Precautionary Savings and Single Women in Japan*

Wataru KUREISHI† and Midori WAKABAYASHI‡

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† Corresponding author: The National Institute of Population and Social Security Research, Hibiya Kokusai Building, 6th Floor, 2-2-3 Uchisaiwaicho, Chiyodaku, Tokyo 100-0011, Japan. Tel.: +81 3 3595 2984; fax: +81 3 3591 4816. E-mail address: wataru.kureishi@gmail.com or kureishi-wataru@ipss.go.jp

‡ College of Economics, Osaka Prefecture University, 1-1 Gakuencho, Nakaku, Sakai, Osaka 599-8531, Japan. Tel.: +81 72 254 9972; fax: +81 72 254 9972. E-mail address: mwaka@eco.osakafu-u.ac.jp

Abstract

Using Japanese panel data, we analyze precautionary savings due to staying single, in the presence of income uncertainty. Our cross-sectional and panel analyses find that young women who have a lower anticipation of getting married within three years have more target savings for precautionary purposes, as well as target savings for retirement. These results suggest that in facing higher risk of income fluctuation owing to choosing to marry late or remain unmarried, young women will add more savings to mitigate the income risk inherent in single life. (87 words)

1 Introduction

Marrying later in life and remaining unmarried altogether are broadly observed trends in many developed countries. In Japan, the prevalence of later marriages and of remaining unmarried is noticeable. According to Japan's Vital Statistics, the average age of first marriage for women was 24.4 in 1960, but it rose to 28.2 in 2006. With respect to remaining unmarried, the Japanese Population Census tells us that in 1960, only 20.6% of women aged 25–29 remained unmarried; this figure rose to 50.4% in 2000. In addition, the percentage of women who never married during their lifetime (i.e., unmarried at the age of 50) was 1.9% in 1960 and rose to 5.8% in 2000. Looking at such trends, we might imagine that many of the current generation of young women will have even less prospect of getting married in their lifetime.

In this paper, we focus on the risk-sharing function of marriage.[1] It is well-known that marriage has a risk-sharing function, in that if a member of the married couple, when facing a loss of capacity to earn income in the future owing to unemployment or illness or lives longer than expected, the other spouse will supplement the income loss and cover the costs of the longer lifespan. When an exogenous shock occurs and reduces the husband's income (assuming he is the main breadwinner), it is optimal for a couple to reduce that income reduction and behave in ways that do not change their consumption levels or leisure time. The risk of living longer than average, too, can be pooled within a marriage. For example, when a wife lives longer than average and her husband dies earlier than her, her consumption following her husband's death can be financed by the money left by her husband. Another way to soften the shock is to increase labor supply. It is well known that the use of a wife's additional labor supply is often induced by a husband's income shock, in what is called the "added worker effect" (Heckman and MacCurdy (1980), Lundberg (1985), and Cullen and Gruber (2000)). In Japan, Kohara has undertaken a number of studies; in Kohara (2009), using the same survey

[1] As the other economic reasons for marriage, Weiss (1997) mentions increasing returns, imperfect credit market, and the sharing of collective goods.

we use, she found that wives' labor supplies were stimulated when their husbands suffered from involuntary job loss in the 1990s, when unemployment rates skyrocketed. However, we do not explicitly consider this additional labor supply on the part of wives an issue of concern.

When young single women get married later in life or do not get married at all, they cannot rely upon such risk-sharing; this means that young single women face higher uncertainty vis-à-vis future income. Thus, the higher risk due to late or no marriage encourages them to add more savings than they would when enjoying the lower risk that comes with getting married. Such additional saving that results from future uncertainty is called "precautionary saving." In fact, whether or not individuals increase their precautionary savings when they are worried about future labor income has been examined previously, using data pertaining to the United States and European countries (see Dardanoni (1991), Carroll and Samwick (1998), Kazarosian (1997), Dynan (1993), and Lusardi (1998)). Moreover, analyses of Japanese households have been undertaken by Zhou (2003), Murata (2003), and Horioka et al. (2000). However, although many studies on precautionary saving relate to unemployment and labor income risk,[2] none has focused on risk due to marriage versus remaining single.

In this paper, we focus on precautionary savings due to staying single, in the presence of income uncertainty. Especially, single women who expect to be married later in life or not to be married at all are unlikely to share income risk with a husband; thus, they face higher risk of income fluctuation, which likely encourages them to increase savings for precautionary reasons. Then, we examine the hypothesis that single women who have lower anticipations of getting married in the future have more precautionary savings than those who have a higher anticipation, using Japanese micro-level data from the Japanese Panel Survey of Consumers (JPSC) of the Institute for Research on Household Economics.

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[2] One exception is Murata (2003), who examines the effects of household anxiety vis-à-vis the public pension system on its saving behavior.

Section 2 presents our hypotheses for empirical analysis, and Section 3 introduces the data we use. Section 4 introduces the estimation model, and Section 5 presents our estimation methods. Section 6 presents descriptive statistics, and Section 7, the estimation results. Finally, in Section 8, we discuss our results and conclude the paper.

2 Hypothesis

To theoretically investigate the relationship between precautionary savings and the marital status of women, we utilize a two-period model based on Nordblom (2004).

First, we considered a single woman who receives a certain income, y_1, in the first period and an uncertain income, y_2, in the second period. Then, y_2 is a random variable. For simplicity, the interest and discount rates are assumed to be zero. Further, we simplified that $y_2 = y_l$ with probability p_1 and $y_2 = y_h$ with probability $p_2 = 1 - p_1$. Then, her budget constraint is

$$c_2 = y_1 - c_1 + y_2,$$

where c_t is consumption in period t. If we represent single woman's savings by

$$s_{\mathrm{s}} = y_1 - c_1,$$

then the Euler equation is

$$u'(y_1 - s_{\mathrm{s}}) = p_1 u'(s_{\mathrm{s}} + y_{\mathrm{l}}) + p_2 u'(s_{\mathrm{s}} + y_{\mathrm{h}}).$$

Under the assumption $u' > 0$, $u'' < 0$, and $u''' > 0$, that is, women are prudent, they save for precautionary reasons.

