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Quantifying Social Construction: Evidence from blood type discrimination in Japan*

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Abstract

Recent trends in populism have revived essentialist views on human traits, prompting renewed debates about whether prejudices are biologically determined or socially constructed. Although previous studies have demonstrated the socially constructed nature of many prejudices, the long history of socioeconomic and political oppression makes it challenging to pinpoint the specific biases that drive discrimination. I address this issue by leveraging a unique natural experiment: discrimination based on blood type in Japan's marriage and labor markets. Specifically, I quantify how the arbitrary prejudice that labels individuals with type B blood as selfish leads to tangible discrimination. I develop a novel theoretical framework to differentiate direct, taste-based discrimination from indirect, market-based discrimination that operates through diminished labor market prospects and self-fulfilling prophecies. Empirical results reveal that this bias reduces marriage rates by 5.4 percentage points and increases unemployment rates by 2 percentage points, with additional evidence highlighting self-fulfilling prophecies among Japanese men with type B blood. The findings underscore the significant economic impact of a particular, socially constructed prejudice.

Keywords: social construction, discrimination, blood type, self-fulfilling prophecies
JEL classification: D23, L22, L25, M10

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1 Introduction

Discrimination based on race and gender has long distorted labor markets and stifled economic opportunities. Seminal field experiments by Goldin and Rouse (2000) and Bertrand and Mullainathan (2004) have illuminated how stereotypes and biases—social constructs without biological justification—persistently influence outcomes.[1] These prejudices, often entrenched by historical events and economic disparities (Heckman (1998); Akerlof and Kranton (2000)), complicate the task of isolating specific stereotypes that lead to particular economic effects. Within the framework of the social identity models proposed by Akerlof and Kranton (2000), Bertrand et al. (2015) examines how the gender identity norm that "a man should earn more than his wife" shapes social and economic behaviors. However, which stereotypes fuel this norm? Is it the notion that women are physically and emotionally "weaker," necessitating protection and support, or the belief that women are "naturally nurturing" and should focus on domestic roles, or the stereotype that women are "less competitive" than men, or is it a complex interplay of these and other stereotypes about both women and men?

To trace the effects of a specific stereotype on economic outcomes, I depart from the traditional focus on race and gender, turning instead to an arbitrary and culturally constructed characteristic in Japan: blood type. At one point, a majority of Japanese people believed that individuals with blood type B are *selfish* (*wagamama* or *jikochu* in Japanese) and unwilling to adjust to others' pace (*my-pace*, a Japanese-made English term). This stereotype lacks any biological or historical basis, representing a historically new form of social bias. Such a context provides a cleaner environment—with limited cultural interactions and intergenerational social mobility—to observe how social markers, even when arbitrary, can rapidly become influential enough to shape marriage and labor market outcomes. Unlike the deep-seated biases examined in existing scholarship, this study offers a rare opportunity to examine the emergence and impact of discrimination within a short historical window, centered on a very specific negative trait.

Using a nationally representative survey from Japan, I find that this bias decreases the marriage rates of people with type B blood by 5.4 percentage points overall, mostly driven by a 12.7 percentage-point decrease in type-B young men's marriage rates. Meanwhile, this bias increases unemployment rates by 2 percentage points (or 121% increase) among Japanese men with type B blood. These effects are concentrated among men, consistent with the traditional role of men as primary breadwinners in Japan during the sample period and with our additional finding that women are more likely to believe in the stereotype.

The effects on marriage markets can arise directly from preferences in the marriage market or indirectly through labor markets and self-fulfilling prophecy effects—or both. On one hand, people's preferences

[1] For a comprehensive overview of the literature, see Bertrand and Duflo (2017).

over blood types may directly affect marriage outcomes. I call it a *taste-based* channel. On the other hand, negative effects on labor market outcomes may indirectly affect marriage prospects by decreasing the attractiveness of potential mates. The negative stereotype can indeed change the personality or ability of stereotyped individuals, as empirically demonstrated by Glover et al. (2017). I call these indirect channels as *market-based* channels. The existing studies do not provide a straightforward way to determine which channel drives the discriminatory results in marriage markets.[2]

To confirm the presence of either channel, I introduce a novel approach based on a simple theoretical model that exploits the characteristics of *partners*. In our model, there are two stages: dating and marriage. I assume that blood type stereotypes affect only the dating stage. If market-based channels exist, this would decrease type-B individuals' attractiveness as potential partners and shift the distribution of such attractiveness to the left. Following the standard setup of cutoff utility values below which one does not marry, this shift would decrease the marriage rate of those with type B blood. Leveraging the known assortativity of matching by characteristics such as education and income, in the absence of the taste-based channel, the shift would result in a lower average of such characteristics for those type-B individuals who are married. However, in the presence of the taste-based channel, with the assumption that the prejudice enters preferences in an additively separable manner, people have different thresholds for different blood types. Given the negative stereotype against blood type B, being blood type B raises the bar to date someone. This further decreases the marriage rate of people with blood type B, while the raised threshold would increase the average of the aforementioned characteristics. This implies that the average of such characteristics may not be lower than the partners of those with the other blood types. I confirm this pattern, establishing the presence of both direct and indirect effects in the marriage market.

To test the robustness of our results, I conduct a placebo analysis using the same survey conducted in the United States. In the U.S., no such stereotype about blood types exists, thus providing a setting to assess whether similar patterns persist among a non-Asian population. I find no differences in marriage and labor market outcomes between individuals with type B blood and those with other blood types, confirming the power of social construction.

While I observe the presence of market-based channels, part of these effects may be driven by self-fulfilling prophecies. Glover et al. (2017) empirically demonstrate that bias against minorities can negatively affect their job performance. Although evidence is mixed in the literature, Sakamoto and Yamazaki (2004) and Tsuchimine et al. (2015), who use different datasets, also find self-fulfilling prophecy effects on the personalities of people with blood type B. Using the same dataset that I use in this study, Nawata (2014)

[2] An exception is Hitsch et al. (2010), who have rich data on the characteristics and email "contact" actions of all potential mates in online dating settings. Their structural model allows one to disentangle the direct and indirect channels with precise magnitudes.

does not find differences in personalities among people with different blood types. Given the differences in survey questions on personalities among these studies, it is unfortunately difficult to test the findings of Sakamoto and Yamazaki (2004) with the survey questions that I use.[3]

To test the self-fulfilling prophecies, I examine one: tardiness. The association between blood type and personality has led to the stereotype that people with blood type B are tardy[4] because they are "my-pace." Exploiting the timeframe of the stereotype's emergence and a survey question about procrastination during childhood, I find evidence of self-fulfilling prophecy effects on the personality traits—specifically, tardiness—of individuals with blood type B.

Although these results are indeed striking, one may ask whether this uniquely Japanese form of discrimination offers any universal insights. For example, might the findings have implications for understanding gender discrimination or racial discrimination? Owing to the long historical trajectories underpinning these latter forms of bias, it is challenging to quantitatively disentangle the specific factors that currently sustain them. Consider, for instance, racial discrimination against African Americans in the United States: it remains difficult to separate the effects of direct prejudice from those of "statistical discrimination" induced by intergenerational factors such as residual poverty stemming in part from the legacy of slavery that can lead to higher crime rates. This is similar to what Heckman (1998) discusses. Consequently, the extent to which the elimination of discriminatory attitudes alone would mitigate racial discrimination remains unclear.

In contrast, the discrimination examined in this study emerged over a short time span and was entirely predicated on baseless prejudices. This context allows us to demonstrate that simply removing discriminatory attitudes can yield remarkably large effects. In this sense, by providing evidence on a specific stereotype-based form of discrimination without historical baggage and the complexity of multidimensional stereotypes, this study contrasts with existing literature that often deals with longstanding inequalities rooted in race or gender, such as among numerous influential papers, in addition to the ones mentioned above, Altonji and Blank (1999); Fryer and Levitt (2004); Card et al. (2008); Kline and Walters (2021); and Kline et al. (2022).

My study also contributes to the long-standing debate about the relationship between biological differences and discrimination. In the context of gender, hormonal differences, such as in testosterone levels, have been discussed (e.g., van Anders et al. (2015) and Luigi et al. (2023)). In the context of race, genetic differences between races are often highlighted, though within-race genetic variation is larger than between-race variation (e.g., Goodman (2000) and Ioannidis et al. (2004)). In my setting, microbiome composition differ-

[3] Furthermore, the survey questions on personalities in Sakamoto and Yamazaki (2004) use yes-or-no binary responses, while the survey I use has 1-to-5-ranged multiple choice responses. Given the known tendency of Japanese people choosing mid-point scale more than other peoples in Asia (Shishido et al. (2009)), the response difference could induce the lack of the observation in differential personalities reported among people with different blood types.

[4] See, e.g., https://news.livedoor.com/article/detail/6613128/ and https://souken.shikigaku.jp/29139/. Retrieved on Oct 30, 2024.

ences among different blood type groups have been studied (Lopera-Maya et al. (2022); Qin et al. (2022); Sanna et al. (2022); and Yang et al. (2022)).[5] Although there exists such biological differences among blood types, the differences do not appear to be significant enough to affect economic and social markers as demonstrated by the null effects in the U.S. sample of my study. Tsuchimine et al. (2015) claims to find the effects of biological differences among blood types on the persistent characteristic of people with blood type B in Japanese population. However, persistence is a known stereotype of blood type B induced because they are "my pace."[6] Given the findings of this paper on self-fulfilling prophecy effects on tardiness, it is natural to think that the persistence difference is socially constructed rather than biologically induced. Furthermore, Hou et al. (2022) find evidence for assortative mating based on blood type in a sample of over one million pregnancies in China. While they do not pin down the mechanism behind this phenomenon, two channels might explain it. One is the influence of Japanese-made blood type association culture on China, as documented by Omura et al. (2009). The other channel is within-province variation. Although they control for province fixed effects, provinces in China are large—some even larger than Japan as a whole. Fujita et al. (1978) find regional differences in blood type distribution even within Japan. Therefore, local variation in the dominance of a particular blood type may exist within one province, resulting in assortative matching by blood type through geographic proximity. This could be exacerbated by the geographic concentration of the 56 ethnic groups in China. While the present survey does not contain data on partners' blood types and cannot address this question directly, the findings shed light on potential mechanisms behind their observations.

Ultimately, this study adds to the broader economics literature by illustrating how culturally arbitrary distinctions, such as blood type, can have significant economic consequences. This perspective enriches our understanding of how discrimination can evolve and embed itself within economic systems even in societies with limited racial diversity, challenging the assumption that such biases are inherently tied to racial or ethnic diversity Guryan and Charles (2013); Alesina et al. (2019). The findings also have important policy implications for addressing discrimination in societies where new forms of bias might emerge, reinforcing the view that social cohesion cannot be achieved merely by eliminating diversity but must address the underlying mechanisms of bias formation.

[5]This difference might have resulted in the differences of vulnerability to COVID-19 by blood type, as documented by Liu et al. (2020).

[6]See, e.g., https://www.p-a.jp/renaru/marriage/24795/. Retrieved on Oct 31, 2024.

