 2005; Wilkinson and Pickett, 2010).

Several empirical studies reveal positive correlations between social status and longevity/health (Reid et al., 1974; Marmot et al., 1978; Rose and Marmot, 1981; Marmot et al., 1984; Marmot et al., 1991). Rose and Marmot (1981) use a survey of male civil servants in London to show that men in highly ranked jobs have a relatively low risk of coronary heart disease. However, these results do not demonstrate that causality runs from social status to longevity, because reverse causality is also possible. Boyce and Oswald (2012) actually show, using a large dataset of British workers, that workers initially in good health go on to be promoted, and that a higher job status does not make workers healthier.

To exploit a causal effect from social status to longevity, empirical studies examine datasets of candidates for prestigious prizes, including the Academy Awards (Oscars®) the Nobel Prize, etc. Recipients and nominees of distinguished awards are likely homogeneous in multiple respects, and thus, being awarded a prize can be viewed as an exogenous shock to social status. Therefore, we can exploit a causal effect from heightened social status to longevity, by comparing the life expectancies and mortality rates of recipients and fellow nominees. Adopting the empirical strategy, Redelmeier and Singh (2001a) show that actors and actresses who receive Oscars® live 3.9 years *longer* than Oscar® nominees.

The problem is that some studies report positive causal relationships between receiving awards and recipients' longevity, while others report negative relationships. Rablen and Oswald (2008) find that Nobel laureates in chemistry and physics live 1.6 years *longer* than fellow nominees. In contrast, Redelmeier and Singh (2001b) show that screenwriters who receive Oscars® live 3.6 years *less* than their fellow nominees. Abel and Kruger (2005) show that players inducted into the Baseball Hall of Fame live 5.0 years *less* than players of similar age. Leive (2016) finds that Gold medalists in Olympic Track and Field games live 2.0 years *less* than Silver medalists.

Why do these studies present such conflicting effects? Two explanations can exist. The first one is that a rise in social status potentially has both positive and negative causal effects on longevity. The second one is that there are differences in analytical accuracy and precision across the studies, and the differences cause differences in the size and directionality of the effects of receiving prizes.

To our knowledge, the following literature explores the second possibility rather than the first one. Sylvestre et al. (2006) and Han et al. (2011) point out that Redelmeier and Singh (2001a) ignore *immortal time bias*, i.e., they do not consider that actors and actresses who live longer have more opportunities to earn Oscars. To eliminate this bias, Sylvestre et al. (2006) re-estimate Redelmeier and Singh's (2001a) dataset by fitting a Cox proportional hazard model with recipient status as a time-dependent covariate and with survival measured from the date of first nomination. They show that the effect of a rise in social status on longevity is positive but statistically insignificant.[1]

However, it remains possible that the first explanation also works. Rablen and Oswald (2008), using a method similar to that of Sylvestre et al. (2006) to address *immortal time bias*, demonstrate that positive causality runs from social status to longevity. That is, after dealing properly with the bias, Rablen and Oswald (2008) report a positive causal effect on longevity, while Sylvestre et al. (2006) report no effect. This means that although differences in how studies address the bias can explain differences in the size and directionality of the effects of receiving prizes, it still remains unclear why studies have produced conflicting results on the effects of receiving prizes.

## 1.2. Hypothesis

This study investigates whether a rise in social status has both positive and negative causal

[1] Smith (2011) notes that no records reveal the dates of death of several Hall of Fame inductees, and Abel and Kruger (2005) treat them as still living. After excluding them from the sample, Smith finds that the negative effect from Hall of Fame membership becomes statistically insignificant.

effects on longevity, and when we find a positive net effect on longevity from receiving a prize. As a first step, we return to the three mechanisms introduced earlier. To our knowledge, the existing literature with prize datasets assumes that effects generated through these mechanisms are positive and constant with every social stratification (levels of income and social status, job categories, etc.); however, we suggest that the directionality and sizes of the effects of a rise in social status on longevity differ depending on social stratification. An effect triggered by one mechanism may be positive, while it may decrease as the social stratum rises. An effect brought about by another mechanism may be negative in some job categories. We re-examine the three mechanisms, exploring the above possibilities.

First, a positive effect of improved economic conditions can be strengthened when people are in the lower social stratum and weaken as their socio-economic status stabilizes. Researchers in economics, social epidemiology, and public health have reached consensus that there is a non-linear and concave relationship between absolute individual income and health status (Deaton, 2003; Subramanian and Kawachi, 2006). Several empirical studies support this association, using cross-section and panel datasets of countries, communities, households, and individuals (Preston, 1975; Rogot et al., 1992; Pritchett and Summers, 1996; Deaton, 2003; Gerdtham and Johannesson 2004; Lorgelly and Lindely 2008).

We find a stronger positive effect of improved economic conditions among people in the lower social stratum, because people who have a relatively low social status within the stratum, such as the poor, are less likely to care about their health. Recent research in behavioral economics indicates that poverty impedes cognitive function and fosters present-biased decision making (Mani et al., 2013; Carvalho et al., 2016). It is well known that people who have present-bias tend to indulge in risky behaviors, including overeating, drinking, smoking, etc. Marmot et al. (1991) also report that a decrease in such risky behaviors explains one-third of the positive correlation between job classifications and the health status of civil servants in the United Kingdom.

Second, in some job categories, people can experience psychological stress from lack of job control when their social status rises. That is, an effect from the second mechanism can be negative. Recent research in public health and sociology supports this possibility, showing that highly ranked job classifications involve long hours of work and high work demands, and these factors generate psychological job stress (Schieman et al., 2006; Damaske et al., 2014; Damaske et al., 2016). In addition, working hours and work demands are positively correlated with job authority, job autonomy, and non-routine work (Schieman et al., 2006). Some studies use sample occupations characterized by these

work conditions, including screenwriting and politics, to show that a rise in social status increases the risk of mortality (Redelmeier and Singh, 2001b; Olenski et al., 2015). A rise in social status could compound workloads, and people with higher status could struggle to meet competing needs and deadlines, working without rest. Damaske et al. (2016) collect information on stress from 122 employees at multiple time points across consecutive days to show that workers with a higher socio-economic status report greater stress at work and are more likely to fail in meeting work demands than those with a lower socio-economic status.

Third, a positive effect of improved mental health can similarly be strong both in the upper and lower strata of society. It is theoretically and empirically known that when people have relatively low income and status within the same age group, job category, region, etc., it decreases utility, well-being, happiness, and satisfaction, and even increases the risk of mortality (Wagstaff and Van Doorslaer, 2000; Ferrer-i-Carbonell and Frijters, 2004; Subramanian and Kawachi, 2004; Miller and Paxson, 2006; Subramanian and Kawachi, 2006; Ball and Chernova, 2008; Clark et al., 2009; Boes et al., 2010). If people compare their income and status within their stratum, an effect generated by the third mechanism should not depend on social stratification. Some studies find a strong positive effect of relative income on utility and health status in developed countries and among wealthy people (McBride, 2001; Deaton, 2003).

Re-examining the three mechanisms suggests that there are both positive and negative causal effects of receiving a prize on longevity. While two positive effects are generated by improved economic conditions and mental health, one negative effect comes from an increase in psychological job stress. If both effects exist, the directionality and size of the net effect of receiving a prize depend on which exerts the larger effect.

Our hypothesis is that we find a positive net effect on longevity from receiving a prize when candidates have an unstable socio-economic status. In that case, the positive effect through improved economic conditions can be strengthened, and the sum of the two positive effects exceeds the negative effect caused by lack of job control. Conversely, when candidates' socio-economic status is stable, the negative effect prevails.[2]

We test the hypothesis, using datasets of two Japanese literary prizes, the Akutagawa and Naoki Prizes. Testing our hypothesis requires two kinds of datasets: one that

[2] Previous studies indicate that there is a positive effect among younger candidates. For example, in the dataset of Academy Awards for actors and actresses (Redelmeier and Singh, 2001a), life expectancy is 3.9 years longer for recipients than for fellow nominees. Their median age is 39. Among the dataset of Nobel laureates, life expectancy is 1.6 years longer for recipients than nominees. Their average age is 51. It is reasonable to regard the socio-economic status of younger candidates as less stable. However, we acknowledge systematic differences in candidates' occupations and the nature of these awards.

encompasses recipients and nominees in lower social stratum and one that has candidates in similarly atypical occupations but in higher social stratum. Datasets for the two prizes fulfill these requirements. The Akutagawa Prize is awarded to new and promising novelists. Candidates are ranked low in the unofficial literary community, *Bundan*. In addition, they generally have low income, a vulnerable social network, and a high level of anxiety about their future. In this sense, the candidates have an unstable socio-economic status. Moreover, the award is given for serious literature. Serious literature sells less than popular literature in Japan and such books are less frequently published because it is often written in a short-story format. Authors who do not receive the prize cannot continue earning an income without winning it. In contrast, candidates for the Naoki Prize are recognized novelists and are expected to have a more stable socio-economic status. Since this prize is for popular literature, they can more easily aspire for better economic conditions without receiving it than those in eyeing the Akutagawa Prize. We expect empirical results to reveal extended longevity among recipients of the Akutagawa Prize and shorter longevity among recipients of the Naoki Prize.