Next, we characterized marriage in this model by making the following assumptions. The first assumption in characterizing marriage in this model was, similar to women, men face the same income risk in the second period. More specifically, with $p_{11} > 0$, both she and her husband receive low income y_{l}. With

$p_{12} > 0$, she receives a high income y_{h}, while her husband receives a low income y_{h}. Also, with p_{12}, she receives a low income y_{l} while her husband receives a high income y_{h}. With $p_{22} > 0$, both she and her husband receive high income y_{h}. Note that $p_{12} > 0$ shows that, for that period, the two spouses' incomes do not perfectly correlate. The second assumption we made was that the married couples had the same level of consumption —that is, $c_{\mathrm{t}}^{\mathrm{wife}} = c_{\mathrm{t}}^{\mathrm{husband}}$ with $t = 1,2$, which makes the married couple maximize utility in a cooperative way, with their total income being pooled. Thus, which of the two spouses earns the income is irrelevant to this analysis.

Then, the Euler equation of a married woman becomes

$$u'(y_1 - s_{\mathrm{m}}) = p_{11}u'(s_{\mathrm{m}} + y_{\mathrm{l}}) + 2p_{12}u'\left(s_{\mathrm{m}} + \frac{y_{\mathrm{l}}+y_{\mathrm{h}}}{2}\right) + p_{22}u'(s_{\mathrm{m}} + y_{\mathrm{h}}),$$

where S_{m} is the married woman's savings. The income structure of a married couple implies that the expectation of a married woman's income is the same as that of single woman's, while the variance of a married woman's income is smaller than that of a single woman. Thus, due to the assumption that there is prudence and income-pooling between a wife and her husband, the marginal utility of consumption in the second period is greater for single women than for married women. Therefore, as Proposition 1 of Nordblom (2004) states, theoretically, we have that married women save less for precautionary reasons than do single women, if period-two incomes of the two spouses do not perfectly correlate. Based on this theoretical result, and if we consider transitions in marital status, it is natural to hypothesize that the more single women expect to get married in the future, the less they will save for precautionary reasons. Therefore, we obtain the following hypothesis for empirical analysis:

Empirical Hypothesis 1. *Single women who have lower anticipations of getting married in the future have more savings for precautionary purposes than those who have higher anticipations thereof.*

However, it must be noted that if a marriage results in a higher expectation vis-à-vis the woman's income, then the married woman will have less savings, even if she is not prudent. Let $d > 0$ be the expected income difference between women and men. Then, the Euler equations of a single woman and a married woman when $u''' = 0$ are, respectively,

$$u'(y_1 - s_s) = u'(s_s + p_1 y_l + p_2 y_h)$$

and

$$u'(y_1 - s_m) = u'\left(s_m + p_1 y_l + p_2 y_h + \frac{d}{2}\right).$$

Thus, we have $s_m < s_s$. If this is the case, savings are motivated by income-smoothing over her lifetime, but not for precautionary reasons. Therefore, we can say that if women have higher expectations vis-à-vis their income after marriage, we will empirically observe a decrease in savings, especially for reasons other than those that are precautionary. Thus, our second empirical hypothesis is:

Empirical Hypothesis 2. *If income-smoothing achieved through marriage to a higher-income spouse has an affect on the saving behavior of single women, then those women who have lower anticipations of getting married in the future will be expected to have more savings for reasons other than those that are precautionary than those who have higher anticipations thereof.*

If income smoothing achieved through marriage to a higher income spouse has an affect on the saving behavior of single women, those women who have lower anticipations of getting married in the future will have more savings for the reasons other than those that are precautionary than those who have higher anticipations thereof.

3 The Data

We use panel data from the Japanese Panel Survey of Consumers, provided by the Institute for Research on Household Economics. This panel survey was initiated in October 1993 and has been conducted annually since then. The data therefore contain 15 waves (1993–2007). In the panel survey, a stratified, two-stage random sample from throughout Japan was performed, using the drop–off, pick–up method.

In 1993, the survey started with 1,500 women (1,002 married women and 498 single women) between 24 and 34 years of age as of October 1993 (cohort A). In 1997, 500 women between 24 and 27 years of age as of October 1997 (201 married women and 299 single women) were added (cohort B); in 2003, 836 women between 24 and 29 years of age as of October 2003 (351 married women and 485 single women) were added (cohort C).

In the survey, each female respondent has been tracked for multiple years, and so we could gauge her age profile against her marital status. In addition, since the ninth wave (year 2001), the subjects' target wealth was tracked for various purposes so that our analysis has been performed with data only from the ninth year of the wave.

In addition, the survey asks each female respondent about her preference vis-à-vis marriage, which is used as an instrumental variable; it also asks for information on household demographics, including family size, age, education, income, and occupational status.

4 The Model

To empirically examine the two empirical hypotheses presented in Section 2, we present our estimation equation as follows:

$$W_{it} = \gamma q_{it} + \boldsymbol{Z}_{it}\boldsymbol{\alpha} + \varepsilon_{it}. \quad (1)$$

The dependent variable W_{it} is defined as the amount of targeted savings, broken down by purpose. For hypothesis 1, we use the following two variables for precautionary purpose: (a) the variable *emergency,* which represents the amount of target savings to prepare for illness, disaster, and emergency, and (b) the variable *no_purpose,* which represents the amount of target savings for general peace of mind and for no particular purpose. For hypothesis 2, we use the following three variables. The first is (c) the variable *durables*, which represents the amount of target savings for purchasing consumer durables. The second is (d) the variable *leisure*, which represents the amount of target savings for spending on leisure activities. The last is (e) the variable *retirement*, which represents the amount of target savings for retirement. We can use all five variables as dependent variables. Note that, as previously mentioned, we can obtain data pertaining to these five variables only from the ninth wave, onwards.