2 History of Blood Type Discrimination in Japan Origins in the Early 20th Century

The human ABO blood group system was found by Landsteiner (1900), which awarded him a Nobel Prize in Physiology or Medicine in 1930. The system groups individuals into either A, B, O, or AB types. Ohmura (2012) claims that this knowledge was later used for discrimination against East Asians due to the prevalence of blood type B which is dominant blood type of Chimpanzees.[7]

The association between blood types and personality traits in Japan began in 1927 when psychologist Takeji Furukawa published a paper suggesting a correlation between blood type and temperament (Furukawa (1927)). As summarized in Omura et al. (2008), Furukawa (1927) observed the relationship between blood type and personality among 11 of his relatives. He found that individuals with blood types B and O were extraverted, while those with blood type A were introverted. Since there were no relatives with blood type AB, he grouped AB with type A. Based on this thinking, he developed a questionnaire and reported that the results supported his hypothesis. Over 300 studies have replicated his theory, covering fields beyond education, including medicine, industry, and military. Although some supporters of Furukawa's theory existed, a comprehensive review of many studies revealed inconsistent results. Around 1933, his theory was academically discredited.[8] However, as Ohmura (2012) documents, his theory sparked the popularity of the association between blood types and personality in the 30s, and even the Takarazuka Revue (Kagekidan), the most famous all-female musical theater troupe, made a drama about the theory during this period.

While the boom faded away, in the 1970s and early 80s, journalist Masahiko Nomi revitalized the idea by publishing a series of books that claimed to detail the relationship between blood types and personality traits (Ohmura (2012); Uemura and Sato (2006)). The idea of the blood-type-personality association became viral, evidenced by the number of books and magazine articles on blood types and personality presented at Table 1.

In general, Takuma and Sato (1994) report that people with blood type A are believed to be scrupulous, nervous, and serious; those with blood type B are cheerful but selfish; those with blood type O are broad-minded; and those with blood type AB have a dual personality. Surprisingly, by the beginning of the 1990s, Sato and Watanabe (1992) document that approximately 60% of the Japanese believed in the association between blood types and personality.[9] A *Newsweek* article in 1985 well described this phenomenon:[10]

[7] It appears that eugenicists were to some extent interested in blood types. See, e.g., Roberts (1947).

[8] See, also, Sakamoto and Yamazaki (2004)

[9] Wu et al. (2005), citing D'Adamo and Whitney (2000), mention that more than 70% of the Japanese believed in the association.

[10] Excerpt from Sakamoto and Yamazaki (2004) who used the article by J. Treen and Y. Hoshiai published on April 1, 1985 at Newsweek (vol. 105, page 50).

Table 1: Number of Publicized Books and Magazine Articles on Blood Types and Personality

Year	**Book**	**Article**	**Total**
1972	1	2	3
1973	6	4	10
1974	5	7	12
1975	5	7	12
1976	8	7	15
1977	1	8	9
1978	7	8	15
1979	7	7	14
1980	17	4	21
1981	12	9	21
1982	22	17	39
1983	19	24	43
1984	51	66	117
1985	59	28	87
1986	16	13	29
1987	9	28	37
1988	16	9	25
1989	2	6	8
1990	17	12	19
1991	14	20	34
1992	26	1	27
1993	2	0	2

Notes: These values are excerpted from Sakamoto and Yamazaki (2004) who used the values from Mizoguchi (1994).

> The Japanese have found a new way to 'typecast' people. It's not astrology; it's not studying the bumps on people's heads. It's blood typing.... There is absolutely no scientific basis for typecasting by blood, of course, but that hasn't stopped many Japanese from applying it to everything from love affairs to employment interviews.

According to Uemura and Sato (2006), the blood-type-theory boom comes roughly once every 10 years, which took place in the mid-80s, 90s, and 2000s. In the early 1990s, people have the most negative prejudice toward people with blood type A (Kamise and Matsui (1991); Sato et al. (1991)). However, this has significantly improved ever since the late 1990s when the media started using the term "genius" rather than "weirdo" to describe blood type AB (Yamaoka (2011)). Indeed, Yamaoka (2011) documents that the stigma against blood type B has been consistently harsh since the 1970s. People have the most negative prejudice toward blood type B, while people with blood type B have negative experiences with the association and were discriminated and bullied at the highest frequencies in 2005 and 2009. Yamaoka (2011) claims that the boom in the mid-2000s, in particular, in December 2004, was due to the TV shows. The TV shows further exacerbated discrimination against type-B people, leading to the "request" by the Broadcasting Ethics and Program Improvement Organization (BPO) to terminate programs that induce such discrimination in

Japan.[11] Yamaoka (2011) shows that many more people were influenced by TV shows regarding blood type stereotypes than readings, implying that the discrimination was most prevalent from the early 2000s to the mid 2000s when the BPO made the request to stop the spread of stereotypes in the end of 2004. Given that the boom took place in the mid 1980s, 1990s, and 2000s, I shall look at those who spend adolescent period during these periods (i.e., under 40 years old in my sample) separately from those above 40 years old.

The prejudice may affect marriage and labor markets. Conducting a survey experiment on college students, Ose and Takigawa (2010) show that the subjects (both explicitly and conjointly) report that blood type B and AB people are the least potential romantic partners and tend to be the least favorable job candidates. Indeed, the Ministry of Labor and Welfare in Japan reports cases in which job candidates were required to report their blood types in their applications or at job interviews, leading to the request not to discriminate by blood types at work.[12] Such cases include the ones in which job candidates were explicitly told that they were rejected due to their blood type being B,[13] The fact that these cases were reported after 2000s when the boom has already gone implies the frequency of such incidents from the 1980s through 2000s in Japan.[14]

While there is no statistics about the proportion of Japanese firms asking blood types for screening, there is one in South Korea. Until recently, Japanese pop culture significantly affected Taiwan, Korea, and China.[15] Hlasny (2009) reports that among 326 private firms in his sample, approximately 25% ask blood types of applicants in their application forms for job positions. In Japan, *Asahi Newspaper*, one of the largest newspaper, published an article in 1990 reporting that Mitsubishi Electronics, a large electronics company under Mitsubishi conglomerates, gathered only those with blood type AB to make a project team.[16] The tone of the news article was surprisingly in favor of the company for trying to create new business ideas, as documented in Takuma and Sato (1994).[17] This implies how prevalent the use of blood type stereotypes was in business.

3 Data

This study uses the Japan Household Panel Survey on Consumer Preferences and Satisfaction (JHPS-CPS), an annual panel survey that is nationally representative of Japan's resident population. The JHPS-CPS

[11] See, https://www.bpo.gr.jp/?p=5125. Retrieved on Oct 1, 2024.

[12] See, e.g., https://jsite.mhlw.go.jp/tokyo-hellowork/content/contents/000723446.pdf and https://jsite.mhlw.go.jp/fukuoka-roudoukyoku/content/contents/001519018.pdf. Retrieved on Oct 1, 2024.

[13] See, e.g., https://www.j-cast.com/kaisha/2011/08/23105091.html?p=all in 2011, https://www.bengo4.com/c_5/n_1928/ in 2014, and https://www.nikkei.com/article/DGKDZO68704120S4A320C1TZ1000/. Retrieved on Oct 1, 2024.

[14] Hasegawa (1985) introduces cases in which some kindergartens divide students into different classes by blood type.

[15] See, e.g., Wu et al. (2005) discussing how the blood-type-personality association is believed in Asia.

[16] From an *Asahi Newspaper* article published on November 21, 1990.

[17] See p. 139 of Takuma and Sato (1994).

is stratified based on two key criteria: geographical region and city size.[18] The survey data are collected through self-administered paper questionnaires, which are hand-delivered and retrieved from the homes of participating households.[19] The survey is administered annually during the months of January and February.

Among 17 waves, only waves of year 2005, 2006, and 2017 ask respondents about their blood types. As Table 2 shows, the survey adds new respondents once in a while to retain the sample size over time. Due to budget cutbacks, the survey was not able to add new respondents between 2010 and 2021. Since respondents age, by the time of wave 2017, few respondents between age of 20 and 30 remain in the sample. For this reason, I focus on wave 2005 and 2006 for main analyses. Restricting the sample to those who were respondents in the two waves, I use other waves for additional analyses. I also exclude around 1% of respondents who did not provide a response to a question asking blood types.

Table 2: Survey Response Rates

Year	Survey Date	Total Surveys Distributed		Valid Responses Collected		Response Rate (%)	
		All	New	All	New	All	New
2003	2003/01/28-2003/02/17	2000	2000	1418	1418	71.1	71.1
2004	2004/01/29-2004/02/25	6002	4600	4224	3161	70.4	68.7
2005	2005/02/09-2005/03/10	4145	0	2987	0	72.1	–
2006	2006/02/10-2006/02/28	4879	2000	3763	1396	77.1	69.8
2007	2007/01/18-2007/02/13	3660	0	3112	0	85.0	–
2008	2008/01/18-2008/02/12	3048	0	2731	0	89.6	–
2009	2009/02/27-2009/03/16	8683	6000	6181	3704	71.2	61.7
2010	2010/01/14-2010/02/15	6134	0	5386	0	87.8	–
2011	2011/01/13-2011/02/14	5316	0	4934	0	92.8	–
2012	2012/01/12-2012/02/13	4887	0	4588	0	93.9	–
2013	2013/01/11-2013/02/12	4544	0	4341	0	95.5	–
2016	2016/01/15-2016/02/15	3186	0	2948	0	92.5	–
2017	2017/01/13-2017/02/13	2207	0	2114	0	95.8	–
2018	2018/01/12-2018/02/12	1736	0	1696	0	97.7	–
2021	2021/01/14-2021/02/10	3437	0	2733	0	79.5	–
2022	2022/01/12-2022/02/10	5841	2500	3427	822	58.7	32.9
2023	2023/01/11-2023/02/10	3444	0	2921	0	84.8	–

[18] All municipalities are divided into 40 strata, consisting of 10 geographical areas and 4 categories based on population size. The sample size within each stratum is proportional to the population of residents aged 20–69 years. Sampling within each stratum is conducted using random systematic sampling of census units. The sampling weights are computed based on seven geographic groups and five age groups. I use the sampling weights throughout the paper.

[19] Participants receive a cash voucher of JPY 1,500 (approximately US$15) upon completing the survey.

Table 3 summarizes descriptive statistics of the data used in this paper. For this table, I restrict the sample from wave 2005 and 2006 to be unique across the two waves.

The first row of Table 3 demonstrates the distribution of blood types in the sample. According to the Japanese Red Cross, the ratio of blood type A, O, and B to blood type AB is roughly speaking 4:3:2:1.[20] The nationally representative sample of the JHPS-CPS follows this distribution. The age of respondents also represents the population overall, while the age of type-B respondents is slightly lower than the other blood type respondents. The sex of respondents is slightly lower than 50%, reflecting the fact that women tend to live longer in Japan. Slightly more male type-B respondents take the survey compared with the other blood types. The status of being married is lower for type-B respondents compared with the other types. The income level data comes from survey responses to income range questions. Other than the bottom (0) and top (over 14 million yen) coding, I take the median of each income range. As for the top coding issue, I use Tobit regression approach when outcomes are the income levels of either respondents themselves or their partners.