Our empirical analysis generates the results that are consistent with our expectations. Recipients of the Akutagawa Prize live 2.4 years longer than those nominated for it, whereas recipients of the Naoki Prize live 5.1 fewer years than their fellow nominees.

This paper proceeds as follows. Section 2 explains the two prizes, our dataset, and descriptive results. Section 3 explains the econometric strategies. Sections 4 and 5 present estimation results and their interpretation. Section 6 discusses our study's implications and limitations.

# 2. Data

## 2.1. Overview of Akutagawa and Naoki Prizes

The Akutagawa and Naoki Prizes share several characteristics. First, both were established simultaneously in 1935 by novelist Kan Kikuchi and are sponsored by Bungeishunju Ltd. and the Society for the Promotion of Japanese Literature. Both are awarded twice yearly in January and July, and the 154th awards were presented on January 19, 2016. There have been 1,061 candidates in total, and 344 have received one of the two prizes.

Second, the Akutagawa and Naoki Prizes are Japan's most prestigious literary recognitions, and receiving either delivers an equivalent shock to social status.[3] Kenzaburo Oe received the 39th Akutagawa Prize in 1958 and the Nobel Prize for literature in 1994. Among novelists awarded the Nobel or said to be candidates, Kobo Abe won the 25th Akutagawa Prize, Shusaku Endo the 33rd, and Haruki Murakami was nominated for the 81st and 83rd Akutagawa Prizes. In addition, Yasunari Kawabata, Junichiro Tanizaki, and Yukio Mishima were members of the review committee for Akutagawa Prizes. Works by candidates for the Naoki Prize, including Ryotaro Shiba and Jiro Akagawa, have sold more than 100 million copies worldwide, paralleling sales of worldwide best-selling novelists Steven King and Sidney Sheldon (Cable News Network, 1999; BBC News and Current Affairs, 2006; Japan Inc Communications, Inc., 2006; The Nishinippon Shimbun Co., Ltd., 2016). Print, broadcast, and Internet media cover recipients of the Akutagawa and Naoki Prizes.

Third, the two prizes have similar selection procedures. Candidates are selected by 20 members of Bungeishunju Ltd. over a span of 10 meetings. Bungeishunju Ltd. telephones finalists and confirms they have a will to receive a prize if they are awarded it. Recipients are selected by professional novelists on the review committee. Authors can receive either prize only once, but those who have received neither prize can be candidates for both.

However, there are two differences between the Akutagawa and Naoki Prizes. The former is for new or rising novelists, whereas candidates for the latter are established novelists. In addition, the Akutagawa Prize recognizes achievements in serious literature and the Naoki Prize in popular literature, as specified in official introductions written by Bungeishunju Ltd. (2014b).

The latter half of this subsection describes the dataset of the Akutagawa and Naoki

[3] Recipients receive a pocket watch and prize money, ¥1,000,000 (US$8,262 at the 2015 exchange rate). The amount is identical for both prizes, and the relative level does not vary over time.

Prizes and compares it with datasets in previous studies. First, the Akutagawa and Naoki Prizes are awarded for works published between semiannual awards. Thus, novels appear near the date awards are presented, and social status at publication is similar to social status upon receiving the award. This characteristic is shared by Redelmeier and Singh's (2001a) dataset of Oscar® nominees.

Second, candidates in our dataset know they are being considered. This means that a causal effect from wining the prizes to longevity includes the discouragement felt by fellow nominees. This characteristic is shared by Redelmeier and Singh's (2001a) dataset.

Third, our candidates can receive either prize only once. That is not the case among populations in Redelmeier and Singh's (2001a) nor in Rablen and Oswald's (2008) datasets. If candidates can receive the same award multiple times, the analysis must consider that previous recognition might alter covariates for the second award. [4] Analyzing data for the Akutagawa and Naoki Prizes allows us to ignore influences from these possibilities. In sum, our award-centered dataset parallels that of similar studies while better enabling us to draw causal inferences to longevity.

## 2.2. Information sources of the dataset

Our dataset captures recipients' and nominees' names, dates and places of birth, dates and causes of death, educations, side jobs, other prizes received, and books published. We construct this dataset from multiple sources (Table 1). We identify recipients and nominees from records of Bungeishunju Ltd. (2014a) and the home pages of Bungeishunju Ltd. (2014b), "Akutagawa shou no subete, no youna mono (All about the Akutagawa Prize)" (Kawaguchi, 2015a) and "Naoki shou no subete (All about the Naoki Prize)" (Kawaguchi, 2015b).

We collect information regarding birthdays, dates of death,[5] places of birth, education, side jobs, and other prizes received[6] from four biographical dictionaries for Japanese

[4] Rablen and Oswald (2008) exclude recipients of multiple Nobel Prizes from the sample. Han et al. (2011) use *g-estimation* to eliminate bias caused by repeat recognition. Robins (1986, 1992) and Robins et al. (1992) develop *g-estimation* to consider *immortal time bias* and the possibility of a previous win affecting future nomination.

[5] Records for some novelists indicate only the year of birth or death, not their dates, so we insert January 1 as the date. We add a dummy variable that denotes no record for dates of birth or death.

[6] There are public and non-public literary prizes. We consider the following public prizes in Japan: *All Yomimono Shinjin, All Yomimono Suiri Shousetsu Shinjin, Asahi Shinjin Bungaku, Asahi Shimbun Kenshou, Bungakukai Shinjin, Bungei, Dazai Osamu, Gunzou Shinjin Bungaku, Shinchou Shinjin, Shousetsu Gendai Shinjin, Shousetsu Subaru Shinjin, Sunday Mainichi Taishu Bungei, Subaru Bungaku, Umitsubame Shinjin Bungaku,* and *Waseda Bungaku Shinjin*. We consider the following non-public prizes: *Bungaku, Kawabata Yasunari Sakka, Mishima Yukio, Noma Bungei, Noma Bungei Shinjin, Noma Bungei Shourei, Sakka* (*Doujin*), *Shibata Renzaburo, Shinchosha Bungaku, Shinchosha Bungei Dai 1 Bu, Shinchosha Bungei Dai*

novelists (Shinchosha Publishing Co., Ltd., 1988; Nichigai Associates, Inc., 2002; Nichigai Associates, Inc., 2004; Japan Writers' Association, 2015)[7] and home pages of literary prizes in Japan. We determine whether nominees have received other literary prizes by consulting “Akutagawa shou monogatari” (Kawaguchi, 2013) and “Naoki shou monogatari” (Kawaguchi, 2014). We compile published books from the database of the National Diet Library (2015). We identify causes of death from databases provided by the Asahi Shimbun Company (2015), the Mainichi Newspapers (2015), and the Yomiuri Shimbun (2015).

**Table 1.** Information sources of the dataset

| | **Information sources** |
|---|---|
| A list of recipients and fellow nominees | One record book published by Bungeishunju Ltd. (2014a)<br>The homepage of Bungeishunju Ltd. (2014b)<br>The homepage of "Akutagawa shou no subete, no youna mono" (Kawaguchi, 2015a)<br>The homepage of "Naoki shou no subete" (Kawaguchi, 2015b) |
| Birthday<br>Date of death<br>Place of birth<br>Educational background<br>Side job<br>Other prizes besides the two prizes | Four biographical dictionaries for novelists in Japan (Shinchosha Publishing Co., Ltd., 1988; Nichigai Associates, Inc., 2002; Nichigai Associates, Inc., 2004; Japan Writers' Association, 2015)<br>Homepages of literary prizes in Japan |
| Published books | The database of the National Diet Library in Japan (2015) |
| Cause of death | Three databases of newspapers (The Asahi Shimbun Company, 2015; The Yomiuri Shimbun, 2015; The Mainichi Newspapers, 2015) |

## 2.3. Descriptive statistics

Our analysis uses 708 observations of novelists, among whom 363 (345) are recipients and nominees of the Akutagawa (Naoki) Prize. We exclude from analysis novelists nominated for both prizes, one novelist with a corporate identity, and two nominated in joint name. We exclude novelists for whom dates of birth or death are unavailable. Our analysis covers Japanese male novelists to avoid gender-based and racially based differences in life expectancy.