Note that these five categories of target savings, (a)–(e), are neither attained nor factual; rather, they are unattainable and ideal figures.

Our main explanatory variable must indicate the anticipation of getting married in the future; we therefore use dummy variable q_{it}, which equals 1 if she gets married within three years, and 0 otherwise. That is, if a respondent woman is unmarried at the n^{th} wave, and she gets married at the $n + 1^{th}$, $n + 2^{nd}$, or $n + 3^{rd}$ wave, then the dummy variable q equals 1, and 0 otherwise.

If, as hypothesis 1 states, the main purpose of savings among single women is precautionary, then we expect the coefficient of the dummy variable q_{it} to be negative when the dependent variables are *emergency* and *no_purpose*. On the other hand, as hypothesis 2 states, if the main purpose of savings among single women is to achieve income-smoothing by marrying a higher-income spouse, then we expect the coefficient of the dummy variable q_{it} to be negative when the dependent variables are *durables*, *leisure*, and *retirement*.

The reasonable grounds for taking three years for defining the dummy variable q_{it} is as follows.

First, suppose that we were to take one or two years, rather than three. There is the fear that we may commit a mistake: that those who have the intention and desire to get married and will get married might conceivably be considered as those who do not or will not. Although couples get engaged, it may take more than one or two years to prepare for a wedding. In fact, in our survey, among those who answered "I am ready to get married" in response to the question about the preference for getting married—which we will address in the next section—74.9% of them had actually married within a year, while 9.0% and 4.1% of them married in the second and the third years, respectively. Thus, a small but not-insignificant number of single women with a certain anticipation of getting married stay single for additional two years. Next, suppose that we were to use marriage taken within four or more years, rather than the three years. In such a case there would be, on the other hand, a fear that we could commit the converse mistake—that is, those who state that they have no intention or desire to marry may happen to get married, due to unexpected encounters or changes of mind. In fact, in our survey, among those who answered "I do not want to get married," 3.2% of them married in the fourth year and 5.5% of them in the fifth year. Therefore, we chose marriage within three years as a proxy for anticipation of getting married. Note that we conduct estimations using marriage within two years and four years, but we saw no major difference.

$\boldsymbol{Z_i}$ is the set of variables that capture the lifecycle of respondents: age, age squared, dummy variables of working status (full-time worker, part-time worker, and not working), dummy variables of educational attainment (junior high school graduate, high school graduate, college graduate, and university graduate or over), dummy variables of the father's educational attainments (same as above), dummy variables of her resident status (live alone, family of two, family of three, family of four or more), her own annual income, and wave dummy (9^{th} wave and 11th wave).

5 Estimation Method

This section introduces our estimation model. We outline our cross-sectional analysis methodology in Section 5.1. We then explain our panel analysis in Section 5.2.

5.1 Cross-Sectional Analysis (Instrumental Variables)

In our cross-sectional analysis, we use the 9th and 11th waves of the survey; thus, in this subsection, we remove the subscript t from the variables we use.

It is difficult to discuss the true impact of q_i on W_i owing to simultaneity problems. It is highly likely that there is a reverse causality, which could bias our estimated coefficients positively or negatively. A single woman who saves more for precautionary reasons could be more likely to get married, if more savings is suggestive to a potential husband of a woman of steady character; thus, it could actually serve as a catalyst for positive bias. On the other hand, a negative bias is brought about when a woman who does not save less but spends money more can be more likely to get married, if extravagant spending creates opportunities to find and meet a potential husband. Note that the former positive bias is due to the fixed effect of individual characteristics, and so we can mitigate this bias through panel analysis.

In order to resolve these problems, we employ the two-stage least squares method using two instruments for q_i. One has five dummy variables representing the respondent's preferences for marriage (*m_preference_j*); the other is the percentage of unmarried women aged 24–35, by prefecture (*unmarried_rate*).

We need to check the validity of these two variables as instruments. First, the variables *m_preference_j* and *unmarried_rate* should not correlate with the error term of estimation equation (1)—that is, the unobservable determinants of savings for precautionary reasons. Second, the variables *m_preference_j* and *unmarried_rate* should partially correlate with q_i, once the impact of the other exogenous variables has been netted out.

In the following, for our two instrumental variables, we can determine whether or not the above two conditions are satisfied.

m_preference_*j*

Our first instrumental variable, *m_preference_j*, is defined using the following survey questionnaire, which asks each respondent single woman about her present situation, that is preferences, in regards to marriage.

Question: Would you like to get married (based on legal definitions)?

Answer:

1. *I am ready to get married.*
2. *I would like to get married soon.*
3. *I would like to get married – not soon, but eventually.*
4. *It is not necessary to get married.*
5. *I do not want to get married.*

From this questionnaire, we construct five dummy variables as *m_preference_j* (j = 1–5)). The base category of these variables includes those who answer "*I would like to get married soon*" (*m_preference_2* = 1).

We discuss whether the dummy variable *m_preference_j* is valid as an instrument. We consider the first condition. We can say that marriage preference, represented by the proxy *m_preference_j*, is not related to precautionary saving behavior, though it is likely that marriage preference does affect target savings for "marriage." Those who have a strong preference for marriage need to set aside a large amount of savings for marriage expenditures, such as the wedding ceremony, honeymoon, and married life. As noted earlier in Section 4, in this survey, questions on target savings are segmented so as to include target saving for reasons

of marriage, as well as target savings for precautionary reasons and for smoothing income over her life. We can therefore say that *m_preference_j* may correlate with unobservable determinants of savings for marriage reasons, while it does not correlate with those of savings for precautionary reasons.[3]