Table 3: Descriptive Statistics

(a) Descriptive Statistics without Sample Weights

	Blood Type				
	A	B	AB	O	Total
N	1,623 (38.5%)	929 (22.0%)	405 (9.6%)	1,258 (29.8%)	4,215 (100.0%)
Age	49.83 (13.15)	48.52 (13.14)	49.83 (13.27)	49.66 (13.18)	49.49 (13.18)
Male (0/1)	0.48 (0.50)	0.46 (0.50)	0.48 (0.50)	0.47 (0.50)	0.47 (0.50)
Married (0/1)	0.78 (0.41)	0.75 (0.43)	0.82 (0.39)	0.78 (0.42)	0.78 (0.42)
Unemployed (0/1)	0.02 (0.13)	0.02 (0.15)	0.02 (0.14)	0.02 (0.12)	0.02 (0.13)
Housewife(husband) (0/1)	0.29 (0.45)	0.30 (0.46)	0.30 (0.46)	0.32 (0.47)	0.30 (0.46)
Income (10,000 yen)	275.99 (303.46)	272.00 (312.28)	263.05 (305.35)	276.88 (311.39)	274.13 (307.89)
Income of Partner	294.13 (335.31)	315.86 (337.40)	289.79 (316.17)	311.78 (341.89)	303.66 (335.87)
Years of Education	12.80 (2.21)	12.88 (2.27)	12.81 (2.26)	12.80 (2.19)	12.82 (2.22)
Years of Education of Partner	12.76 (2.28)	12.87 (2.25)	13.01 (2.40)	12.78 (2.31)	12.81 (2.29)

(b) Descriptive Statistics Weighted by Sample Weights

	Blood Type				
	A	B	AB	O	Total
N	51,056,255 (38.3%)	30,482,487 (22.8%)	12,441,087 (9.3%)	39,463,791 (29.6%)	133,443,620 (100.0%)
Age	45.28 (15.23)	43.50 (15.04)	45.99 (15.23)	45.38 (15.10)	44.97 (15.16)
Male (0/1)	0.51 (0.50)	0.50 (0.50)	0.49 (0.50)	0.50 (0.50)	0.51 (0.50)
Married (0/1)	0.68 (0.47)	0.62 (0.49)	0.75 (0.44)	0.68 (0.47)	0.67 (0.47)
Unemployed (0/1)	0.02 (0.13)	0.02 (0.14)	0.02 (0.14)	0.02 (0.14)	0.02 (0.14)
Housewife(husband) (0/1)	0.26 (0.44)	0.25 (0.43)	0.27 (0.45)	0.27 (0.44)	0.26 (0.44)
Income (10,000 yen)	266.82 (289.23)	258.76 (290.10)	245.22 (288.66)	265.69 (296.26)	262.61 (291.43)
Income of Partner	276.92 (327.39)	305.58 (327.82)	279.82 (303.34)	299.18 (331.68)	290.07 (326.43)
Years of Education	13.05 (2.22)	13.13 (2.28)	12.93 (2.20)	13.02 (2.20)	13.05 (2.23)
Years of Education of Partner	12.77 (2.25)	12.93 (2.23)	13.00 (2.33)	12.83 (2.29)	12.85 (2.27)

The response and survivor rates of the survey are potential sources of selection biases, if the social stigma affect marriage and labor markets. As Tables 4 and 4(c) show, housewives are likely to remain in the

[20]See, e.g., https://www.bs.jrc.or.jp/kk/hyogo/donation/m2_02_01_00_bloodtype.html, retrieved on Sep 27, 2024. Furukawa (1932) reports that the proportion of the blood type distribution in Japan was 38.2%, 31%, 21.2%, and 9.6% for A, O, B, and AB, respectively.

succeeding wave of the survey, and thus, housewives may likely respond to the survey more frequently than other populations. Note that, in Japan, women are expected to quit jobs and become housewives, potentially with some part-time job, once married, a phenomenon called "kotobukitaisha" (Guo et al. (2024)). This practice is not applied to men. Given that we do not find effects on the marriage and unemployment rates of women with blood type B, the stigma is not expected to differentiate the response rates among women with different blood types.

However, the stigma does affect those rates of men with type B blood. Table 4(b) shows that those respondents who are older and married tend to remain in the subsequent wave, whereas the unemployment rates do not influence. Then, it may be the case that those married men tend to respond to the survey, possibly asking their wives to fill in the survey questions for them.

For these reasons, for analyses on marriage rates, I do not use the panel structure of the survey and only use unique samples in the two waves. As for labor market outcomes, I exploit the panel structure and include both responses of the survivors to increase power.

I expect a differential effect of the stereotype of blood type on men and women, since women are expected to be more superstitious than men.[21] In fact, the present sample shows this tendency. The 2008 wave of the survey includes two questions: The first question asks if "you believe in superstition" and the other one asks if "one can tell someone's personality by that person's blood type." The answers are measured on a scale of 1 to 5, where 1 is "strongly agree," 2 is "somewhat agree," 3 is "neutral," 4 is "somewhat disagree," and 5 is "strongly disagree." To check if the difference is induced by actually the greater proportion of those who believe in these norms, I construct a binary variable if a response lies in 1 or 2 out of 1 to 5 scale. Table 5 demonstrates that, in the sample of respondents to the 2005 or 2006 waves, women indeed tend to believe in superstition and the blood-type-personality association more than men. This is actually a remarkable difference given the known tendency of Japanese people choosing mid-point scale more than other peoples in Asia (Shishido et al. (2009)). Therefore, at least at marriage markets, I expect a greater degree of discrimination on men. This tendency should be reinforced by the fact that men tend to put greater weight on physical attractiveness of partners than women (see, e.g., Fisman et al. (2006)), which implies that men might care less about the personality, and thus, blood types of potential mates than women do.

Lastly, to test the self-fulfilling prophecy effects, I also look at different age cohorts. The main survey question to test the self-fulling prophecy effects asks how respondents have done homework during holiday seasons when they are a child. The response ranges from 1 (finishing homework in the beginning of the holiday seasons) to 5 (finishing homework toward the end of the holiday seasons). I use this question as a proxy for procrastination and thus tardiness during childhood. As mentioned above, the first boom of the

[21] See, e.g., Blum (1976); Maqsood et al. (2018); and Shahid (2023).

Table 4: Characteristics of Survivors of 2005 Respondents

(a) All

	(1) Non-survivor	(2) Survivor	(3) (1) vs. (2), p-value
Age	49.24	50.29	0.07
Male (0/1)	0.51	0.46	0.02
Married (0/1)	0.73	0.81	0.00
Unemployed (0/1)	0.02	0.02	0.70
Housewife(husband) (0/1)	0.26	0.32	0.00
Income (10,000 yen)	277.88	273.09	0.75
Income of Partner	253.76	321.12	0.00
Years of Education	12.70	12.76	0.54
Years of Education of Partner	12.69	12.81	0.35

(b) Male Respondents

	(1) Non-survivor	(2) Survivor	(3) (1) vs. (2), p-value
Age	49.92	51.49	0.06
Married (0/1)	0.74	0.82	0.00
Unemployed (0/1)	0.02	0.02	0.89
Housewife(husband) (0/1)	0.07	0.05	0.24
Income (10,000 yen)	443.70	456.56	0.58
Income of Partner	93.48	125.30	0.04
Years of Education	12.99	12.94	0.76
Years of Education of Partner	12.38	12.38	1.00

(c) Female Respondents

	(1) Non-survivor	(2) Survivor	(3) (1) vs. (2), p-value
Age	48.52	49.27	0.36
Married (0/1)	0.71	0.80	0.00
Unemployed (0/1)	0.02	0.01	0.74
Housewife(husband) (0/1)	0.45	0.56	0.00
Income (10,000 yen)	119.55	122.24	0.83
Income of Partner	472.04	513.21	0.16
Years of Education	12.38	12.60	0.08
Years of Education of Partner	13.05	13.19	0.50

Notes: "Non-survivor" indicates those respondents who responded to 2005 but not 2006 wave, while "Survivor" indicates those respondents who responded to both 2005 and 2006 waves.

blood-type stereotypes has occurred in the mid-1980s. Then, given that mandatory schooling ends at junior high school in Japan and that I use 2005 and 2006 survey samples, I use 40-years old as the cut-off to test the self-fulfilling prophecy effects. Since I observe significant differences in procrastination, I also perform

Table 5: Differential Degree of Belief in Superstition and Blood-type-Personality Association

	(1) Female	(2) Male	(3) (1) vs. (2), p-value
Belief in Superstition (1/5 scale)	3.15	3.58	0.00
Belief in Bloodtype (1/5 scale)	3.09	3.31	0.00
Strong or Moderate Belief in Superstition (0/1)	0.22	0.12	0.00
Strong or Moderate Belief in Bloodtype (0/1)	0.25	0.22	0.06

Notes: For the 1/5 scale questions, 1 indicates strongly agree, 2 indicates somewhat agree, 3 indicates neutral, 4 indicates somewhat disagree, and 5 indicates strongly disagree.

the age-subsample analysis for all the other outcomes.

4 Model

4.1 Illustrative One-sided, Two-Stage Matching Model

I shall introduce a simple illustrative one-to-one matching model that involves two stages: dating and marriage. Since blood type stereotype is a belief that can be corrected after dating and getting to know someone, the prejudice is assumed to not affect marriage decisions conditional upon dating. However, the prejudice does affect dating decision before spending costs of dating in a way that for woman w to date man m with stereotype, man m's attributes are so good that woman w considers dating man m. To formalize this process, I introduce two reservation utilities at the dating stage and marriage stage. The former depends on blood types, while the latter does not.

For the illustrative model, the focus is restricted to one-sided matching or partial equilibrium analysis. In particular, given that women tend to believe in the blood-type stereotype more than men, I focus on the perspective from women's point of view. That is, women care and decide whether to date men, but men accept all feasible dates. The model can be extended to a two-sided matching model with general equilibrium analysis, which follows after this section. However, there is no added insight from the extension, and therefore, readers who are not interested in the technical details can safely skip that section.

The illustrative model has two stages only for the sake of a clear exposition. Indeed, the model with only marriage decision is isomorphic to the two-stage model. I shall explain this further in the section for the extension.

The intuition behind the model prediction is as follows. There are channels that affect dating decision and thus marriage decision. One is an indirect *market-based* channel. This channel captures how labor market discrimination or self-fulfilling stereotypes reduce a man's attractiveness on the marriage market. For example, poor employment prospects or undesirable personality make him a "less desirable" partner in the eyes of potential spouses.

The other channel is a direct *taste-based* channel. This captures direct preferences or aversions toward a mate's trait including blood types. This is where a potential spouse's "reservation utility" of marrying someone from a certain blood type group shifts because they directly hold a preference "for or against" that group.