Table 2 shows descriptive results of the outcome variable age at death. It reveals that on average Akutagawa Prize recipients are 6.6 years *older* at death than their fellow

*2 Bu*, *Tanizaki Junichiro*, *Yamamoto Shugoro*, *Yoshikawa Eiji Bungaku*, and *Yoshikawa Eiji Bungaku Shinjin*.

[7] When we find insufficient information in these four references, we use the National Diet Library and Kawaguchi’s two home pages to complete novelists’ profiles.

nominees (1 percent statistical significance). On average, Naoki Prize recipients are 2.4 years *younger* than their fellow nominees when they die (10 percent statistical significance).

Although the results cannot support causal claims, they can be consistent with the expectation that receiving the Akutagawa Prize has a positive effect on longevity and receiving the Naoki Prize has a negative effect. As introduced in Section 1.2, our empirical expectations depend on the assumption that candidates for the Akutagawa Prize have less stable socio-economic status than those for the Naoki Prize. We already supported this assumption by introducing characteristics of the two prizes in Section 2.1. We can also confirm it using the information regarding candidates' age, number of published books, side jobs, and other attributes.

First, we examine candidates' ages when they were nominated and the number of books published by them before nomination. Table 3 shows that their average age at final nomination is 37.7 (44.8) for the Akutagawa (Naoki) Prize. At 1 percent significance, we can reject the null hypothesis of no difference in ages. Nominees for the Akutagawa Prize are 7.1 years younger than nominees for the Naoki Prize. In addition, the average number of books published is fewer among candidates for the Akutagawa Prize (4.83) than candidates for the Naoki Prize (15.62) at 1 percent significance. Younger novelists with fewer publications are more likely to have an unstable socio-economic status.

Next, we consider side employment. Table 3 shows two results: (1) the proportion of novelists with no side job or no stable side job[8] is significantly higher among candidates for the Akutagawa Prize (34 percent) than candidates for the Naoki Prize (23 percent) at 1 percent significance, and (2) the proportion of novelists who are office workers is lower among candidates for the Akutagawa Prize (20 percent) than among candidates for the Naoki Prize (34 percent) at 1 percent significance. These results also support the possibility that candidates for the Akutagawa Prize are more likely to have unstable socio-economic status than those for the Naoki Prize.

However, the descriptive results include the possibility of reverse causality that novelists who live longer have more opportunities to be nominated and awarded. Table Appendix A shows that recipients' number of total nominations is larger than fellow nominees' number in both prizes, and that there are differences in other aspects between recipients and fellow nominees. These results indicate the existence of reverse causality. Therefore, we should compare the effects of receiving the Akutagawa and Naoki Prizes after statistically dealing with the prospect of reverse causality.

[8] We define novelists who work part-time or frequently change a side job as those with no stable side job.

**Table 2.** Descriptive statistics of age at death and death (dummy)

| | **The Akutagawa Prize** | | **The Naoki Prize** | |
|---|---|---|---|---|
| | Recipients N=109 | Fellow nominees N=254 | Recipients N=125 | Fellow nominees N=220 |
| Variable name | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Age at death | 74.42 (12.90) | 67.83 (15.57) | 72.48 (11.36) | 74.89 (12.10) |
| Death (Dummy) | 0.49 (0.50) | 0.50 (0.50) | 0.56 (0.50) | 0.59 (0.49) |

**Table 3.** Descriptive statistics of information regarding socioeconomic status

| | | **The Akutagawa Prize** N = 363 | **The Naoki Prize** N = 345 |
|---|---|---|---|
| Variable name | Time | Mean (SD) | Mean (SD) |
| Age | At 1st nomination | 36.30 (8.24) | 42.48 (8.41) |
| Age | At final nomination | 37.67 (8.56) | 44.78 (8.98) |
| Number of total nominations | At final nomination | 1.79 (1.20) | 1.99 (1.45) |
| Number of published books | At final nomination | 4.83 (12.86) | 15.62 (23.30) |
| Number of other public prizes | At final nomination | 0.25 (0.46) | 0.21 (0.50) |
| Number of other non-public prizes | At final nomination | 0.33 (0.58) | 0.32 (0.58) |
| Side job 1: No job or no stable job (Dummy) | | 0.34 (0.48) | 0.23 (0.42) |
| Side job 2: Creators (Dummy) | | 0.06 (0.23) | 0.10 (0.31) |
| Side job 3: Office workers (Dummy) | | 0.20 (0.40) | 0.34 (0.47) |
| Side job 4: Self-employed (Dummy) | | 0.18 (0.38) | 0.19 (0.39) |
| Side job 5: Servants (Dummy) | | 0.21 (0.41) | 0.13 (0.34) |

*Notes:* We collect information regarding side jobs from four biographical dictionaries for Japanese novelists (Shinchosha Publishing Co., Ltd., 1988; Nichigai Associates, Inc., 2002; Nichigai Associates, Inc., 2004; Japan Writers' Association, 2015). We cannot identify precisely when novelists take their side jobs. We define novelists who work parttime or change a side job frequently as those with no stable side job.

# 3. Model

Following Sylvestre et al. (2006) and Rablen and Oswald (2008), we use Cox's proportional hazard model for the analysis. Its advantages are as follows: (1) we can control for confounding effects by adding covariates, (2) we can address heterogeneity between recipients and nominees before observing them by setting time-zero, (3) we can address heterogeneity between recipients and nominees from the time we start observing them by adding time-varying covariates, and (4) we can consider whether effects of receiving the prizes vary over time by adding time-varying parameters.

Subsection 3.1 explains how we address time-dependency of covariates and parameters of receiving the prizes. The estimation model appears in Subsection 3.2.

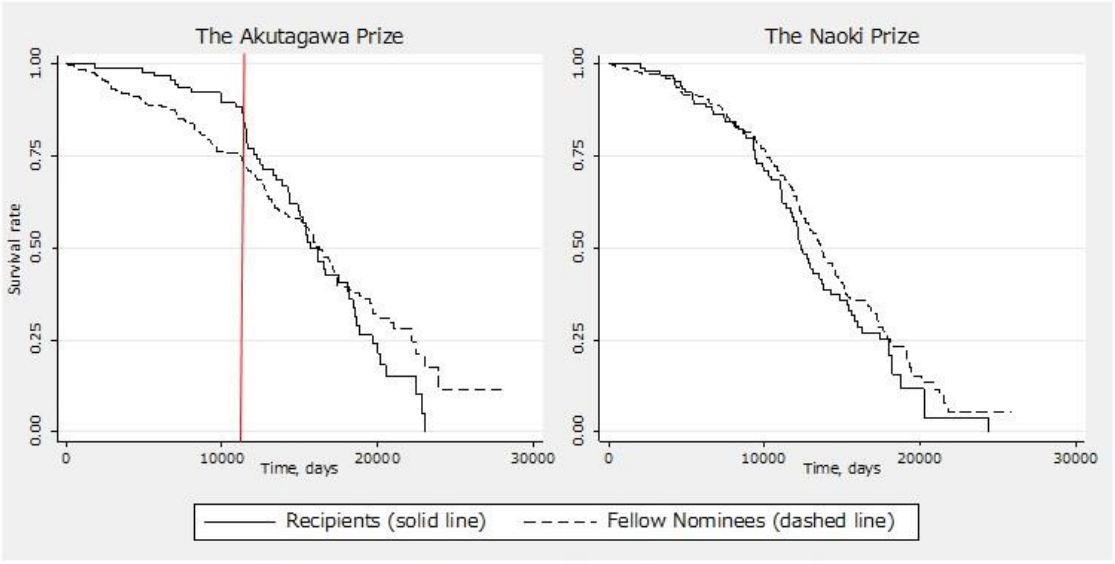
## 3.1. Time-varying covariates and time-varying parameters

We consider time-dependency of covariates and time-dependency of parameters from three perspectives. First, to address the possibility that novelists who are destined to live longer have more opportunities for nominations, we set time-zero as the date of first nomination. Second, we address the previously described *immortal time bias* by adding time-varying covariates to the model. More precisely, we construct the dataset in a panel format capturing first and final nominations. Using a step function, we code novelists as nominees until they receive a prize. We allow as time-varying covariates age and the number of nominations, other prizes received, and published books to vary during the first and final nominations (Simon and Makuch, 1984; Sylvestre et al., 2006; Rablen and Oswald, 2008; Shintani et al., 2009).