Next, we examine the second condition. It is natural to say that respondents who are strongly fond of the idea of marriage are more likely to get married. In the survey questionnaire we use, the survey asks, "Did you do some activities for marriage during the last year?"; multiple answers were allowed.[4] The answers from our 590 respondents indicate that those who have a strong preference for marriage are more likely to undertake more than one activity related to getting married. Actually, 81.8% of those who had answered "I am ready to get married" (*m_preference_1* = 1) undertake more than one activity related to marriage, while 70.5% of those who answered "I would like to get married soon" (*m_preference_2* = 1) and 35.7% of those who answered "I would like to get married not soon, but eventually" (*m_preference_3* = 1) do so. These findings imply that those with a strong preference for marriage are active with regard to getting married, and such activities provide them with greater chances of meeting a marriage partner and getting married in the future.

unmarried_rate

We obtain from Census data the percentage of unmarried women aged 24–35, by prefecture. Since the Census

[3] The instrument can be invalid if *m_preference_j* has a direct effect on target savings, whereas if we regress *m_preference_j* on target savings, *m_preference_j* has insignificant coefficients.

[4] The choices are: (1) a meeting arranged by relatives and families, (2) a meeting arranged by friends, (3) asked friends and relatives to introduce a male marriage partner, (4) joined a matrimonial agency in the last year, (5) continued to be part of a matrimonial agency over the year, (6) read a bridal magazine, (7) talked about marriage with the boyfriend, (8) got engaged, (9) other, and (10) did nothing.

is conducted only every five years, we could not obtain the percentage for each cohort (9th wave (2001) and 11th wave (2003)); we therefore use the percentages of the nearest years—that is, 2000, and 2005, respectively.

Then, we examine whether the percentage of unmarried women aged 24–35 by prefecture (*unmarried_rate_j*) is valid as an instrument. We needed to ascertain that the first condition—that interprefectural variations in the ratio of the unmarried women are unlikely to correlate with unobservable determinants of saving behavior—is reasonable. It is obvious that the ratio of unmarried women by prefecture does not affect individual-level saving behavior. We consider the second condition—that is, whether or not this ratio correlates with q_i. It is reasonable that in a prefecture where the ratio of unmarried women is high, it is more likely that the respondents will remain unmarried. This is because the large number of unmarried women implies that there are many marriage competitors, and thus it is difficult to find a marriage partner. In addition, in an environment where there is a large number of unmarried women, being unmarried becomes a norm of sorts, and unmarried women therefore may not feel anxious about being single.[5]

Results of the first-stage estimation

Based on the above discussion, we look at the results of the first-stage estimation (Table 1), which regress q_i on *m_preference* and *unmarried_rate*, and the other exogenous variables included in $\boldsymbol{Z_i}$. In five columns, our first-stage estimations are done with different sample selections prepared for the second-stage estimation of the dependent variable, such as *emergency*, *no_purpose*, *durable*, *leisure*, and *retirement*.

First, look at the rows pertaining to Hansen's J test. With the test, we investigate the null hypothesis

[5] We first considered that the percentage of unmarried "men" aged 24–35 by prefecture is also highly related to q_i. However, it is also highly related to the percentage of unmarried women therein, which forces us to choose one of them as the instrumental variable. We also tried using the difference of these variables as an alternative instrumental variable, but the result was not significant.

that all excluded instruments are exogenous. As with Table 1, we find that in almost all specifications—except *emergency*—we cannot reject this null hypothesis; this finding suggests that the variables *m_preference* and *unmarried_rate* are exogenous.

Next, we find that in any five specifications in Table 1, all of the coefficients of *m_preference_1* are positive and significant, and all of *m_preference_3*, *m_preference_4*, and *m_preference_5* are negative and significant. (As mentioned, the base category is those with *m_preference_2* = 1.) In specification (a), the coefficients of *m_preference_1*, *m_preference_3*, *m_preference_4*, and *m_preference*_5 are 1.793, –0.584, –0.990, and –1.265, respectively, all of which are significant at the 1% level. We also calculate the marginal effects, which indicate that single women who are ready to get married are 65 percentage points more likely to be married within three years than single women who would like to marry soon; single women who would like to get married but not soon are 14 percentage points less likely to do so within three years; and those who answer that it is not necessary to get married are 20 percentage points less likely to do so within three years. With respect to single women who do not want to get married, they are 18 percentage points less likely to do so. With respect to the other four specifications, we have similar coefficients, all with statistical significance. These results suggest that respondents who have a strong fondness for marriage are more likely to have a high anticipation of getting married within the next three years, whereas those who have less interest in marriage are less likely to do so.

Then, we look at the coefficient of *unmarried_rate*. Unfortunately, in any of the five specifications in Table 1, we have insignificant coefficients for *unmarried_rate*. From these results, we cannot say that the respondents who live in a prefecture where there is a higher percentage of unmarried women aged 24–35 are more or less likely to have a high anticipation of getting married in the next three years.

Finally, as for the second condition, *F*-statistics in the first-stage regression are much greater than 10 for the null hypothesis that the coefficients on the instrumental variables are equal to 0—a condition that is

necessary for the instruments to be valid in all specifications.

Sample selection

In the cross-sectional analysis, we use the 9th wave of Cohorts A and B (i.e., from year 2001) and the 11th wave of Cohort C (i.e., year 2003) of unmarried respondents.

There were a total of 918 observations (332 from cohorts A and B, and 586 from cohort C). We restrict the sample to respondents with no children, which reduces the number of observations from 918 to 832 (266 from cohorts A and B, and 566 from cohort C); we also restrict the sample to respondents who answered all of the questions in full, which further reduces the number from 832 to 590 (210 from cohorts A and B, and 380 from cohort C). Therefore, the number of observations we use in the cross-sectional analysis is 590. In addition, according to dependent variables (a)–(e), the number of observations we use in our estimation are finally reduced to 553, 558, 555, 552, and 555.