Suppose there is a cut-off for each woman about whether to date or not and marry or not. Moreover, suppose we do observe marriage rates differences between type-B men and non-type-B men. If there is a market-based channel, then this shifts the distribution of attractiveness of type-B men to the negative value. In the absence of the taste-based channel, because of the cut-off, the average value of economic characteristics of married men with blood type B must be lower than that of married men with another blood type. However, if there is a taste-based channel as well, this raises the bar for type-B men to date women. This works as an increase in the cut-off for dating and thus marriage to men with blood type B. The raised bar selects only those with high values of traits for blood-type-B men. This will increase the average value of those married men with blood type B. Therefore, the net effects may not be even negative but rather neutral or even positive, depending on which channel dominates.

4.1.1 Model Setup

I consider a continuum of agents with a set of men M, partitioned into M^B (blood type B) and $M^{\neg B}$ (non-B) and with aset of women W. Each man $m \in M$ has a scalar trait $x_m \in X \subseteq \mathbb{R}$, and each woman $w \in W$ has a scalar trait $y_w \in Y \subseteq \mathbb{R}$. In this model, there are two stages before the decision of marriage. The first stage is dating decision.

4.1.2 Stage 1: Dating Decision

For woman w, the utility of dating man w is given by:

$$U_{mw}^D = f(x_m, y_w) + \epsilon_{mw}^D,$$

where ϵ_{mw}^D is an idiosyncratic error term. I assume that f is continuously twice differentiable, and $\frac{\partial f}{\partial x_m \partial y_m} > 0$, meaning that the model leads to assortative matching where men and women with similar characteristics pair together. For the simplicity, I assume a unidimensional trait.

The reservation utility for dating is given by:

$$R_w^D = \beta B_m + \nu_w^D$$

where B_m represents arbitrary attributes (e.g., blood type) of man m, ν_w^D is an idiosyncratic error term. Woman w will choose to date man m if and only if:

$$U_{mw}^D \geq R_w^D$$

4.1.3 Stage 2: Marriage Decision

For individuals who are dating, the utility of marrying is given by:

$$U_{mw}^M = g(x_m, y_w) + \epsilon_{mw}^M.$$

I assume that g is continuously twice differentiable, and $\frac{\partial g}{\partial x_m \partial y_m} > 0$, meaning that the model leads to assortative matching where partners with similar characteristics pair together and get married.

The reservation utility for marriage is

$$R_w^M = \nu_w^M,$$

where ν_w^M is an idiosyncratic error term at the marriage decision stage. Note that R_w^M does not depend on arbitrary attributes such as blood type.

Woman w will choose to marry man m if and only if:

$$U_{mw}^M \geq R_w^M.$$

Notice that blood type discrimination does not enter the marriage decision making stage. This is because once one dates someone, she or he would know her or his or her partner's personality well, which eliminates the prejudice.

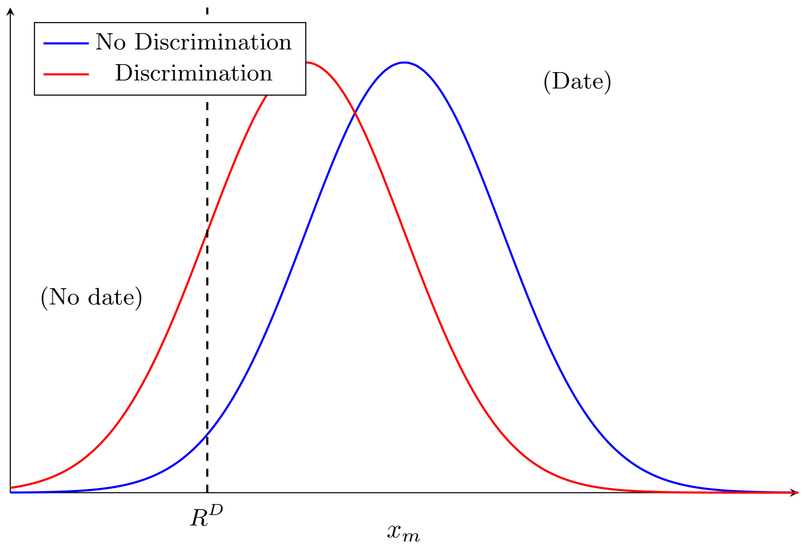
Finally, in this one-sided matching model, the stability of a matching outcome is essentially welfare-maximizing outcome for women. For the sake of completeness, define a stable outcome as an outcome in which (1) every woman who meets her threshold R_w^D for some man is either matched with that man (if he is still free) or else unmatched because all men who meet her threshold are already taken, and (2) there is no woman who could improve her payoff by unilaterally switching to a free man above her threshold.

4.1.4 Intuition of Model Prediction

Suppose discrimination by blood type exists in the labor market for men. This shifts the distribution of x_m to the left. Then, as portrayed by Figure 2, fewer people with blood type B can get married. If $\beta = 0$ meaning that reservation utility of potential dates does not shift, then this will lead to the decrease in the mean of x_m with blood type B who are married.

If $\beta > 0$ and the reservation utility at dating shifts to the right, then, the average wage and intelligence of married people with blood type B may not decrease. We can test this hypothesis by examining the wage and education years of the partners of those with blood type B who are married. This is because of the assortativity of matching. If only the attractiveness shifts due to labor market discrimination or self-fulfilling prophecies that do not involve shifts in the reservation utility level, then by assortativity, the wage and education years of their partners should also decrease. If discrimination takes place not just through labor market but also the direct route of preference structure, the reservation utility shift implies the possible zero or even increase in the wage of education years of the partners of blood type B people.

Figure 1: Dating Market without Prejudice



4.1.5 Formal Proof

In this section, I prove the model prediction more formally. Readers can safely skip this section to understand empirical analyses based on the model predictions.

Consider discrimination against men with blood type B. The proof for discrimination against women with blood type B is similar. First, I shall formally define what I mean by a shift in the distribution of x_m. Let $x_m \sim \Omega_x$ represent the distribution of attributes for men and $y_w \sim \Omega_y$ for women. Let $\Omega_x^{B,\text{date}}$ represent the distribution of x_m for blood type B men who successfully date and $\Omega_x^{B,\text{marry}}$ that for men who successfully marry. I assume that each of these distributions Ω is continuous with full support.

Due to labor market discrimination, assume that men with blood type B have a distribution of attributes Ω_x^B that is shifted to the left compared with the distribution $\Omega_x^{\neg B}$ for men without blood type B. That is, I assume the first-order stochastic dominance (FOSD):

Assumption 1. *If there is discrimination against people with blood type B at the labor market, Ω_x^B is first-order stochastically dominated by $\Omega_x^{\neg B}$*

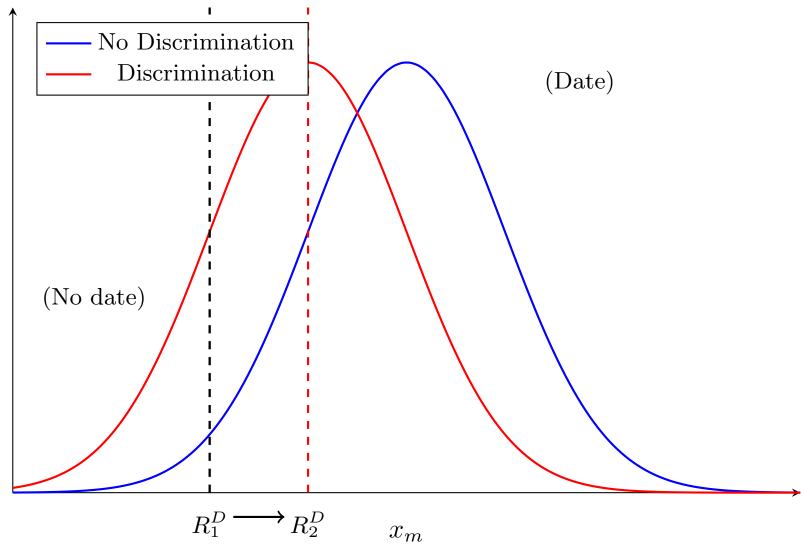
Proposition 1. *Suppose there is discrimination against people with blood type B in the labor market. Let Assumption 1 hold, and suppose a stable (welfare-maximizing) outcome. If $\beta = 0$, then*

$$\mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,marry}] < \mathbb{E}[x_m \mid x_m \sim \Omega_x^{\neg B,marry}].$$

If $\beta > 0$, then

$$\mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,marry}, \beta = 0] < \mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,marry}, \beta > 0].$$

Figure 2: Dating Market with Prejudice



Proof. Men with attributes $x_m \sim \Omega_x^B$ must meet the dating threshold R_w^D to proceed to the marriage stage. Define the subset of Ω_x^B that meets this threshold as $\Omega_x^{B,\text{date}}$. By the properties of truncation and Assumption 1, the expected value of x_m for blood type B individuals who pass the dating stage is less than the expected value for non-B individuals:

$$\mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,\text{date}}] < \mathbb{E}[x_m \mid x_m \sim \Omega_x^{\neg B,\text{date}}].$$

Men who pass the dating stage proceed to the marriage stage if they meet the marriage threshold R_m^M. Importantly, R_m^M is the same for blood type B and non-B individuals.

Because $\Omega_x^{B,\text{date}}$ has a lower mean than $\Omega_x^{\neg B,\text{date}}$ and the marriage threshold does not differentiate by blood type, Ω_x^B is still first-order stochastically dominated after marriage selection. Thus:

$$\mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,\text{marry}}] < \mathbb{E}[x_m \mid x_m \sim \Omega_x^{\neg B,\text{marry}}].$$

As for the second part, let T_0 represent the dating threshold when $\beta = 0$ and T_1 represent the threshold when $\beta > 0$. Since

$$R_w^D = \beta B_w + \nu_w^D,$$

an increase in β for B-type men implies $T_1 > T_0$.

The stricter threshold T_1 means that only a smaller subset of B-type men, with $x_m \geq T_1$, will pass the dating stage. The mean trait value among this smaller subset will necessarily be higher than the mean among the larger subset who pass the lower threshold T_0:

$$\mathbb{E}[x_m \mid x_m \geq T_1] > \mathbb{E}[x_m \mid x_m \geq T_0].$$

Since the marriage reservation utility R_m^M is unaffected by blood type, the stricter dating threshold directly translates to a higher conditional mean x_m among B-type men who marry:

$$\mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,\text{marry}}, \beta > 0] > \mathbb{E}[x_m \mid x_m \sim \Omega_x^{B,\text{marry}}, \beta = 0].$$

$\square$

Note that the sign of the net effects of discrimination in both labor and marriage markets is ambiguous. If the discrimination in the marriage market is small, then the labor market effect dominates and the average value of the traits of married men with blood type B is supposed to be lower than men with another blood type. However, if the discrimination in the marriage market dominates, the sign of the net effects may even be *positive.* This is left for empirical analysis in later sections.

4.2 Isomorphism Between Two-Stage and One-Stage Models

Before delving into the extension to general equilibrium analysis, I demonstrate that the two-stage model of dating and marriage is isomorphic to a one-stage stable matching model with a feasibility constraint. The equivalence holds under the assumption that preferences in the marriage stage depend only on traits and are unaffected by additional information from the dating stage.