Third, we address the possibility that effects of receiving prizes vary over time (Kleinbaum and Klein, 2012). To check the time-dependency of parameters of winning, we draw Kaplan–Meier survival functions in Figure 1. Values on the vertical axis are survival rates, and values on the horizontal axis are the number of days between the first nomination and death. We treat as censored samples novelists who are alive at stopping observing, and the novelists who died from non-natural causes.

If the parameters of receiving prizes lack time-dependency, the reduction rates of survival functions among recipients do not vary over time. Figure 1 reveals that the reduction rates among the Akutagawa recipients rises sharply 11,000 days (almost 30 years) after the first nomination. We find no change in reduction rates among Naoki recipients.

To confirm this finding, we check Akutagawa recipients' survival functions in Table 4.




*Note:* 10,000 days are equal to 27.4 years, 20,000 days are equal to 54.8 years, and 30,000 days are equal to 82.2 years.

**Figure 1.** Survival functions for recipients and fellow nominees (Graph)

**Table 4.** Survival functions for recipients and fellow nominees (Table)

| The Akutagawa Prize | | | | | | | The Naoki Prize | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time, days | Beg. Total | Failures | **Survival function** | Standard error | 95% confidence interval | | Time, days | Beg. Total | Failures | **Survival function** | Standard error | 95% confidence interval | |
| **Recipients** | | | | | | | **Recipients** | | | | | | |
| 5000 | 97 | 2 | **0.98** | 0.01 | 0.92 | 0.99 | 5000 | 100 | 8 | **0.92** | 0.03 | 0.85 | 0.96 |
| 6000 | 93 | 1 | **0.97** | 0.02 | 0.91 | 0.99 | 6000 | 94 | 3 | **0.89** | 0.03 | 0.82 | 0.94 |
| 7000 | 84 | 2 | **0.95** | 0.02 | 0.88 | 0.98 | 7000 | 86 | 3 | **0.86** | 0.03 | 0.78 | 0.92 |
| 8000 | 78 | 1 | **0.94** | 0.03 | 0.86 | 0.97 | 8000 | 82 | 2 | **0.84** | 0.04 | 0.76 | 0.90 |
| 9000 | 72 | 1 | **0.92** | 0.03 | 0.84 | 0.96 | 9000 | 73 | 4 | **0.80** | 0.04 | 0.71 | 0.87 |
| 10000 | 68 | 2 | **0.90** | 0.03 | 0.81 | 0.94 | 10000 | 60 | 8 | **0.71** | 0.05 | 0.60 | 0.79 |
| 11000 | 64 | 1 | **0.88** | 0.04 | 0.79 | 0.94 | 11000 | 55 | 3 | **0.67** | 0.05 | 0.57 | 0.76 |
| 12000 | 56 | 8 | **0.77** | 0.05 | 0.66 | 0.85 | 12000 | 47 | 8 | **0.57** | 0.05 | 0.46 | 0.67 |
| 13000 | 50 | 4 | **0.71** | 0.05 | 0.60 | 0.80 | 13000 | 33 | 10 | **0.44** | 0.05 | 0.34 | 0.55 |
| 14000 | 44 | 3 | **0.67** | 0.06 | 0.55 | 0.76 | 14000 | 28 | 4 | **0.39** | 0.05 | 0.28 | 0.49 |
| 15000 | 36 | 4 | **0.60** | 0.06 | 0.48 | 0.71 | 15000 | 26 | 2 | **0.36** | 0.05 | 0.26 | 0.46 |
| **Fellow nominees** | | | | | | | **Fellow nominees** | | | | | | |
| 5000 | 202 | 25 | **0.90** | 0.02 | 0.85 | 0.93 | 5000 | 185 | 18 | **0.92** | 0.02 | 0.87 | 0.95 |
| 6000 | 194 | 2 | **0.89** | 0.02 | 0.84 | 0.92 | 6000 | 181 | 1 | **0.91** | 0.02 | 0.87 | 0.94 |
| 7000 | 189 | 3 | **0.88** | 0.02 | 0.83 | 0.91 | 7000 | 168 | 5 | **0.89** | 0.02 | 0.84 | 0.92 |
| 8000 | 177 | 8 | **0.84** | 0.02 | 0.78 | 0.88 | 8000 | 155 | 8 | **0.84** | 0.03 | 0.79 | 0.89 |
| 9000 | 164 | 8 | **0.80** | 0.03 | 0.74 | 0.85 | 9000 | 146 | 5 | **0.82** | 0.03 | 0.76 | 0.86 |
| 10000 | 153 | 7 | **0.76** | 0.03 | 0.70 | 0.82 | 10000 | 133 | 8 | **0.77** | 0.03 | 0.70 | 0.82 |
| 11000 | 142 | 2 | **0.75** | 0.03 | 0.69 | 0.81 | 11000 | 113 | 12 | **0.70** | 0.03 | 0.63 | 0.76 |
| 12000 | 125 | 10 | **0.70** | 0.03 | 0.63 | 0.76 | 12000 | 99 | 9 | **0.64** | 0.04 | 0.56 | 0.71 |
| 13000 | 108 | 10 | **0.64** | 0.03 | 0.57 | 0.70 | 13000 | 80 | 14 | **0.55** | 0.04 | 0.47 | 0.62 |
| 14000 | 97 | 7 | **0.60** | 0.04 | 0.53 | 0.66 | 14000 | 66 | 10 | **0.48** | 0.04 | 0.40 | 0.55 |
| 15000 | 94 | 3 | **0.58** | 0.04 | 0.51 | 0.65 | 15000 | 51 | 9 | **0.41** | 0.04 | 0.33 | 0.49 |

*Note:* Survival function is calculated over full data and evaluated at indicated timess; it is not calculated from aggregates shown at left.

The reduction in their survival function is 0.07 from 7,000 to 11,000 days, 0.28 from 11,000 to 15,000 days, 0.02 from 10,000 to 11,000 days, and 0.10 from 11,000 to 12,000 days. That is, the reduction rate among Akutagawa recipients rises sharply 11,000 days after their first nomination.

In sum, Figure 1 indicates that the parameter for receiving the Akutagawa Prize varies over time. It could change after 30 years following authors' first nomination for the prize. Similar time-dependency is not observed among recipients of the Naoki Prize.

## 3.2. Estimation model and variables

We estimate the following equation:

$$\begin{aligned}\lambda(\mathrm{t}|\mathrm{x}) = \lambda_0(\mathrm{t}) \times \exp(&\beta_{1-1}\mathrm{Winner} + \beta_{1-2}\mathrm{Winner} \times (t > 11{,}000) + \beta_2\mathrm{Age} \\ &+ \beta_3\mathrm{Number\ of\ Nominations} + \beta_4\mathrm{Number\ of\ Published\ Books} \\ &+ \beta_5\mathrm{Number\ of\ Other\ Prizes} + z'\gamma), \qquad (1)\end{aligned}$$

The equation is divided into the baseline hazard of $\lambda_0(\mathrm{t})$ and the regression of $\exp(\dots)$. In the regression, the treatment variable $\mathrm{Winner}$ distinguishes recipients from fellow nominees. We add covariates for age and number of nominations, books published, and other public or non-public prizes received. We also add several attribute covariates, including birth year, winning rate[9] when nominated, education, information about side jobs, and place of birth.

As explained, we treat novelists as nominees until their prize is actually awarded. We also allow age and number of nominations, other prizes received, and books published to vary between the first and final nominations. In analyzing the Akutagawa Prize, we add $\mathrm{Winner} \times (t > 11{,}000)$[10] to the regression, considering the time-dependency of the parameter for receiving the prize.

[9] We define winning rate as the proportion of winners for nominees in each prize.

[10] We conduct a specification test using the STATA command "linktest," which can detect specification errors in a Cox's proportional hazard model. Test results suggest adding $\mathrm{Winner} \times (t > 11{,}000)$ to the model for the Akutagawa Prize but not for the Naoki prize.