5.2 Panel Analysis

When it is more likely that an unmarried woman will not marry over time, how does her saving behavior change over time? To examine this question, we conduct a panel estimation. We expect that if a woman believes it unlikely that she will marry, she will save more for precautionary reasons. We use the data from the 9th to the 12th wave, with the number of observations being 385 (N = 959 and T = 2.49). In addition, according to the dependent variables (a)–(e), the number of observations we use in our estimation are finally reduced to 377, 375, 377, 377, and 375.

The data we use in our analysis are from unbalanced panels, on which we conduct both fixed-effects and random-effects regressions.

6 Descriptive Statistics

First, we present descriptive statistics of the characteristics of the Japanese unmarried women we use in this analysis. Table 2 summarizes the descriptive statistics of continuous variables, and Table 3, of category variables.

In our analysis, respondent unmarried women were aged 24–35 years (mean, 29.0 years). Given that the Vital Statistics of Japan says that the average age of first marriage for Japanese women was 26.3 in 1995, 28.0 in 2005, and 28.6 in 2009, we can say that all the respondent women are at marriageable age. Actually, in our sample, of the women unmarried at the start of each cohort, 22.0% were married within three years, as shown in q_{it} in Table 3. With respect to preference for marriage (*m_preference_j*), the proportion of respondents who would like to get married (*m_preference_2* or *m_preference_3* = 1) is about 68.7%; those who believe it is not necessary to get married (*m_preference_4* = 1) comprised 22.9%, and those who do not want to get married comprised only 2.9%. Thus, most respondents believed that they would get married.

One noticeable characteristic of the sample we use is the large proportion therein who live with their parents (79.2%, *live_alone* = 0 in Table 3). According to the Japanese National Fertility Survey, the proportion of Japanese unmarried women who live with their parents was 79.4% in 1997 and 78.5% in 2002, when they are 25–29 years old; the numbers in those years climb to 72.1% and 76.1%, respectively, for those aged 30–34 years. Hence, from this perspective, our data resembles that of the national representative survey.

In addition, about 90% of our survey respondents work (as full-time employees [63.1%, *work_fulltime* = 1] or part-time employees [25.8%, *work_parttime* = 1]). According to labor force statistics gathered by the Ministry of Internal Affairs and Communications, in 2004, the labor force participation rate of unmarried women aged 25–29 was 91.0%, while that of those aged 30–34 was 90.7%.

Next, we examine target wealth vis-à-vis precautionary savings. On average, the amount of target

savings to prepare for illness, disaster, and emergency is ¥652,400, and that of target savings for general peace of mind or for no particular purpose is ¥2,239,400. With respect to lifecycle savings, the amount of target savings for purchasing consumer durables is ¥191,000, that of target savings for spending on leisure activities is ¥258,000, and that of target savings for retirement is ¥1,290,000.

Looking at Figure 1—where we show how target savings change as single respondents more closely approach the time of marriage—we can see that *emergency* and *no_purpose* decrease about three years prior to marriage. On the other hand, *durables* and *leisure* show little change. In addition, *retirement* rises sharply three years before marriage, but overall shows a downward trend. From this figure, there seems a relationship between target savings and the "countdown" to marriage.

Finally, a note about income: on average, the respondents' annual income (i.e., not only income from work, but also that from property, social security, and allowance from parents, etc.) is ¥2.62 million, on average. According to the National Survey of Family Income and Expenditure, in 1999, young single households (aged under 30) have an average earnings of ¥2.88 million annually. Hence, the respondents whose data we use have slightly lower earnings than those in the National Survey of Family Income and Expenditure.

7 Estimation Results

In this section, we present our estimation results regarding the true impact of q_{it} on W_{it}.

7.1 Estimation Results of Cross-Sectional Analysis (Table 4)

In this subsection and Table 4, we present the estimation results of our cross-sectional analysis. Note that we take into account the endogeneity of the variable q_i and adopt the instrumental variable method. Here, we

discuss the coefficients of the predicted variable of q_i, that is, $\hat{q}_i$.

First of all, in columns (a) and (b)—where the dependent variables are *emergency* and *no_purpose*—$\hat{q}$ has negative and significant coefficients. That is, those who get married within three years have an approximately ¥586,000 less wealth target to prepare for illness, disaster, and emergency, and approximately ¥1,626,000 less target wealth for general peace of mind or for no particular purpose than those who do not. The *p*-values for these two dependent variables are 7.3% and 1.2%, respectively. These results support hypothesis 1: if single women think it highly likely they will get married in the future, then they will have a lower amount of precautionary savings than those who do not.

With respect to the control variable $\boldsymbol{Z}_{it}$, we have positive and significant coefficients of *income* in both columns (a) and (b)—that is, if the annual income of a single woman increases by an additional ¥10,000 per year, then the amount of target wealth to prepare for illness, disaster, and emergency and the amount of target wealth for general peace of mind and for no particular purpose will be lowered by approximately ¥2,270 and ¥6,040, respectively. Hence, we can say that the higher the annual income of a single woman is, the higher will be her savings for precautionary reasons. Moreover, *educ_junior* has a negative and significant coefficient in column (b)—that is, if a single woman is a junior high school graduate, the amount of target wealth for general peace of mind and for no particular purpose lowers to approximately ¥1,423,000, compared to a single woman who is a high school graduate. Thus, we can say that when single women are junior high school graduates, their precautionary savings are lower than those of single women who are high school graduates.

We now turn to columns (c)–(e), where the dependent variables are *durables*, *leisure*, and *retirement*. There, we find that $\hat{q}$ has negative and significant coefficients in columns (c) and (e)—that is, those who get married within three years have approximately ¥211,000 less target wealth for spending on leisure activities than those who do not, and approximately ¥1,144,000 less target wealth for retirement. From these results, we

cannot deny the possibility of hypothesis 2 being true—that is, marriage to a higher-income spouse invokes an income-smoothing motive, and thus, single women who have higher anticipations of getting married in the future have lower savings than those who have lower anticipations thereof.