For a clear exposition, call the dating stage of the two-stage model as Stage 1, while the marriage stage as Stage 2. Define a pair (i, j) as *feasible* if it passes the Stage 1 dating condition:

$$f(x_m, y_w) + \epsilon_{mw}^D \geq \beta B_m + \nu_m^D.$$

The two-stage model above can be recast as a single-stage stable matching model by defining an *effective surplus function* that incorporates the dating threshold as a feasibility constraint. In particular, construct an effective surplus function $\widetilde{S}(x_m, y_w)$ that incorporates this feasibility constraint:

$$\widetilde{S}(x_m, y_w) = \begin{cases} g(x_m, y_w), & \text{if the pair is feasible (passes Stage 1)}, \\ -\infty, & \text{otherwise.} \end{cases}$$

Then, solve a single-stage stable matching problem using $\widetilde{S}(x_m, y_w)$. The stable matching condition ensures that no feasible pair (i, j) can block the outcome by matching with each other instead of their current partners.

Proposition 2. *The set of pairs (i, j) who marry in any stable outcome of the one-stage model with $\widetilde{S}(x_m, y_w)$ coincides exactly with the set of pairs who pass Stage 1 and marry in the two-stage model.*

Proof. In the two-stage model, any pair (i, j) that fails Stage 1 is infeasible for marriage. This infeasibility is directly encoded in the one-stage model by assigning a surplus of $-\infty$ to such pairs in $\widetilde{S}(x_m, y_w)$. Thus, no such pair can be part of a stable matching. Among pairs that pass Stage 1, the marriage decision in the two-stage model depends on the surplus $g(x_m, y_w)$. This is precisely the surplus used for feasible pairs in the one-stage model. Therefore, the stable matching conditions in the one-stage model replicate the pairwise decisions in Stage 2 of the two-stage model. Since the one-stage model eliminates infeasible pairs and reproduces the stable matching conditions among feasible pairs, the outcomes of the two models are identical.

□

4.3 Two-sided Matching Model

Given the isomorphism, let us explore the general equilibrium analysis. In this paper, although I assume transferable utility for simplicity and exposition, the extension to non-transferable utility case is straightforward and thus omitted. The total (household) surplus generated when man i matches with woman j is denoted by $S(x_m, y_w)$, which is assumed to be strictly **supermodular**:

$$S(x, y) + S(x', y') > S(x, y') + S(x', y), \quad \forall x' > x,\, y' > y.$$

Strict supermodularity ensures that higher-x men and higher-y women generate more surplus together, supporting positive assortative matching and ensuring the uniqueness of a stable matching. Furthermore, I make the standard continuity and regularity assumptions on the surplus function. First, the joint surplus function $S(x, y)$ is continuous (and often continuously differentiable) on $X \times Y$, where X and Y are the respective trait spaces of men and women. Next, the trait spaces X and Y are closed intervals in $\mathbb{R}$, such that:

$$X = [\underline{x}, \overline{x}], \quad Y = [\underline{y}, \overline{y}].$$

This ensures the problem is well-posed and avoids issues with unbounded traits or surplus. Lastly, both Ω_x and Ω_y are absolutely continuous (no point masses) with respect to the Lebesgue measure and have positive density on their respective intervals, ensuring that every trait level is represented in the population.

A matching function μ is defined as the standard matching function in one-to-one matching. That is, $\mu : M \cup W \longrightarrow M \cup W \cup \{\varnothing\}$ such that for each man m, $\mu(m) \in W \cup \{\varnothing\}$, and for each woman w, $\mu(w) \in M \cup \{\varnothing\}$. For the stability of a matching, I employ the standard definition.

Definition 1. *A matching μ is stable if*

1. *No man or woman is matched to more than one partner.*
2. *There is no blocking pair: no unmatched man–woman pair who could both do strictly better by matching with each other.*

I model women's prejudice against blood type B men by introducing a parameter β. First, if man m is of blood type B and has $x_m < T(\beta)$, he is excluded from the marriage market. Second, the threshold $T(\beta)$ is increasing in β: higher β imposes stricter selectivity, excluding more lower-x men with blood type B. The effective surplus for a man m with blood type B and x_m is then

$$\tilde{S}^B(x_m, y_w) = \begin{cases} -\infty, & \text{if } x_m < T(\beta), \\ S(x_m, y_w), & \text{otherwise.} \end{cases}$$

Thus, when $\beta = 0$, almost all B-type men are admitted to the matching pool, whereas for $\beta > 0$, only men of blood type B with $x \geq T(\beta)$ are eligible to match.

With the strict supermodularity, continuity, and regularity assumptions above, the following lemma is immediate from Becker (1973) and Gretsky et al. (1999), and thus, the proof is omitted.

Lemma 1. *A unique, stable matching μ exists. This μ features positively assortative matching.*

Let $\mu_\beta(M^B)$ denote the set of matched B-type men under the stable matching μ_β. Now, we are ready to prove the following proposition:

Proposition 3. *Let Assumption 1 hold. Under a unique stable matching μ_β, the following two statements hold.*

1. *If $\beta = 0$, then*
$$\mathbb{E}[x_m \mid m \in \mu_\beta(M^B)] < \mathbb{E}[x_m \mid m \in \mu_\beta(M^{\neg B})].$$

2. *If $\beta > 0$, then*
$$\mathbb{E}[x_m \mid m \in \mu_\beta(M^B), \beta = 0] < \mathbb{E}[x_m \mid m \in \mu_\beta(M^B), \beta > 0].$$

Proof. First, by Lemma 1, we know that there exists a unique stable matching. Next, by the cut-off, we know that

$$\mu_\beta(M^B) \subseteq \{i \in M^B : x_m \geq T(\beta)\}.$$

Thus, the average trait x_m of matched men with blood type B satisfies:

$$\mathbb{E}[x_m \mid m \in \mu_\beta(M^B)] \geq T(\beta).$$

Given Assumption 1, we know that

$$\Pr\left(x_m \leq t \mid m \in M^B\right) \geq \Pr\left(x_m \leq t \mid m \in M^{\neg B}\right),$$

which implies

$$\Pr\left(x_m \leq t \mid m \in M^B, x_m \geq T(0)\right) \geq \Pr\left(x_m \leq t \mid m \in M^{\neg B}, x_m \geq T(0)\right),$$

and therefore,

$$\Pr\left(x_m \leq t \mid m \in \mu_\beta(M^B)\right) \geq \Pr\left(x_m \leq t \mid m \in \mu_\beta(M^{\neg B})\right).$$

Thus,

$$\mathbb{E}[x_m \mid m \in \mu_\beta(M^B)] < \mathbb{E}[x_m \mid m \in \mu_\beta(M^{\neg B})].$$

As for the second part, since $T(\beta)$ is strictly increasing in β, $\mathbb{E}[x_m \mid i \in \mu_\beta(M^B)]$ is strictly increasing in β. In particular, for $\beta' > \beta$:

$$\mathbb{E}[x_m \mid m \in \mu_{\beta'}(M^B)] > \mathbb{E}[x_m \mid m \in \mu_\beta(M^B)].$$

□

5 Econometric Framework

To estimate the discrimination effects of blood types on labor and marriage markets, I assume that blood types do not biologically affect labor and marriage markets but affect the markets only through social stigma attached to blood types. I validate this assumption later using the U.S. sample of the same survey as a placebo setting.

To mitigate the potential downward bias induced by selection biases discussed in section 3, for analyses on marriage rates, I do not use the panel structure of the survey and only use unique samples in the two waves. As for labor market outcomes, given the absence of statistically significant correlation between survivorship and unemployment rates, I exploit the panel structure and include the both responses of the survivors to increase power. For labor market outcomes, I focus on the working age population between 15 and 64 years old. Moreover, as explained above, to test self-fulfilling prophecies, I conduct subsample analyses by two age groups with the cutoff of 40 years old not only for the homework survey question but also for all the other outcomes. Given these, I estimate the following equation:

$$y_{iwp} = \delta_w + \kappa_p + \beta BloodtypeB_i + \epsilon_{iwp}, \tag{1}$$

where y_{iwp} is an outcome of respondent i based in prefecture p from wave $w \in \{2005, 2006\}$, and $BloodtypeB_i$ is an indicator that equals 1 if respondent i is blood type B and 0 otherwise. Main outcomes of interest are three-fold. One is a binary variable that equals 1 if respondent i is currently not married at year t and 0 otherwise. Another variable is an indicator for the unemployment status of respondent i, and the last one is the annual earnings of respondent i. Note that I do not include controls such as age and sex, due to the selection issue discussed above. The inclusion of these variables leads to the "bad control" issue discussed in Angrist and Pischke (2009). Whenever I use the panel structure and do not restrict samples to be unique, I cluster standard errors at the respondent level to address the potential serial correlation within a respondent. Otherwise, I use Huber–White heteroskedasticity consistent standard errors, following the recommendation by Solon et al. (2015). I also provide results without sampling weights as suggested by Solon et al. (2015) in Appendix.

Outcomes for individual respondents include the status of marriage, the status of unemployment, annual earnings both conditional and unconditional upon working, years of education, and the measure for self-fulfilling prophecies. Given the presence of many housewives/husbands and that unemployment does not necessarily indicate zero earnings, I analyze unconditional earnings to shed light on the entire distribution of individual traits and conditional earnings to examine the presence of discrimination at companies as intensive-margin measures.

On the other hand, outcomes for respondents' partners include the status of unemployment, annual earnings unconditional upon working, and years of education. I do not include annual earnings conditional upon working since regardless of the presence of discrimination in the labor markets, what matters is whether or not mates do work and whether or not mates have earnings that may come from financial assets.

6 Results

6.1 Marriage Market

Table 6 demonstrates that being blood type B decreases the marriage rate. As the first column shows, the stigma on B-blood-type people decreased the marriage rate by 5.4 percentage points. This decrease is driven mostly by young adults and in particular young men below 40 years old with 12.7 percentage-point decrease, evidenced by the rest of the columns.

Table 6: Marriage Market Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-0.054*	-0.065	-0.046	-0.085*	-0.127*	-0.080	0.006	0.003	0.011
	(0.023)	(0.033)	(0.030)	(0.037)	(0.056)	(0.053)	(0.016)	(0.022)	(0.023)
Observations	4201	1996	2205	1051	446	596	3150	1544	1606
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber–White heteroskedasticity consistent standard errors in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. * $p < 0.05$, ** $p < 0.01$.

Now, the question is whether the marriage market results are driven by discrimination in the labor markets, discrimination through preferences, or both. Let us look at labor market discrimination first.