# 4. Basic analysis

## 4.1. Results

Table 5 shows results of the survival analysis using a Cox proportional hazard model. We conduct the analysis from datasets for the Akutagawa and Naoki Prizes. We express estimation results in hazard ratios. If the estimated value exceeds 1, mortality increases, and vice-versa. We can read a change in mortality as a percentage by subtracting 1 from the estimated value and multiplying by 100.

This sub-section first presents the estimation results of receiving the prizes and then presents the estimation results of some covariates. Column A1 shows that recipients of the Akutagawa Prize exhibit 62.0 percent *lower* mortality than other nominees for 30 years after the first nomination. After 30 years, their mortality is four times *higher* than the control group. Both effects are statistically significant at 1 percent. Column N1 shows that Naoki Prize recipients exhibit 58.4 percent *higher* mortality than fellow nominees. This effect is also statistically significant at 1 percent. The accompanying columns show these effects are stable after adding a suicide dummy to the model or by excluding suicide subjects from the sample.

These results indicate that receiving the Akutagawa Prize has a positive causal effect on longevity for 30 years of the first nomination, and receiving the Naoki Prize has a negative causal effect. However, recipients of the Akutagawa Prize exhibit 4.0 times *higher* mortality than fellow nominees after 30 years. Thus, we cannot state categorically that receiving the Akutagawa Prize affirmatively and causally affects longevity for the whole period.

To check the average directionality of the effect of receiving the Akutagawa Prize, we use the predicted values to calculate the longevity of each novelist, and compare the expected values of recipients and fellow nominees. Expected longevity is 48.3 years for recipients of the Akutagawa Prize and 45.9 years for nominees. That is, receiving the Akutagawa Prize *extends* the longevity of recipients by 2.4 years on average. On the other hand, the expected longevity for Naoki Prize recipients is 34.1 years and for nominees, it is 39.2 years. That is, receiving the Naoki Prize *shortens* recipients' longevity by 5.1 years, on average. Hence, we can say definitively that receiving the Akutagawa Prize has a positive causal effect on longevity throughout the period, and receiving the Naoki Prize has a negative causal effect.

These results are consistent with our hypothesis that there is a positive net effect on longevity of receiving a prize, when candidates have an unstable socio-economic status,

Table 5. Basic analysis: Effects of receiving a prize on mortality

| Probability-of-death equations with time-varying covariates | | **The Akutagawa Prize** | | | **The Naoki Prize** | | |
|---|---|---|---|---|---|---|---|
| Time-zero: Date of first nomination | | **A1** | **A2** | **A3** | **N1** | **N2** | **N3** |
| **The Akutagawa Prize winner:** | Before 30 years | 0.380*** | 0.358*** | 0.381*** | | | |
| | | (0.127) | (0.118) | (0.134) | | | |
| | After 30 years | 3.963*** | 4.305*** | 4.059*** | | | |
| | | (1.525) | (1.642) | (1.625) | | | |
| **The Naoki Prize winner:** | | | | | 1.584*** | 1.617*** | 1.614*** |
| | | | | | (0.254) | (0.262) | (0.261) |
| Time-varying covariates: | Age | 1.068*** | 1.068*** | 1.066*** | 1.093*** | 1.094*** | 1.095*** |
| | | (0.021) | (0.021) | (0.021) | (0.020) | (0.020) | (0.020) |
| | Number of nominations (Akutagawa) | 1.255*** | 1.251*** | 1.229*** | | | |
| | | (0.090) | (0.088) | (0.088) | | | |
| | Number of nominations (Naoki) | | | | 0.842*** | 0.842*** | 0.844*** |
| | | | | | (0.051) | (0.051) | (0.051) |
| | Number of published books | 0.989 | 0.989 | 0.990 | 1.002 | 1.002 | 1.002 |
| | | (0.009) | (0.009) | (0.009) | (0.003) | (0.003) | (0.003) |
| | Number of other non-public prizes | 0.593 | 0.525 | 0.310** | 1.295 | 1.216 | 1.160 |
| | | (0.358) | (0.259) | (0.183) | (0.593) | (0.541) | (0.551) |
| | Number of other public prizes | 1.648 | 1.875 | 3.186* | 0.756 | 0.788 | 0.819 |
| | | (1.110) | (1.008) | (1.995) | (0.366) | (0.382) | (0.415) |
| | Suicide dummy | | 11.491*** | | | 13.194*** | |
| | | | (4.457) | | | (5.650) | |
| Other attribute variables: | | YES | YES | YES | YES | YES | YES |
| Suicide failures: | | YES | YES | NO | YES | YES | NO |
| Number of subjects: | | 363 | 363 | 358 | 345 | 345 | 343 |
| Number of observations: | | 1,409 | 1,409 | 1,388 | 1,901 | 1,901 | 1,899 |

*Notes:* Cluster robust seeform in parentheses. *** p<0.01, ** p<0.05, * p<0.1. We express estimation results in hazard ratios. If the estimated value exceeds 1, mortality increases, and vice-versa. We can read a change in mortality as a percentage by subtracting 1 from the estimated value and multiplying by 100. When checking the time-dependency of the parameters of winning, we find that the reduction rates of the survival function among the Akutagawa recipients rises sharply 30 years after the first nomination. We find no change in reduction rates among Naoki recipients.

and that there is a negative net effect on longevity of receiving a prize, when candidates have a stable socio-economic status. In Section 2, we detailed the characteristics of the Akutagawa and Naoki Prizes and the descriptive statistics of our dataset; they show that candidates for the Akutagawa Prize are equivalent to the former, and those for the Naoki Prize are equivalent to the latter.

In the Appendix B, we present the results of another estimation, where we re-measure survival from the date of birth. They show that even if the starting point is different, the implications are the same.

Before starting to interpret the above results, we introduce estimation results for age and number of nominations among several covariates. Table 5 shows that age and the number of nominations have a statistically significant and stable effect on mortality. Aging increases mortality in both prize datasets. In contrast, the directional effects of the number of nominations differ between the two datasets. Estimation results show that a higher number of nominations increases the mortality of candidates for the Akutagawa Prize but reduces it for those for the Naoki Prize.

Our analysis further shows that while aging increases mortality in both prize datasets, the directional effects of the number of nominations differ between them. The former result is intuitive. We can also explain the latter result by surmising that the two prizes cause different degrees of mental shocks from not receiving the awards and from the publicity effects of being nominated. Perhaps, mental shock is bigger among candidates for the Akutagawa Prize, or the publicity effect is larger among candidates for the Naoki Prize. Receiving the Naoki Prize could be more important for new or rising novelists. In addition, since established novelists have published more books, being nominated for a prestigious award could boost sales of previous publications.

## 4.2. Interpretations

Our analysis shows that receiving the Akutagawa Prize has a positive causal effect on longevity, whereas receiving the Naoki Prize has a negative effect on it. We derive these results using samples from the same occupation, to demonstrate that receiving a prize potentially has positive and negative effects on longevity, and the directionality and sizes of the net effect depend on the timing of the prizes and the conditions under which they are received. Again, these results support our hypothesis.

In the first half of this subsection, we explain these results by describing the mechanism of how social status impacts longevity and the differences in characteristics between the two prizes. Firstly, existing literature shows that a rise in social status from receiving a

prize has both positive and negative effects on longevity. Positive effects come from improved economic conditions with a rise in absolute income and improved mental health with a rise in relative income. A negative effect comes from psychological job stress with increased workloads and lack of job control. Furthermore, the first positive effect of absolute income is stronger when people are in the lower social stratum where their socio-economic status is not stable; this effect weakens in the upper social stratum where their socio-economic status is stable. Secondly, introduction of the Akutagawa and Naoki Prizes and the descriptive statistics in Section 2 show that the Akutagawa Prize is for new or rising novelists and serious literature, and thus the candidates are expected to have an unstable socio-economic status. On the other hand, the Naoki Prize is for established novelists producing popular literature, and candidates are expected to have a more stable socio-economic status.

The above summary enables us to explain the results in the following ways. We detect a positive net effect of receiving the Akutagawa Prize, because its candidates have an unstable socio-economic status, the positive effect through improved economic conditions is strengthened, and the sum of the positive effects exceed the negative effect caused by their increased workloads and lack of job control. On the other hand, we detect a negative net effect of receiving the Naoki Prize, because its candidates have a more stable socio-economic status, the positive effect of absolute income is weakened, and the sum of the positive effects becomes smaller than the negative effect.