With respect to the control variable $\boldsymbol{Z}_{it}$, the effects of education are found to be as follows: *educ_univ* has a negative and significant coefficient in column (c), and *educ_junior* has a negative and significant coefficient in column (d). Thus, we can say that the higher a single woman's educational attainment, the more likely she will have savings for income-smoothing by marrying a higher-income spouse. Then, for the other significant coefficients, *income* and *work_fulltime* are positive, and *live_alone is negative*.

7.2 Estimation Results of Panel Data Analysis

In this subsection and Tables 5 and 6, we present the estimation results of our panel data analysis.

Table 5 presents results vis-à-vis the dependent variables *emergency* and *no_purpose*. There, $\hat{q}$ has negative and significant coefficients $\hat{q}$ in columns (a-1) and (b-1), where the random-effects method is used—that is, those who get married within three years have approximately ¥434,000 less target wealth to prepare for illness, disaster, and emergency and approximately ¥911,000 less target wealth for the general peace of mind and for no particular purpose than those who do not get married. The *p*-values thereof are 4.6% and 3.3%, respectively. $\hat{q}$ has no significant coefficients we when we use the fixed-effect method. With respect to the Hausman test, $p = 0.42$ for the estimation with the dependent variable *emergency* (column (a)), so we cannot reject the null hypothesis; meanwhile, $p=0.00$ for the estimation with the dependent variable *no_purpose* (column (b)), and so we can reject it. Hence, we should use a random-effect estimation for *emergency* and a fixed-effect estimation for *no_purpose*. Thus, the anticipation of *not* getting married in the future leads to the accrual of higher amounts of savings to prepare for illness, disaster, and emergency, which

supports our hypothesis 1; this finding is similar to that resulting from the cross-sectional analysis.

With respect to the control variables, *income* has positive and significant coefficients in both columns, following the use of the random-effect method. Hence, with the cross-sectional analysis, a single woman's higher annual income leads to higher target savings for precautionary reasons. Additionally, *family_of_two* has a positive coefficient—that is, those who live in smaller families tend to have higher precautionary savings. Then, *age_squared* has two significant coefficients: that obtained through the random-effect estimation is positive, while that obtained through the fixed-effect estimation is negative.

Table 6 presents the panel-analysis results, where the dependent variables are *durables*, *leisure*, and *retirement*. There, $\hat{q}$ has a negative and significant coefficient only in column (e-1), where the random-effect method is used—that is, those who get married within three years have approximately ¥1,106,000 less target wealth for retirement than those who do not. Note that the Hausman test cannot be rejected (p = 0.15), and so we use this random-effects estimation. The inclusion of the variable *retirement* in the category of precautionary savings can be quite controversial, but it is included because, as Japan's population ages and its birth rate drops, growing insecurity surrounding Japan's pension system has been generating precautionary savings. In fact, using the same survey as we use, Murata (2003) points out that there exist in Japan precautionary savings due to uncertainty concerning public pension benefits. She also notes that households begin to accrue precautionary savings, even when the respondents are as young as in their 30s. Therefore, we cannot ignore the precautionary aspect of retirement savings, although in some cases they could be categorized as being part of lifecycle savings.

In the panel estimations for *durables*, *leisure*, and *retirement*, we have significant control-variable coefficients, similar to the previous estimations—that is, *income* and *age_squared* have positive and significant coefficients, while *work_parttime*, *live_alone*, and *family_of_two* have negative and significant coefficients.

8 Discussion and Conclusion

The results of our analysis support our first hypothesis, that single women who anticipate not getting married in the future have larger amounts of precautionary savings than those who do. The following are explanations thereof.

In our cross-sectional analysis, single women who do not get married within three years have a larger amount of target wealth to prepare for illness, disaster, and emergency, as well as a larger amount of target wealth for general peace of mind and for no particular purpose, than those who do (columns (a) and (b) of Table 4). In addition, in our panel analysis (column (a-1) of Table 5), single women who do not get married within three years have a larger amount of target wealth to prepare for illness, disaster, and emergency. These findings enable us to advocate the possibility that the anticipation of not getting married in the future promotes in women the accrual of precautionary savings.

On the other hand, in our cross-sectional analysis (columns (d) and (e) of Table 5), we find that single women tend to have larger amounts of target wealth to spend on leisure activities and for retirement, as a direct result of their anticipation of not getting married within three years. We also find that single women tend to have smaller amounts of target wealth for retirement, as a direct result of their anticipation of not getting married, as found through panel analysis (column (e-1) of Table 6). From these results, we cannot deny the possibility that our second hypothesis holds—that is, marriage to a higher-income spouse incurs an income-smoothing motive, and thus single women who have higher anticipations of getting married in the future tend to have fewer savings than those with a lower anticipation thereof.

From these findings, a number of our results can be explained in terms of our hypothesis that the more a single woman expects to get married, the lower the amount she is likely to save for precautionary reasons.

In the following, we present several policy implications that derive from our results. First, our results help to measure income and employment risk among unmarried women. It is well known that social security systems in Japan generously support those who work for larger firms, or households whose members work for larger firms (Horioka and Kanda (2010)). Also known is that women in Japan tend to be irregular and short-term employment workers. Hence, they are more susceptible to income and employment risk in a social environment that has been experiencing rapid change, resulting in marriage later in life and many remaining altogether unmarried, as discussed in the Introduction. To mitigate such risk among unmarried women in Japan—a risk that could adversely affect their quality of life—social security systems may need to become less firm- and household-oriented and more individual-oriented.

Second, it is also important to eliminate mismatches arising in the Japanese marriage market, which would not only lower the opportunity costs of marriage (including the introduction of a dual-surname system and unregistered marriage), childbirth, and child rearing, but also promote rehiring.