6.2 Channels of Marriage Market Results

6.2.1 Market-based Channel: Labor Market

Table 7 shows the results of labor market outcomes including unemployment, annual earnings both conditional and unconditional upon working, and years of education. Given the presence of many housewives/husbands, and given that unemployment does not necessarily indicate zero earnings, I analyze unconditional earnings to shed light on the entire distribution of individual traits and conditional earnings to examine the presence of discrimination at companies as intensive-margin measures. Table 7(a) and 7(d) are based on ordinary least squares (OLS) regressions, while Table 7(b) and 7(c) are estimated by Tobit regressions. Table 7(b) uses annual earnings measures unconditional upon working, which include zeros as valid values, while Table 7(c) uses annual earnings conditional upon working, both in 10,000-yen unit with upper limit to be the survey top-coding value of 14,000,000 yen. To address the top-coding issue, I conduct standard Tobit regressions on earnings outcomes. Note that as demonstrated by Figure B1 and B2 in Appendix B, the earnings outcomes (especially conditional earnings) are not highly-skiewed, in part due to the top-coding issue and in part due to the fact that the survey contains fewer unemployed people than the population. Given the distributions, I do not take the natural logarithm of these outcomes.

Table 7(a) shows the results of the unemployment outcome. One can see that men's unemployment rates increase by 2 percentage points, which amounts to 121% increase given that the unemployment rate of the non-B type working-age men is 1.65%. On the other hand, no discerning effects are found on women's unemployment rates. The results are consistent with the marriage market discrimination concentrated on men. As for both unconditional annual and conditional earnings, interestingly, Table 7(b) and 7(c) demonstrate that the effects on earnings are concentrated on young men but no effects on the other populations. The effects on young men reach 680,000-yen reduction and almost 520,000-yen reduction for unconditional and conditional annual earnings, respectively.

Table 7: Labor Market Results

(a) Unemployment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.006	0.020*	-0.003	0.006	0.023	-0.009	0.009	0.020	-0.001
	(0.006)	(0.009)	(0.006)	(0.011)	(0.018)	(0.015)	(0.006)	(0.011)	(0.005)
Observations	5359	2435	2924	1509	628	876	3850	1804	2046
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(b) Annual Earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-2.742	-12.205	-0.980	-22.294	-68.099**	4.228	12.695	24.910	-3.365
	(13.066)	(23.430)	(9.597)	(15.279)	(25.981)	(14.624)	(19.089)	(26.711)	(12.298)
Observations	4870	2145	2725	1379	569	810	3491	1576	1915
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(c) Annual Earnings Conditional upon Wage Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.533	8.616	-7.676	-22.590	-51.693*	4.344	22.203	31.788	-52.611
	(18.139)	(24.808)	(17.115)	(16.886)	(25.688)	(17.621)	(24.930)	(27.662)	(31.861)
Observations	2280	1530	750	739	435	304	1541	1095	446
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(d) Years of Education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.040	0.154	-0.026	-0.151	0.140	-0.274	0.107	0.114	0.121
	(0.102)	(0.161)	(0.117)	(0.165)	(0.290)	(0.190)	(0.109)	(0.173)	(0.128)
Observations	5345	2431	2914	1505	627	872	3840	1800	2040
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Standard errors clustered at the respondent level in parentheses. Table 7(a) and 7(d) are based on OLS regressions, while Table 7(b) and 7(c) are estimated by Tobit regressions. Table 7(b) uses annual earnings measures unconditional upon working, which include zeros as valid values, while Table 7(c) uses annual earnings conditional upon working, both in 10,000-yen unit with upper limit to be the survey top-coding value of 14,000,000 yen. * $p < 0.05$, ** $p < 0.01$.

6.2.2 Market-based Channel: Self-fulfilling Prophecies

While we just observed that all men appear to be discriminated in the labor market, I shall test the presence of self-fulfilling prophecy effects of the blood-type stereotype by examining the degree of procrastination of assignments at school. Table 8 demonstrate the self-fulfilling prophecy effects. We can see that there is a statistically significant difference in assignment procrastination between type-B individuals and those of the other types, which is driven by the effects on individuals less than 40 years old. Given that the stereotype began in the beginning of the 1980s, this result supports the presence of self-fulfilling prophecies.

Table 8: Procrastination in Assignments at School

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.141*	0.150	0.106	0.291*	0.317	0.146	0.014	0.032	0.003
	(0.058)	(0.079)	(0.075)	(0.113)	(0.176)	(0.149)	(0.057)	(0.079)	(0.079)
Observations	4095	1946	2149	1030	434	587	3065	1506	1559
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber–White heteroskedasticity consistent standard errors in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. The response ranges from 1 (finishing homework in the beginning of the holiday seasons) to 5 (finishing homework toward the end of the holiday seasons). * $p < 0.05$, ** $p < 0.01$.

6.2.3 Taste-based Channel

With the presence of labor-market discrimination, I now examine the presence of a shift in the threshold through preferences. To do so, as explained in the model prediction, we can look at the average values of partner characteristics for married individuals. Fisman et al. (2006) find that men place more emphasis on physical attractiveness while women prioritize intelligence and ambition. Unfortunately, the survey data does not provide data over physical attractiveness of respondents' partners. Nevertheless, I shall look at labor market outcomes and education levels of respondents' partners to shed light on the presence of discrimination in people's preferences over blood types.

Table 4(a), 4(b), and 4(c) display the results over unemployment rates, annual earnings, and years of education of respondents' partners. I use unconditional earnings to capture overall financial attractiveness. As these tables show, I do not find statistically significant differences in these outcomes between the partners of blood type B and those of the other blood types. Given that the higher unemployment rates and lower earnings of men with type-B blood, my model predicts that the reservation utility for potential partners of these men is higher than the other types of blood. Therefore, the no-difference results provide supporting evidence for the direct effects of blood-type stigma on individual preferences toward mates in marriage markets.

Table 9: Differences in Partner Characteristics

(a) Unemployment Status of Partner

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-0.001	-0.002	0.000	0.004	0.000	0.008	-0.004	-0.003	-0.006
	(0.002)	(0.002)	(0.005)	(0.005)	(.)	(0.010)	(0.003)	(0.004)	(0.004)
Observations	4071	1934	2137	1038	439	589	3033	1488	1545
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(b) Annual Earnings of Partner

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	10.465	10.479	1.444	38.053	18.509	15.651	2.418	4.395	-3.812
	(16.944)	(14.613)	(22.645)	(31.098)	(31.466)	(28.976)	(20.043)	(16.490)	(29.964)
Observations	2366	1163	1203	491	204	287	1875	959	916
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(c) Years of Education of Partner

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.076	0.109	0.015	0.041	0.157	-0.177	0.086	0.091	0.073
	(0.100)	(0.127)	(0.148)	(0.244)	(0.394)	(0.332)	(0.107)	(0.126)	(0.173)
Observations	3139	1513	1626	529	200	318	2608	1306	1302
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber–White heteroskedasticity consistent standard errors in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. Annual earnings of partner are in 10,000-yen unit with upper limit to be the survey top-coding value of 14,000,000 yen. * $p < 0.05$, ** $p < 0.01$.

6.3 Placebo: US survey

In this section, I conduct a placebo analysis using the 2005 counterpart of the survey conducted in the United States that asks essentially the same questions. Unfortunately, the 2006 counterpart does not ask about blood types. Many of the respondents in the United States do not know about their blood types since it is not customary to test blood types unless one is hospitalized and needs blood or somehow tests blood types perhaps for precautionary reasons. Naturally, those who know their blood types are significantly different from those who do not know, as demonstrated by Table 10.

Table 10: Balance Test by Knowledge of Blood Types

	Know	Not Know	Difference	Std. Error	N
Age	48.22	45.12	3.09**	(0.51)	4865
Male	0.43	0.48	-0.05**	(0.01)	4939
Annual Earnings (USD)	33487.17	28376.78	5110.39**	(953.39)	4689
Firm Employee #	0.12	0.09	0.03**	(0.01)	4960
White Race	0.81	0.77	0.04**	(0.01)	4960

Notes: Firm Employee # indicates the number of employees at the firm respondents work. * $p < 0.05$, ** $p < 0.01$.

Nevertheless, I conduct a placebo test using only the subsample who know their blood types. Given the regional and racial variation in blood types, I take out states-by-race fixed effects. The results are shown at Table 11. I do not find any effects of being blood type B on the marriage and unemployment rates in the United States.

Table 11: Placebo Test with US Sample

(a) Marriage Rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.027	0.008	0.032	0.051	0.124	0.003	0.003	-0.043	0.030
	(0.029)	(0.045)	(0.037)	(0.051)	(0.085)	(0.064)	(0.035)	(0.051)	(0.048)
Observations	2415	1080	1333	809	326	480	1604	747	852
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(b) Unemployment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.013	0.018	0.016	-0.001	0.023	-0.009	0.023	0.017	0.033
	(0.013)	(0.018)	(0.017)	(0.018)	(0.032)	(0.021)	(0.017)	(0.021)	(0.025)
Observations	2440	1092	1345	817	331	483	1621	756	861
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(c) Annual Earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	879.819	5849.675	-2671.340	627.891	3635.722	-2941.308	1083.895	7698.808	-3940.237
	(2293.058)	(3973.281)	(2575.463)	(2913.956)	(5103.429)	(3363.184)	(3278.034)	(5098.711)	(3830.705)
Observations	1954	848	1106	780	318	462	1174	530	644
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(d) Annual Earnings Conditional upon Wage Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-895.314	9213.540	-3733.959	-1771.258	4484.086	-6619.383	1749.021	11955.622	-3051.279
	(2777.925)	(4932.215)	(3021.990)	(3538.283)	(5444.251)	(4672.686)	(4413.619)	(6627.625)	(4972.633)
Observations	1094	496	598	440	196	244	654	300	354
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(e) Years of Education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.096	0.070	0.111	0.118	0.049	0.115	0.161	0.179	0.175
	(0.140)	(0.219)	(0.182)	(0.250)	(0.371)	(0.326)	(0.170)	(0.271)	(0.223)
Observations	2419	1081	1336	810	328	479	1608	747	856
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber–White heteroskedasticity consistent standard errors in parentheses. State-by-race fixed effects are included. Annual earnings measures are in US$ with upper limit to be the survey top-coding value of USD 140,000, and Tobit regressions are used for these outcomes. * $p < 0.05$, ** $p < 0.01$.

7 Discussions And Limitations

7.1 Marriage Premium versus Labor Market Discrimination

Note that there may be "marriage premium" effects on the labor market outcomes. However, the unemployment rate difference is observed among the entire working-age type-B men. Despite the absence of statistical significance (p-value being slightly above 0.05), the tendency is observed those between 40 and 64 years old men who do not experience lower marriage rates than non-type B men. Indeed, the logistic regression results in Appendix B find statistically significant results for the age range through the efficiency gain of the nonlinear model. This implies that marriage premium effects are not large enough to explain all the labor market results.

Furthermore, I demonstrated the absence of differences in the partners' characteristics. If the marriage premium effects explain all the labor market results, this implies that the labor market results are driven indirectly by the taste-based channel. That is, the increased threshold solely decreases the marriage rates and affects only those below the threshold who could not marry in the labor markets through the marriage premium. This means that the distributional shift in the attractiveness of type-B individuals does not occur for those (married) type-B individuals who are above the cutoff. My theory then predicts a higher value in the average of the attractiveness of the partners of type-B individuals. We do not observe this, and thus, there must have been a shift in the entire distribution including those married individuals. With that said, I humbly admit the difficulty of quantifying how much of the labor market results are driven by direct discrimination in the labor markets.