In the latter half of this subsection, we empirically investigate whether our explanations are reasonable, based on our data. First, we investigate if the positive effect of absolute income is larger for the Akutagawa Prize than for the Naoki Prize. We replace the outcome of physical mortality with career mortality, and re-conduct the survival analysis with a Cox proportional hazard model. We obtain from the database of the National Diet Library (2015) the date when the most recent book was published, calculate the duration from the date of first nomination to publication date, and define it as career duration. If the positive effect of absolute income is stronger for the Akutagawa Prize than for the Naoki Prize, we should observe a larger positive effect of a prize on career duration for the Akutagawa Prize.

Table 6 shows that the results are consistent with our expectations. Recipients of the Akutagawa Prize exhibit almost 22.2 percent *lower* career mortality than fellow nominees during the whole period.[11] Conversely, receiving the Naoki Prize does not have any

[11] The model with career mortality does not use time-dependent parameters, different from that with physical mortality. This is because our preliminary analysis confirms that effects of receiving prizes on career mortality does not vary over time.

statistically significant effect on recipient's career mortality. That is, for the recipients, career durations are longer than those for fellow nominees of the Akutagawa Prize, while both are indifferent in the Naoki Prize. These results support the explanation that the positive effect of absolute income is larger for the Akutagawa Prize than for the Naoki Prize.

Second, we investigate if there exists a similar negative effect caused by increased workloads and lack of job control in the two prizes. Our data allows us to examine only whether receiving a prize increases recipients' workloads. We construct variables of annual number of published books before and after receiving a prize or the date of final nomination, subtract the former from the latter, and define the variable as an increase in workloads. We obtain the necessary information from the database of the National Diet Library (2015). In addition, we use the fixed-effects model estimation for this analysis. We re-construct the dataset in a panel format capturing the first and final nominations both for recipients and fellow nominees, and exclude unobservable time-invariant individual effects. If there exists in both prizes a negative effect caused by increased workloads and lack of job control, receiving a prize should increase the workloads of both prizes' recipients.

We find from Table 7 that the Akutagawa and Naoki Prizes increase the annual number of published books within several years of receiving the prizes. This result implies that after receiving either prize, the recipients' workloads increase more than those of fellow nominees. In addition, the size of the effect on one year of receiving the prizes is around two times larger for the Naoki Prize (2.553) than for the Akutagawa Prize (1.342). Additionally, the Naoki (Akutagawa) Prize recipients annually publish 3.016 (1.064) books before receiving the prize. These results imply that an increase in workloads is larger with the Naoki Prize, and that the Naoki Prize recipients annually publish almost six books. The excessive increase in workloads can generate greater psychological stress. In sum, both prizes increase recipients' workloads. This supports our explanation that the negative effect is there for both of the prizes. In addition, the effect is larger with the Naoki Prize, and thus the Naoki Prize would cause greater psychological job stress. This presents the possibility that the negative effect is larger with the Naoki Prize.

Third, we assume that another positive effect of improved mental health is constant across social stratification. We recognize that empirically investigating this mechanism is important for our analysis. It is because candidates in our dataset know that they are being considered in winner selection, and thus a positive causal effect from winning the prizes to longevity could include the discouragement felt by fellow nominees. But, unfortunately, our data does not allow us to enough test the existence and degree of this positive effect.

We report the feasible analysis in Appendix C. In the analysis, we use a binary variable of whether a death is a suicide or not as an outcome variable. Winner selection results might discourage fellow nominees, harm their mental health, and promote their intention to commit suicide. If so, receiving a prize might have a negative impact on the likelihood that recipients commit suicide. Table Appendix C shows that although the number of suicides among the deceased recipients is smaller than that among the deceased fellow nominees, the proportion of suicides among the deceased is statistically indifferent between recipients and fellow nominees in both prizes. This might indicate that the positive effect of improved mental health is similarly small in the two prizes, supporting our above assumption; however, the result also can be influenced by the fact that there are quite small number of suicides in our dataset.

In sum, our additional analysis reveals some of the mechanisms of the net effects of receiving the prizes. What is important here is that our findings contribute to reasonably explaining why receiving the Akutagawa (Naoki) Prize has a positive (negative) net effect on recipients' longevity.

Table 6. Interpretations (1): Effects of receiving a prize on career mortality

| Probability-of-**career-death** equations with time-varying covariates | | **The Akutagawa Prize** | | | **The Naoki Prize** | | |
|---|---|---|---|---|---|---|---|
| Time-zero: Date of first nomination | | **A1** | **A2** | **A3** | **N1** | **N2** | **N3** |
| **The Akutagawa Prize winner:** | | 0.778*** | 0.786** | 0.784** | | | |
| | | (0.074) | (0.074) | (0.075) | | | |
| **The Naoki Prize winner:** | | | | | 1.006 | 1.018 | 1.017 |
| | | | | | (0.110) | (0.112) | (0.112) |
| Time-varying covariates: | Age | 1.039*** | 1.038*** | 1.039*** | 1.032*** | 1.032*** | 1.032*** |
| | | (0.011) | (0.011) | (0.011) | (0.011) | (0.011) | (0.011) |
| | Number of nominations (Akutagawa) | 0.974 | 0.964 | 0.976 | | | |
| | | (0.037) | (0.037) | (0.038) | | | |
| | Number of nominations (Naoki) | | | | 0.827*** | 0.828*** | 0.828*** |
| | | | | | (0.033) | (0.033) | (0.033) |
| | Number of published books | 0.994* | 0.994* | 0.994* | 0.989*** | 0.989*** | 0.989*** |
| | | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| | Number of other non-public prizes | 1.047 | 1.059 | 1.028 | 1.123 | 1.090 | 1.101 |
| | | (0.128) | (0.127) | (0.126) | (0.154) | (0.149) | (0.152) |
| | Number of other public prizes | 0.976 | 0.949 | 1.019 | 0.857 | 0.870 | 0.866 |
| | | (0.144) | (0.141) | (0.150) | (0.148) | (0.152) | (0.150) |
| | Suicide dummy | | 2.136 | | | 4.364*** | |
| | | | (1.179) | | | (1.625) | |
| Other attribute variables: | | YES | YES | YES | YES | YES | YES |
| Suicide failures: | | YES | YES | NO | YES | YES | NO |
| Number of subjects: | | 363 | 363 | 358 | 345 | 345 | 343 |
| Number of observations: | | 1,346 | 1,346 | 1,325 | 1,901 | 1,901 | 1,899 |

*Notes:* Cluster robust seeform in parentheses. *** p<0.01, ** p<0.05, * p<0.1. We express estimation results in hazard ratios. If the estimated value exceeds 1, mortality increases, and vice-versa. We can read a change in mortality as a percentage by subtracting 1 from the estimated value and multiplying by 100. When we replace the outcome of physical mortality with career mortality and check again the time-dependency of the parameters of winning, we find no change in reduction rates of survival functions among both Akutagawa and Naoki recipients.

Table 7. Interpretations (2): Effects of receiving a prize on an increase in annual workloads

| | **An increae in annual workloads** | | | | | |
|---|---|---|---|---|---|---|
| Fixed effects model estimation | Within 1 year | 2-3 years | 3-5 years | 5-10 years | 10-15 years | 15-20 years |
| **The Akutagawa Prize winner:** | 1.342*** | 0.418* | 0.900*** | 0.875** | 0.588 | 0.753 |
| | (0.344) | (0.223) | (0.317) | (0.367) | (0.477) | (0.576) |
| Number of subjects: | | | 1,346 | | | |
| Number of observations: | | | 363 | | | |
| **The Naoki Prize winner:** | 2.553*** | 2.015*** | 2.730*** | 2.386*** | 1.497** | 0.623 |
| | (0.464) | (0.434) | (0.536) | (0.703) | (0.726) | (0.730) |
| Number of subjects: | | | 1,901 | | | |
| Number of observations: | | | 345 | | | |

*Notes:* Cluster robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. We construct variables of annual number of published books before and after receiving a prize or the date of final nomination, subtract the former from the latter, and define the variable as an increase in workloads.

# 5. Further analysis

Section 4 established that receiving a prize potentially has positive and negative effects on longevity, and directionality and sizes of the ret effect depend on the times and situations of receiving the prizes, in particular, levels of recipients' socio-economic status. However, some might argue that receiving the Akutagawa or Naoki Prize produces a differential effect through unobserved factors, including talent and effort, between candidates for the two prizes. If the Akutagawa Prize assembles more talented and earnest candidates and the Naoki Prize assembles less talented and earnest candidates, differences could appear in the effects of receiving the prizes.