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Table 1: First Stage (Two Stage Estimation)
dependent variable: *q*

sample selection	(a) emergency		(b) no_purpose	
	Coefficient	Standard Error	Coefficient	Standard Error
m_preference_1	1.793 ***	(0.362)	1.814 ***	(0.362)
m_preference_3	-0.584 ***	(0.169)	-0.552 ***	(0.168)
m_preference_4	-0.990 ***	(0.212)	-0.984 ***	(0.212)
m_preference_5	-1.265 **	(0.532)	-1.166 **	(0.539)
unmarried_rate	-1.453	(1.315)	-1.362	(96.740)
Hansen's J chi2	10.4201 (p = 0.0339)		1.54666 (p = 0.8183)	
F test (Prob > F)	37.7322 (0.0000)		37.3723 (0.0000)	
Wald (20)	97.790		96.740	
Prob > chi2	0.000		0.000	
Log likelihood	-232.925		-235.808	
Pseudo R2	0.205		0.202	
Number of obs	553		558	

sample selection	(c) retirement		(d) durables		(e) leisure	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
m_preference_1	1.809 ***	(0.356)	1.855 ***	(0.357)	1.821 ***	(0.356)
m_preference_3	-0.589 ***	(0.168)	-0.576 ***	(0.169)	-0.582 ***	(0.169)
m_preference_4	-0.999 ***	(0.213)	-0.986 ***	(0.213)	-0.990 ***	(0.212)
m_preference_5	-1.262 **	(0.535)	-1.267 **	(0.535)	-1.262 **	(0.537)
unmarried_rate	-1.539	(1.316)	-1.305	(1.324)	-1.000	(1.326)
Hansen's J chi2	5.69435 (p = 0.2232)		5.09353 (p = 0.2778)		6.38944 (p = 0.1719)	
F test (Prob > F)	41.9182 (0.0000)		43.526 (0.0000)		41.0289 (0.0000)	
Wald (20)	100.560		98.400		98.670	
Prob > chi2	0.000		0.000		0.000	
Log likelihood	-233.503		-232.678		-231.626	
Pseudo R2	0.206		0.211		0.209	
Number of obs	552		555		552	

Japanese Panel Survey of Consumers, 9th wave of the cohort of A and B and 11th wave of the cohort of C. In order to define q, we use the 12th and 14 wave respectively.

Probit models are used. The level of significance at 1% is ***, 5% is **, and 10% is *. Control variables in Zi are included in all the specifications, but suppressed.

Table 2: Descriptive Statistics (Continuous Variables)

Variables	Obs	Mean	Std. Dev.	Min	Max
age (year)	590	29.03	3.99	24	42
educ (year)	590	13.93	1.67	9	18
income +	590	262.17	141.22	0	738
n_family	590	3.13	1.51	1	8
father_educ (year)	590	12.32	2.50	9	18
emergency +	553	65.24	184.67	0	3000
no_purpose +	558	223.94	405.76	0	5000
durables +	555	19.08	67.77	0	500
leisure +	552	25.76	62.56	0	500
retirement +	552	129.86	475.63	0	6000

Japanese Panel Survey of Consumers, the 9th wave of cohort A and B and the 11th wave of cohort C.
+: 10 thousand yen

Table 3: Descriptive Statistics (Category Variables)

Variables		Freq.	Percent
wave =	9	210	35.59
	11	380	64.41
	Total	590	100.00
q++ =	0	460	77.97
	1	130	22.03
	Total	590	100.00
m_preference =	1	33	5.59
	2	88	14.92
	3	317	53.73
	4	135	22.88
	5	17	2.88
	Total	590	100.00
live_alone =	0	467	79.15
	1	123	20.85
	Total	590	100.00
work_fulltime =	1	372	63.05
work_parttime =	1	152	25.76
nowork =	0	66	11.19
	Total	590	100.00

Japanese Panel Survey of Consumers, 9th wave of the cohort of A and B and 11th wave of the cohort of C. In In order to define q, we use the 12th and 14 wave respectively.

Table 4: Second Stage (Two Stage Estimation)

dependent variable	(a) emergency		(b) no_purpose		(c) durables		(d) leisure		(e) retirement	
	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.
q_hat	-58.597 *	(32.655)	-162.444 **	(64.680)	7.978	(15.222)	-21.124 **	(8.957)	-114.439 *	(64.354)
age	-27.119	(22.675)	-33.059	(60.719)	1.502	(10.899)	-2.510	(10.004)	-89.947	(75.661)
age_sq	0.555	(0.388)	0.782	(1.009)	-0.019	(0.181)	0.041	(0.170)	1.742	(1.224)
work_fulltime	-4.015	(24.323)	4.275	(46.983)	-0.716	(9.587)	-20.381	(14.613)	138.899 *	(78.371)
work_parttime	-26.147	(20.617)	-1.399	(55.050)	-7.150	(7.274)	-20.000	(12.951)	21.702	(36.943)
educ_junior	-25.647	(25.428)	-142.300 ***	(51.011)	-8.188	(5.714)	-21.302 ***	(6.732)	-84.940	(67.977)
educ_college	-30.613	(26.275)	-27.530	(37.593)	2.212	(6.267)	8.835	(6.228)	-94.639	(64.164)
educ_univ	-27.031	(27.014)	-49.285	(54.204)	14.575 *	(7.768)	2.553	(7.443)	-85.769	(81.754)
f_educ_junior	33.101	(23.024)	-27.883	(36.034)	0.450	(6.430)	1.951	(5.730)	-68.031	(66.058)
f_educ_college	-21.359	(23.627)	44.296	(61.081)	-7.551	(9.255)	7.111	(10.397)	-80.249	(60.245)
f_educ_univ	17.905	(14.832)	30.647	(46.373)	-0.182	(7.885)	8.247	(7.037)	42.625	(60.260)
live_alone	-4.374	(18.407)	-48.525	(35.547)	-1.199	(7.329)	-17.349 ***	(6.329)	105.028	(81.965)
family_of_two	72.193	(57.922)	-17.320	(82.197)	-0.740	(13.905)	0.026	(12.809)	87.788	(88.229)
family_of_four	2.859	(14.572)	49.845	(42.273)	7.423	(6.673)	-4.005	(7.144)	9.197	(40.827)
income	0.227 **	(0.101)	0.604 ***	(0.167)	0.036	(0.029)	0.065 *	(0.036)	0.007	(0.263)
wave_11	-12.606	(15.461)	43.423	(35.509)	-16.420 *	(8.901)	-4.687	(6.971)	-34.369	(47.118)
_cons	351.625	(330.336)	377.273	(911.035)	-12.608	(165.478)	70.346	(149.264)	1249.470	(1164.902)
F-value	27.570		3.670		1.860		2.730		2.150	
Prob>F	2.310		0.000		0.022		0.000		0.006	
R-squared	0.114		0.087		0.037		0.041		0.068	
Root MSE	176.380		393.440		67.481		62.167		466.070	
Number of obs	553		558		555		552		552	