7.2 Survey Nonresponse and Selection Bias

Like many household surveys, the data may suffer from nonresponse issues, particularly among the unemployed. Those who are unemployed or in unstable labor market positions may be less inclined or able to respond. This nonrandom participation could bias the estimated effects if, for instance, unemployed individuals with blood type B are systematically underrepresented. Notice, however, that given the absence of statistically significant biological effects on social markers, such a systematic difference by blood types is itself *evidence* of socially constructed influence on type-B individuals.

7.3 Magnitude of Taste-Based Versus Market-Based Channels in Marriage

While the theoretical and empirical analyses indicate the presence of taste-based discrimination and an indirect, market-based channel through reduced earnings potential and self-fulfilling prophecies, the precise magnitudes of each channel remain elusive. Consequently, although both mechanisms appear to be at work, their relative importance is difficult to pin down.

8 Conclusion

In conclusion, this study demonstrates that culturally arbitrary markers—exemplified by the negative stereotype associated with blood type B in Japan—can quickly evolve into potent drivers of economic discrimination. Using nationally representative data, I show that individuals, particularly young men with type B blood, face significant disadvantages in both marriage and labor markets. These findings reveal that these outcomes are the product of both direct, taste-based discrimination in the dating stage and indirect, market-based effects that influence labor market performance and personality of individuals through self-fulfilling prophecy effects. A placebo analysis using U.S. data further confirms that these disparities are not rooted in biology but in the rapid social construction of bias. The findings illuminate how rapidly new forms of prejudice can emerge and embed themselves in economic systems, thus broadening our understanding of discrimination and highlighting important avenues for policy intervention.

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Appendices

A Survey Details

A.0.1 Purpose

Economics assumes that people behave rationally to maximize their utility based on certain assumptions about utility functions. However, the validity of these assumptions has hardly been examined. The survey was conducted to determine whether the current economic view of people's rationality and utility functions is correct.

A.0.2 Survey Years

- Started in 2003 and conducted annually for 11 consecutive years until 2013.
- Resumed in 2016 and conducted annually for 3 consecutive years until 2018.
- Resumed in 2021 and conducted annually for 2 consecutive years until 2022.

A.0.3 Survey Questionnaire Items

The survey questionnaire includes:

1. General questions on risk aversion, time preference rate, habit formation, and consumption externalities
2. Basic attributes of individuals and households, and basic attributes related to household finances and consumption

A.1 Survey Method

A.1.1 Population for Newly Extracted Samples

- 2003: Male and female individuals aged 20–69 residing nationwide as of January 1, 2003
- 2004: Male and female individuals aged 20-69 residing nationwide as of January 1, 2004
- 2006: Male and female individuals aged 20-69 residing nationwide as of January 1, 2006
- 2009: Male and female individuals aged 20-69 residing nationwide as of January 1, 2009
- 2022: Male and female individuals aged 20-39 residing nationwide as of January 1, 2022

A.1.2 Extraction Method

Stratified two-stage random sampling method

A.2 Stratification Method

A.2.1 Regional Division

Municipalities nationwide were divided into 10 regional blocks:

1. Hokkaido (Hokkaido)
2. Tohoku (Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima)
3. Kanto (Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa)
4. Koshinetsu (Niigata, Yamanashi, Nagano)
5. Hokuriku (Toyama, Ishikawa, Fukui)
6. Tokai (Gifu, Shizuoka, Aichi, Mie)
7. Kinki (Shiga, Kyoto, Osaka, Hyogo, Nara, Wakayama)
8. Chugoku (Tottori, Shimane, Okayama, Hiroshima, Yamaguchi)
9. Shikoku (Tokushima, Kagawa, Ehime, Kochi)
10. Kyushu (Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, Kagoshima, Okinawa)

A.2.2 City Size Division

Within each block, further division into 4 categories based on city size:

1. Designated cities
2. Cities with population over 100,000
3. Cities with population under 100,000
4. Towns and villages

A.2.3 Sample Allocation

The prescribed sample (new) was proportionally allocated according to the population size of 20-69 year-olds in each regional block and city size stratum.

A.2.4 Point Extraction Method

1. Basic unit districts set at the time of the most recently published national census were used as the primary sampling units.

2. The number of survey points was set so that the sample size per survey point in each stratum was about 15.

3. For each stratum, an extraction interval was calculated (total population in the stratum ÷ number of survey points calculated for the stratum), and basic unit districts were extracted at equal intervals starting from the basic unit district to which the person at the randomly determined "start number" belonged.

4. The order of municipalities within each stratum for extraction followed the order of municipal codes set by the Ministry of Internal Affairs and Communications.

A.2.5 Subject Extraction Method

At each point, subjects (about 15 people) were extracted by the equal interval extraction method, starting from the eligible person at the randomly determined "start number" in the "Basic Resident Register" (or "Electoral Roll" if the Basic Resident Register was not available for viewing).

A.2.6 Extraction of New Samples

A.2.7 2003 Survey

Of the 4,600 new additional samples, 3,000 were extracted from newly extracted basic unit districts (about 130 points) using the same stratification criteria as the first survey. The remaining 1,600 were extracted by the equal interval extraction method from the Basic Resident Register, continuing from the extraction subjects at each survey point of the first survey (previous year's survey).

A.2.8 2005 Survey

Two thousands new samples were extracted by the equal interval extraction method from the Basic Resident Register, continuing from the extraction subjects at the survey points of the 2002 first survey and the 2003 second survey.

A.2.9 2008 Survey

Due to circumstances regarding the viewing of the Basic Resident Register, 6,000 new samples were extracted by the equal interval extraction method from general housing in areas continuing from the previous survey points using housing maps, and implemented by on-site extraction method with specified completion target numbers by gender and age group for each point.

A.2.10 2022 Survey

Two thousand and five hundred new samples (ages 20–39) were extracted by the equal interval extraction method from the Basic Resident Register in areas continuing from the 2003 survey points and some of the 2004 survey points.

A.2.11 Sample Extraction for 2016-2018 and 2021 Surveys

For the 2016–2018 and 2021 surveys, no new sample extraction was conducted. The surveys were conducted on those who had continuously responded to the survey up to 2013. The survey targets were limited to 73% in 2016, 75% in 2017, 82% in 2018, and 76% in 2021 of the continuous survey respondents from the previous survey.

A.2.12 New Sample Extraction for 2022 Survey

New sample extraction was conducted limited to the 20–39 age group due to the decrease in sample size for the younger generation (20-30s) since no new sample extraction had been conducted since 2009. To improve the response rate and encourage continued participation in the survey, the questionnaire distributed to new sample targets had fewer questions than the one distributed to continuing sample targets.

A.2.13 Survey Method

- Visit and leave method (until 2018 survey): Prior to implementation, a "request letter" for survey cooperation was mailed to the subject. The survey staff visited to request self-recorded responses from the subject and collected them later by visit. A large envelope for returning the questionnaire was distributed along with the questionnaire when deemed necessary. The staff were instructed to visit at least four times, changing the date and time as appropriate. Respondents were given gift certificates as a token of appreciation.

- Postal survey method (from 2021 survey): A questionnaire with a greeting letter and a return envelope was mailed. A reminder postcard was sent once. Respondents were later mailed QUO cards (shopping coupons) as a token of appreciation.

A.2.14 Survey Implementation

The survey was commissioned to the Central Research Services, Inc.

A.3 Dataset Weighting (Sampling Weight)

A.3.1 Creation Method

Sampling weights variables swght_a and swght_b are available.

The sampling weights for this survey are created by calculating the number of people represented by one respondent ("standard population" / "number of the survey respondents") by dividing the population into groups by birth cohort (or age) and region.

swght_a is a weight created by classifying the population and sample by birth cohort and region of residence, while swght_b is created by classifying by age and region of residence.

The regions are classified into seven groups, some of which are merged from the 10 regions used for sample stratification. To construct sampling weights that correspond to the decrease in respondents due to the continuation of the panel survey, regions with significant sample decline were merged with neighboring region groups.

Region groups:

- Hokkaido / Tohoku
- Kanto
- Hokuriku / Koshinetsu
- Tokai
- Kinki
- Chugoku / Shikoku
- Kyushu

Birth cohort or age groups are divided as follows:

Cohort groups:

- Born in the 1930s and 1940s

- Born in the 1950s
- Born in the 1960s
- Born in the 1970s
- Born in the 1980s

Age groups:

- 60–89 years old
- 50–59 years old
- 40–49 years old
- 20–39 years old

This survey is a panel format that continuously asks questions to the same individuals, so the average age within the sample increases with each survey. To construct consistent sampling weights across surveys, the age groups for young and old need to be defined quite broadly when using age-based grouping (there must always be at least one person in each age group). To address this issue, this survey constructs sampling weights by classifying samples by cohort rather than age. However, the 2003 and 2004 surveys only included questions about age groups (20s, 30s, 40s, 50s, 60s), making it impossible to know the exact year of birth. Therefore, sampling weights based on age groups are also created to maintain consistency from 2003 when necessary. Please use swght_a when using only surveys from 2005 onwards, and swght_b when including the 2003 or 2004 survey.

Note: The 2022 survey newly extracted samples from those born in the 1990s and 2000s (20s and 30s). Therefore, from this point on, these two groups are added as new cohort groups.

A.3.2 Standard Population

The population for each division was calculated based on the National Census (total population by prefecture, city/county, gender, and single year of age) (Ministry of Internal Affairs and Communications).

- 2003, 2004, 2005 surveys: Used the confirmed population from the 2000 National Census.
- 2006, 2007, 2008, 2009, 2010 surveys: Used the confirmed population from the 2005 National Census.
- 2011, 2012, 2013 surveys: Used the confirmed population from the 2010 National Census.
- 2016, 2017, 2018 surveys: Used the confirmed population from the 2015 National Census.

- 2021, 2022 surveys: Used the confirmed population from the 2020 National Census.

The main survey period for this study is January, while the National Census reflects the state as of October 1 of the survey year. Also, the National Census reports population by age as of October 1, not by birth year. Therefore, using the National Census report by birth month (four divisions), the survey conductor corrected for differences arising from the different survey timing when calculating the population for birth cohorts and age groups.

A.3.3 Number of Respondents

The number of the survey respondents was calculated by dividing the total number of respondents nationwide into the above birth cohort (or age) × region divisions.

A.4 Personal Identification Variable

The variable [PANELID] is available as a personal identification variable.

Variable [PANELID]: Stored as the second variable from the left in each year's survey data. It is a 6-digit variable.

A.5 Points to Note

Some panel respondents have missing data for certain years due to personal circumstances preventing them from cooperating with the survey in those years.