However, we found that several novelists nominated for the Akutagawa Prize were nominated or awarded the Naoki Prize. This evidence suggests there is little difference in talent and effort between candidates for the two prizes. Furthermore, we run another analysis empirically dealing with that concern. The further analysis is based on the new assumption that candidates for both prizes are extracted from a common population. Concretely, we combine the datasets of the Akutagawa and Naoki Prizes, assume that every candidate can win either prize, and investigate the effect of receiving the Akutagawa or the Naoki Prize.[12] If the two prizes' candidates constitute different populations defined by unobserved factors, estimation results of receiving the prizes with the combined dataset can be inconsistent with those with each dataset.

When combining datasets, we consider that unsuccessful nominees for the Akutagawa Prize cannot hope to receive it after becoming established authors. However, unsuccessful nominees for the Naoki Prize can expect to receive it later, assuming their standing as established authors do not falter. There are systemic differences between the two prizes in nominees' expectations of being re-nominated and eventually receiving them. To consider that difference, we add to the model a variable denoting endorsements (letters, comments, feedback)[13] of review committees for nominees who did not receive the prize during previous selections. We assume that nominees with more endorsements have stronger expectations of receiving the prize eventually. After adding the covariate, candidates for both prizes plausibly become homogeneous (assuming equal talent and effort).

In Table 8, the model of Column 1 includes the variable that explains the number of

[12] The second analysis adds to the sample 44 new candidates nominated for both prizes. As a result, some won either of the two.

[13] We collect the number of letters in reviews from multiple sources (Kawaguchi, 2015a, 2015b; Bungeishunju Ltd., 1982a, 1982b, 1982c, 1982d, 1982e, 1982f, 1982g, 1982h, 1982i, 1982j, 1982k, 1983, 1989a, 1989b, 2002a, 2002b, 2002c, 2002d, 2002e, 2002f, 2002g, 2003a, 2003b).

letters reviewing nominees for the Naoki Prize only. This variable shows 0 for other candidates. Model 2 includes the variable that explains the number of letters reviewing nominees for both prizes.

The estimation results show that recipients of the Akutagawa Prize exhibit 52.6 percent–56.3 percent *lower* mortality than fellow nominees until 30 years after their first nomination. After 30 years, recipients' mortality becomes 3.1–3.2 times *higher* than that of fellow nominees'. The first (second) effect is statistically significant at 5 percent (1 percent). Conversely, recipients of the Naoki Prize exhibit 51.8 percent–53.0 percent *higher* mortality than fellow nominees. This effect is also statistically significant at 1 percent. In addition, we reject the null hypothesis that the first effect of receiving the Akutagawa Prize equals that of receiving the Naoki Prize, and we do so for the second effect of receiving the Akutagawa Prize.

These results coincide with results in Section 4.1. This finding arrests concerns that we detect a positive effect from the Akutagawa Prize and a negative effect from the Naoki Prize because of unobserved factors between candidates for the two prizes. Again, the reasonable explanation is that the candidates for the Akutagawa Prize have unstable socio-economic status, and the candidates for the Naoki Prize have more stable socio-economic status.

Table 8. Further analysis: Effects of receiving a prize on mortality (with the combined dataset)

| Probability-of-death equations with time-varying covariates | | **The Akutagawa and Naoki Prizes** | |
|---|---|---|---|
| Time-zero: Date of first nomination | | **1** | **2** |
| **The Akutagawa Prize winner:** | Before 30 years | 0.437** | 0.474** |
| | | (0.143) | (0.158) |
| | After 30 years | 3.112*** | 3.152*** |
| | | (1.104) | (1.113) |
| **The Naoki Prize winner:** | | 1.518*** | 1.530*** |
| | | (0.245) | (0.241) |
| Time-varying covariates: | Age | 1.076*** | 1.077*** |
| | | (0.014) | (0.014) |
| | Number of nominations (Akutagawa) | 1.038 | 1.017 |
| | | (0.060) | (0.058) |
| | Number of nominations (Naoki) | 0.893** | 0.907** |
| | | (0.043) | (0.044) |
| | Number of published books | 1.002 | 1.002 |
| | | (0.003) | (0.003) |
| | Number of other non-public prizes | 1.299 | 1.306 |
| | | (0.446) | (0.449) |
| | Number of other public prizes | 0.779 | 0.771 |
| | | (0.278) | (0.276) |
| | Number of letters in reviews | 1.018 | |
| | for fellow nominees (Only Naoki) | (0.012) | |
| | Number of letters in reviews | | 1.015 |
| | for fellow nominees (Both) | | (0.010) |
| Other attribute variables: | | YES | |
| Suicide failures: | | YES | |
| Number of subjects: | | 752 | |
| Number of observations: | | 4,049 | |

*Notes:* Cluster robust seeform in parentheses. *** p<0.01, ** p<0.05, * p<0.1. We express estimation results in hazard ratios. If the estimated value exceeds 1, mortality increases, and vice-versa. We can read a change in mortality as a percentage by subtracting 1 from the estimated value and multiplying by 100.

# 6. Discussion, implications, limitations and future research

This study shows that recipients of the Akutagawa Prize live 2.4 years longer than those nominated for it, and recipients of the Naoki Prize live 5.1 fewer years than their fellow nominees. We provide these results with the samples from the same occupation, demonstrating that receiving a prize potentially has positive and negative effects on longevity, and that the directionality and sizes of the net effect depend on the timing of the prizes and conditions under which they are won.

We re-examine the results of previous literature and show that positive effects are generated by improvements in economic conditions with a rise in absolute income and improvements in mental health with a rise in relative income, and that a negative effect is generated by worsening psychological stress with increased workloads and lack of job control. We also find that the first positive effect of absolute income is strengthened in the lower social stratum where people do not have a stable socio-economic status, and that it weakens in the upper social stratum where their socio-economic status is stable.

In addition, we use our dataset to examine the background of the net effects of receiving the Akutagawa and Naoki Prizes, and investigate whether this background is consistent with the above mechanism. The additional analysis shows that receiving the Akutagawa Prize extends the career duration and increases the workloads but the Naoki Prize does not influence career duration, although it increases the workloads. These results mean that receiving the Akutagawa Prize has both a positive effect of absolute income and the negative effect caused by increased workload and lack of job control, but the positive effect is weak for the Naoki Prize. Thus, we detect a positive (negative) net effect from receiving the Akutagawa (Naoki) Prize, because positive effects are larger (smaller) than the negative effects.

One academic contribution of this study is that it provides a reasonable explanation of earlier studies, which show conflicting effects on longevity of receiving awards. For example, when analyzing the dataset of actors and actresses nominated for Academy Awards, we found that the effect of winning the awards is positive but statistically insignificant (Sylvestre et al., 2006; Han et al., 2011). This may be because the candidates include not only rookie actors and actresses but also experienced ones. If we had divided the samples into one sample with rookie ones and another with experienced ones, we might have found a more significant positive effect on longevity from the former sample.

Next, when analyzing the dataset of screenwriters nominated for Academy Awards, we found that the effect of winning the awards was negative (Redelmeier and Singh, 2001b). This can be explained by considering the characteristics of screenwriters. Since

screenwriters are engaged in literary work like novelists, winning the awards could increase the workloads for the recipients. In addition, because the average age of the screenwriter recipients is higher than of the actor and actress recipients, the positive effect of absolute income could weaken. Hence, the negative effect becomes larger than the positive ones.

Finally, when using the dataset of the Nobel Prize, we found that the effect of winning the prize is positive and statistically significant (Rablen and Oswald, 2008). This result appears confusing at first glance. The average age of the candidates is higher than that for the Naoki Prize, and thus we expect to find a negative net effect from receiving the Nobel Prize. This can be explained by considering lags between the dates of achievement and recognition. Since these lags are large with the Nobel Prize, the recipients may have retired from active research at the time recognition; winning the prize does not increase the workloads of the recipients, the negative effect weakens, leaving the positive effects larger than the negative one. However, this study and previous studies do not empirically reveal that differences in the lags influence the size and directionality of a net effect of receiving a prize. This is left to future research.