- SEQNO = 20402, PANELID = 4071
- SEQNO = 41803, PANELID = 7267
- SEQNO = 5540006, PANELID = 8090
- SEQNO = 7040102, PANELID = 8200
- SEQNO = 250303, PANELID = 10714

B Additional Results and Robustness Checks

B.1 Histograms of Annual Earnings

Figure B1: Annual Earnings

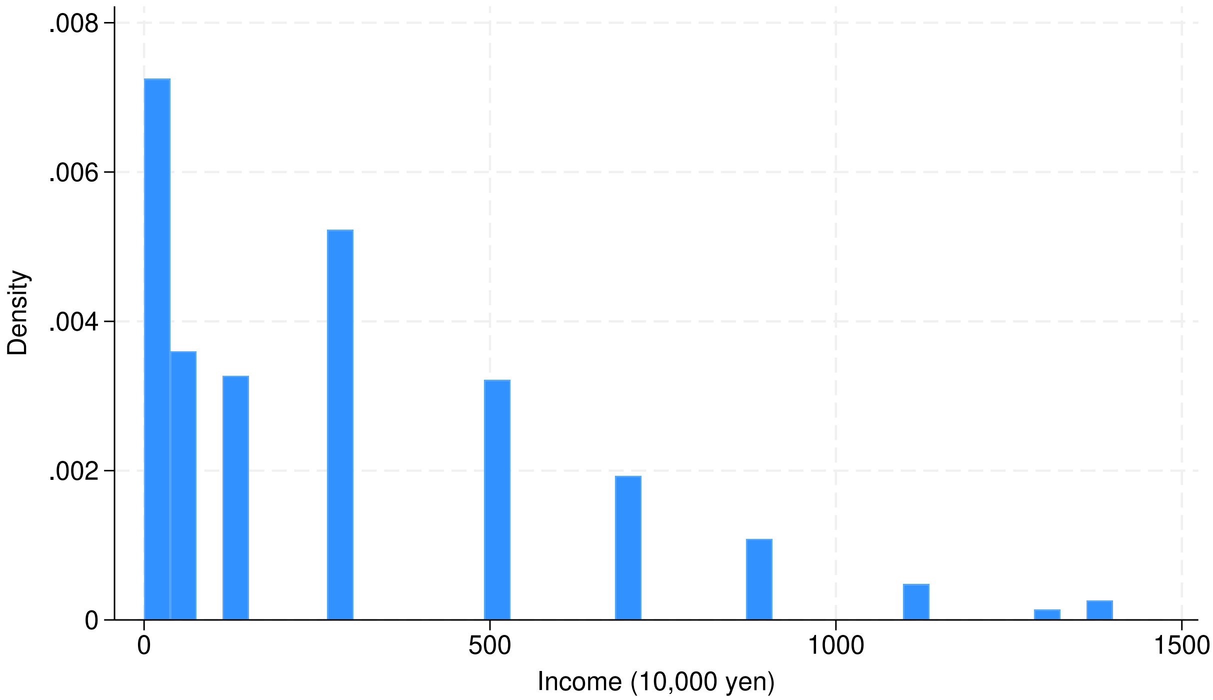
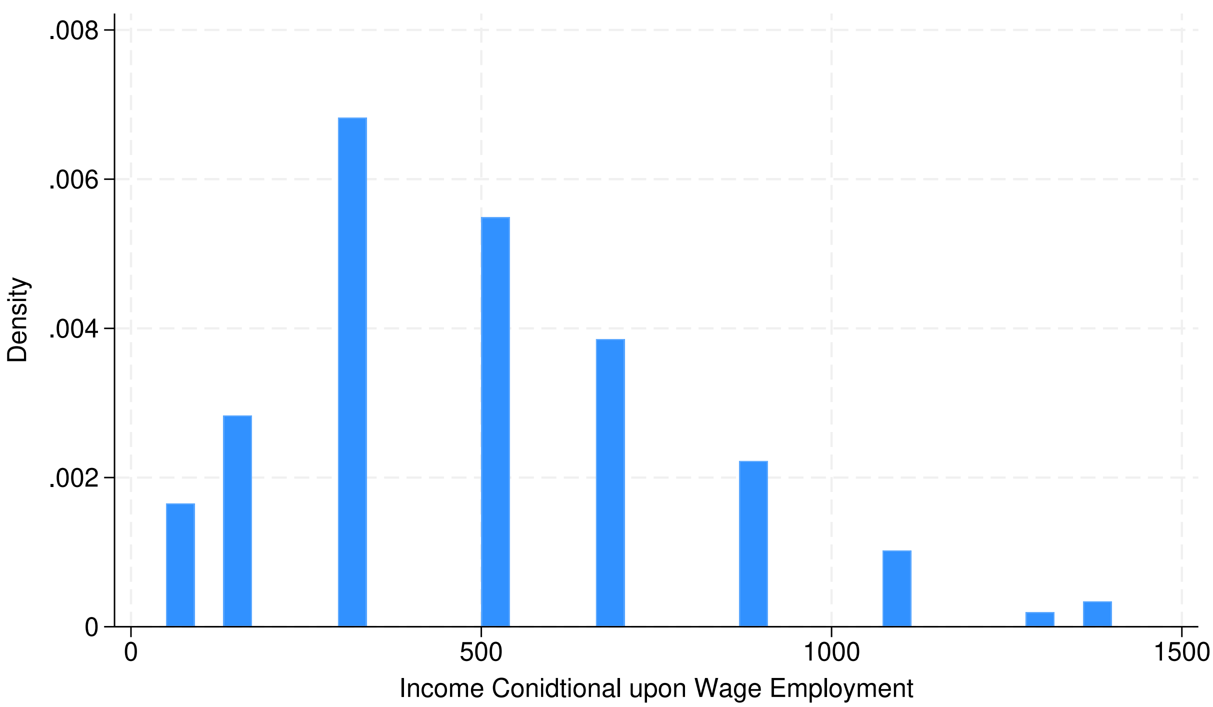


Figure B2: Annual Earnings Conditional upon Wage Employment



B.2 Unweighted Results

Table B1: Marriage Market Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-0.028	-0.032	-0.023	-0.113**	-0.145*	-0.110*	0.012	0.007	0.019
	(0.016)	(0.023)	(0.022)	(0.037)	(0.059)	(0.049)	(0.015)	(0.021)	(0.021)
Observations	4201	1996	2205	1051	446	596	3150	1544	1606
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber-White heteroskedasticity consistent standard errors in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. * $p < 0.05$, ** $p < 0.01$.

Table B2: Labor Market Results

(a) Unemployment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.007	0.020*	-0.002	0.005	0.026	-0.009	0.009	0.019	-0.000
	(0.005)	(0.009)	(0.005)	(0.010)	(0.019)	(0.012)	(0.006)	(0.011)	(0.005)
Observations	5359	2435	2924	1509	628	876	3850	1804	2046
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(b) Annual Earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-1.197	-0.360	-6.540	-30.714	-79.673**	-7.649	10.146	24.777	-5.636
	(13.836)	(21.518)	(9.337)	(16.176)	(26.804)	(14.174)	(18.134)	(25.866)	(11.778)
Observations	4870	2145	2725	1379	569	810	3491	1576	1915
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(c) Annual Earnings Conditional upon Wage Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	4.925	14.195	-28.541	-27.053	-53.764*	-9.441	19.381	28.652	-59.337*
	(18.659)	(22.625)	(17.969)	(17.693)	(26.183)	(16.193)	(24.247)	(26.569)	(29.482)
Observations	2280	1530	750	739	435	304	1541	1095	446
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(d) Years of Education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.035	0.101	-0.001	-0.164	-0.049	-0.208	0.094	0.130	0.086
	(0.086)	(0.146)	(0.101)	(0.149)	(0.281)	(0.169)	(0.103)	(0.170)	(0.122)
Observations	5345	2431	2914	1505	627	872	3840	1800	2040
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Standard errors clustered at the respondent level in parentheses. Panel 2(a) and 2(d) are based on OLS regressions, while panel 2(b) and 2(c) are estimated by Tobit regressions. Panel 2(b) uses annual earnings measures unconditional upon working, which include zeros as valid values, while panel 2(c) uses annual earnings conditional upon working, both in 10,000-yen unit with upper limit to be the survey top-coding value of 14,000,000 yen. * $p < 0.05$, ** $p < 0.01$.

Table B3: Procrastination in Assignments at School

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.043	0.050	0.042	0.168	0.159	0.115	-0.005	0.027	-0.020
	(0.048)	(0.070)	(0.066)	(0.103)	(0.170)	(0.134)	(0.055)	(0.078)	(0.076)
Observations	4095	1946	2149	1030	434	587	3065	1506	1559
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Table B4: Differences in Partner Characteristics

(a) Unemployment Status of Partner

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-0.002	-0.002	-0.003	0.003	0.000	0.005	-0.004	-0.003	-0.007
	(0.002)	(0.003)	(0.004)	(0.005)	(.)	(0.008)	(0.003)	(0.004)	(0.004)
Observations	4071	1934	2137	1038	439	589	3033	1488	1545
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(b) Annual Earnings of Partner

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	7.988	9.187	-0.457	37.729	28.666	20.546	1.553	3.761	-9.196
	(16.968)	(14.266)	(22.711)	(31.675)	(34.351)	(30.597)	(19.749)	(15.630)	(28.319)
Observations	2366	1163	1203	491	204	287	1875	959	916
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

(c) Years of Education of Partner

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.053	0.104	-0.012	-0.097	0.051	-0.175	0.089	0.123	0.041
	(0.096)	(0.120)	(0.144)	(0.236)	(0.353)	(0.320)	(0.105)	(0.127)	(0.166)
Observations	3139	1513	1626	529	200	318	2608	1306	1302
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber-White heteroskedasticity consistent standard errors in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. Annual earnings of partner are in 10,000-yen unit with upper limit to be the survey top-coding value of 14,000,000 yen. * $p < 0.05$, ** $p < 0.01$.

B.3 Logistic Results

In this section, I report marginal effects of logistic regressions of binary outcomes in Table B5 and B6.

Table B5: Marriage Rate: Logistic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	-0.053*	-0.063*	-0.045	-0.087*	-0.135*	-0.079	0.006	0.003	0.012
	(0.022)	(0.031)	(0.028)	(0.038)	(0.059)	(0.051)	(0.016)	(0.021)	(0.024)
Observations	4201	1986	2205	1049	434	596	3123	1485	1579
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Huber-White heteroskedasticity consistent standard errors in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. * $p < 0.05$, ** $p < 0.01$.

Table B6: Unemployment: Logistic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blood Type B	0.007	0.023*	-0.006	0.011	0.061	-0.030	0.010	0.025*	-0.003
	(0.006)	(0.009)	(0.012)	(0.018)	(0.036)	(0.052)	(0.007)	(0.013)	(0.013)
Observations	4507	1867	1791	837	209	297	2940	1200	878
Sex	Both	Male	Female	Both	Male	Female	Both	Male	Female
Age	All	All	All	Under 40	Under 40	Under 40	Over 40	Over 40	Over 40

Notes: Standard errors clustered at the respondent level in parentheses. Fixed effects for calendar years (or survey waves) and prefectures are included. * $p < 0.05$, ** $p < 0.01$.