## Acknowledgements

We thank Yuriko Shiiba, Akihiro Nakajima, Tomoya Nomizo, Jun Kamohara, and Yuta Matsuo for their support in dataset construction. We also thank Naoki Matayoshi, Kanako Nishi, Ryo Kambayashi, Yoshiki Ishikawa, Ayumi Shintani, Naoki Kondo, Masaru Sasaki, Miki Kohara and participants at the 10th Applied Econometrics Conference 2015, ABEF's 9th Annual Conference 2015, and the 11th Annual Conference of Japan Health Economics Association for discussions, comments, and encouragement. This paper is awarded "Young Best Presentation Award 2016" at the 11th Annual Conference of Japan Health Economics Association.

Our gratitude goes to the Japan Society for the Promotion of Science and the Institute of Social and Economic Research at Osaka University for financial supports. JSPS Grant Numbers are 14J04581(S. Sasaki), 14J07655(M. Akesaka), 13J05272(H. Kurokawa), and (A) 26245041(F. Ohtake).

# Appendices

**Table Appendix A.** Comparisons between recipients and fellow nominees

| | | The Akutagawa Prize | | |
|---|---|---|---|---|
| | | Recipients N = 109 | Fellow nominees N = 254 | |
| Variable name | Time | Mean (SD) | Mean (SD) | Difference (SE) |
| Age | At 1st nomination | 35.33 (7.14) | 36.72 (8.65) | -1.40* (0.94) |
| Age | At final nomination | 36.78 (7.26) | 38.05 (9.04) | -1.27* (0.98) |
| Number of total nominations | At final nomination | 2.00 (1.31) | 1.70 (1.14) | 0.30** (0.14) |
| Number of published books | At final nomination | 5.39 (8.67) | 4.59 (14.29) | 0.81 (1.47) |
| Number of other public prizes | At final nomination | 0.29 (0.50) | 0.23 (0.44) | 0.07 (0.05) |
| Number of other non-public prizes | At final nomination | 0.44 (0.67) | 0.29 (0.53) | 0.15** (0.07) |
| Side job 1: No job or no stable job (Dummy) | | 0.30 (0.46) | 0.36 (0.48) | -0.06 (0.05) |
| Side job 2: Creators (Dummy) | | 0.08 (0.28) | 0.04 (0.20) | 0.04* (0.03) |
| Side job 3: Office workers (Dummy) | | 0.22 (0.42) | 0.20 (0.40) | 0.02 (0.05) |
| Side job 4: Self-employed (Dummy) | | 0.19 (0.40) | 0.17 (0.38) | 0.02 (0.04) |
| Side job 5: Servants (Dummy) | | 0.19 (0.40) | 0.22 (0.41) | -0.03 (0.05) |

| | | The Naoki Prize | | |
|---|---|---|---|---|
| | | Recipients N = 125 | Fellow nominees N = 220 | |
| Variable name | Time | Mean (SD) | Mean (SD) | Difference (SE) |
| Age | At 1st nomination | 41.95 (7.86) | 42.79 (8.71) | -0.84 (0.94) |
| Age | At final nomination | 45.15 (8.72) | 44.58 (9.14) | 0.58 (1.01) |
| Number of total nominations | At final nomination | 2.49 (1.76) | 1.70 (1.16) | 0.78*** (0.16) |
| Number of published books | At final nomination | 22.55 (29.15) | 11.68 (18.12) | 10.87*** (2.55) |
| Number of other public prizes | At final nomination | 0.22 (0.46) | 0.20 (0.52) | 0.02 (0.06) |
| Number of other non-public prizes | At final nomination | 0.36 (0.57) | 0.30 (0.59) | 0.06 (0.07) |
| Side job 1: No job or no stable job (Dummy) | | 0.19 (0.40) | 0.25 (0.44) | -0.06* (0.05) |
| Side job 2: Creators (Dummy) | | 0.14 (0.35) | 0.08 (0.27) | 0.06** (0.03) |
| Side job 3: Office workers (Dummy) | | 0.32 (0.47) | 0.35 (0.48) | -0.03 (0.05) |
| Side job 4: Self-employed (Dummy) | | 0.18 (0.38) | 0.19 (0.39) | -0.01 (0.04) |
| Side job 5: Servants (Dummy) | | 0.15 (0.36) | 0.12 (0.33) | 0.03 (0.04) |

*Notes:* We collect information regarding side jobs from four biographical dictionaries for Japanese novelists (Shinchosha Publishing Co., Ltd. 1988; Nichigai Associates, Inc., 2002; Nichigai Associates, Inc., 2004; Japan Writers' Association, 2015). We cannot identify precisely when novelists take their side jobs. We define novelists who work part-time or frequently change a side job as those with no stable side job.

**Table Appendix B.** Effects of receiving a prize on mortality (Time-zero: date of birth)

| Probability-of-death equations with time-varying covariates | | **The Akutagawa Prize** | | | **The Naoki Prize** | | |
|---|---|---|---|---|---|---|---|
| Time-zero: **Date of birth** | | **A1** | **A2** | **A3** | **N1** | **N2** | **N3** |
| **The Akutagawa Prize winner:** | Before 65 years | 0.408*** | 0.390*** | 0.410** | | | |
| | | (0.142) | (0.133) | (0.150) | | | |
| | After 65 years | 3.187*** | 3.405*** | 3.248*** | | | |
| | | (1.237) | (1.305) | (1.317) | | | |
| **The Naoki Prize winner:** | | | | | 1.446** | 1.472** | 1.475** |
| | | | | | (0.234) | (0.241) | (0.241) |
| Time-varying covariates: | Age | 1.008 | 1.005 | 1.005 | 1.016 | 1.017 | 1.018 |
| | | (0.020) | (0.020) | (0.020) | (0.018) | (0.018) | (0.018) |
| | Number of nominations (Akutagawa) | 1.394*** | 1.392*** | 1.366*** | | | |
| | | (0.100) | (0.098) | (0.099) | | | |
| | Number of nominations (Naoki) | | | | 1.028 | 1.031 | 1.032 |
| | | | | | (0.052) | (0.053) | (0.053) |
| | Number of published books | 0.990 | 0.990 | 0.990 | 1.004 | 1.004 | 1.004 |
| | | (0.009) | (0.009) | (0.008) | (0.003) | (0.003) | (0.003) |
| | Number of other non-public prizes | 0.629 | 0.569 | 0.330** | 1.514 | 1.388 | 1.385 |
| | | (0.369) | (0.277) | (0.183) | (0.496) | (0.454) | (0.473) |
| | Number of other public prizes | 1.441 | 1.581 | 2.727* | 0.662 | 0.701 | 0.702 |
| | | (0.934) | (0.836) | (1.601) | (0.234) | (0.258) | (0.263) |
| | Suicide dummy | | 13.569*** | | | 19.830*** | |
| | | | (5.812) | | | (8.239) | |
| Other attribute variables: | | YES | YES | YES | YES | YES | YES |
| Suicide failures: | | YES | YES | NO | YES | YES | NO |
| Number of subjects: | | 363 | 363 | 358 | 345 | 345 | 343 |
| Number of observations: | | 1,413 | 1,413 | 1,392 | 1,901 | 1,901 | 1,899 |

*Notes:* Cluster robust seeform in parentheses. *** p<0.01, ** p<0.05, * p<0.1. We express estimation results in hazard ratios. If the estimated value exceeds 1, mortality increases, and vice-versa. We can read a change in mortality as a percentage by subtracting 1 from the estimated value and multiplying by 100. When checking the time-dependency of the parameters of winning, we find that the reduction rates of the survival function among the Akutagawa recipients rises sharply 65 years after the date of birth. We find no change in reduction rates among Naoki recipients.

**Table Appendix C.** Suicides among deceased

| | The Akutagawa Prize | | |
|---|---|---|---|
| Variable name | Deceased Recipients N=54 | Deceased fellow nominees N=129 | Difference |
| Number of suicides | 1 | 4 | -3 |
| Proportion of suicides (SD or SE) | 0.02 (0.14) | 0.03 (0.17) | -0.01 (0.03) |

| | The Naoki Prize | | |
|---|---|---|---|
| Variable name | Deceased Recipients N=72 | Deceased fellow nominees N=131 | Difference |
| Number of suicides | 0 | 2 | -2 |
| Proportion of suicides (SD or SE) | 0.00 (0.00) | 0.02 (0.12) | -0.02 (0.01) |

*Note:* *** p<0.01, ** p<0.05, * p<0.1.

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