Japanese Panel Survey of Consumers, 9th wave of the cohort of A and B and 11th wave of the cohort of C. In order to define q, we use the 12th and 14 wave respectively.

Two stage least squares methods are used. The level of significance at 1% is ***, 5% is **, and 10% is *.

Table 5: Panel Analysis (Precautionary Savings)

	emergency				no_purpose			
	(a-1) random effects		(a-2) fixed effects		(b-1) random effects		(b-2) fixed effects	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
q	-43.417 **	(21.778)	16.507	(41.735)	-91.120 **	(42.770)	6.564	(72.471)
work_fulltime	11.540	(28.921)	-5.928	(50.154)	10.136	(59.400)	30.960	(90.847)
work_parttime	-18.916	(28.490)	-12.496	(44.590)	-24.665	(56.735)	-49.817	(79.908)
income	0.224 ***	(0.060)	0.054	(0.143)	0.672 ***	(0.140)	-0.130	(0.252)
live_alone	4.064	(25.626)	40.354	(92.283)	-32.757	(55.832)	151.710	(152.192)
family_of_two	44.876	(27.335)	164.183 *	(50.996)	-82.479	(62.230)	10.969	(156.104)
family_of_four	0.283	(20.801)	1.597	(0.333)	11.220	(44.817)	-31.770	(89.488)
age_sq	0.065 **	(0.027)	-0.062	(0.104)	0.039	(0.058)	-0.304 *	(0.184)
_cons	-33.004	(47.666)	136.829	(137.968)	43.585	(97.937)	624.759 ***	(240.846)
sigma_u	62.135		182.726		283.756		456.101	
sigma_e	202.115		202.115		353.390		353.390	
rho	0.086		0.450		0.392		0.625	
Number of obs	902		902		896		896	
Number of group	377		377		375		375	
F(8)	64.680		0.530		48.620		0.700	
Prob > F	0.000		0.833		0.000		0.689	
Hausman	8.12 (p = 0.4219)				22.36 (p = 0.0043)			

Japanese Panel Survey of Consumers, from 1st wave to 12th wave.

Random effects method and fixed effects method are used. The level of significance at 1% is ***, 5% is **, and 10% is *.

Time invariant variables such as age, educ, and f_educ are included in the random effects, but suppressed.

Table 6: Panel Analysis (Savings for Income Smoothing)

	durables				leisure				retirement			
	(c-1) random effects		(c-2) fixed effects		(d-1) random effects		(d-2) fixed effects		(e-1) random effects		(e-2) fixed effects	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
q	-4.654	(9.465)	20.477	(18.575)	-7.552	(6.239)	-14.156	(13.331)	-110.641 *	(63.201)	-57.285	(104.911)
work_fulltime	0.457	(12.410)	-15.331	(22.275)	-11.387	(8.241)	5.265	(15.817)	61.932	(86.573)	-95.983	(127.142)
work_parttime	-0.435	(12.278)	4.018	(19.983)	-14.268 *	(8.107)	-13.624	(14.109)	50.448	(83.268)	67.516	(114.657)
income	0.108 ***	(0.026)	-0.001	(0.064)	0.092 ***	(0.017)	0.093 **	(0.046)	0.636 ***	(0.205)	0.054	(0.358)
live_alone	-13.146	(11.039)	2.598	(42.326)	-17.684 **	(7.212)	17.114	(29.108)	133.957	(83.125)	12.436	(245.369)
family_of_two	-29.121 **	(11.918)	13.241	(44.042)	-12.167	(7.776)	11.636	(31.062)	125.727	(91.371)	40.331	(231.454)
family_of_four	-10.089	(9.003)	3.680	(22.958)	-3.221	(5.865)	26.709	(16.357)	-54.230	(66.187)	-95.205	(127.921)
age_sq	0.011	(0.012)	-0.004	(0.047)	-0.007	(0.008)	-0.006	(0.033)	0.324 ***	(0.085)	0.691 ***	(0.263)
_cons	-6.923	(20.491)	29.713	(61.755)	26.778 **	(13.448)	-4.037	(44.139)	18.282 ***	(3.765)	-445.043	(347.721)
sigma_u	26.050		77.792		15.122		52.971		413.684		604.115	
sigma_e	90.558		90.558		64.619		64.619		507.356		507.356	
rho	0.076		0.425		0.052		0.402		0.399		0.586	
Number of obs	903		903		904		904		898		898	
Number of groups	377		377		377		377		376		376	
F(8)	36.210		0.350		45.510		1.480		69.410		1.300	
Prob > chi2	0.000		0.947		0.000		0.161		0.000		0.243	
Hausman	8.24 (p = 0.4102)				6.92 (p = 0.5448)				12.11 (p = 0.1464)			

Japanese Panel Survey of Consumers, from 1st wave to 12th wave.

Random effects method and fixed effects method are used. The level of significance at 1% is ***, 5% is **, and 10% is *.

Time invariant variables such as age, educ, and f_educ are included in the random effects, but suppressed.

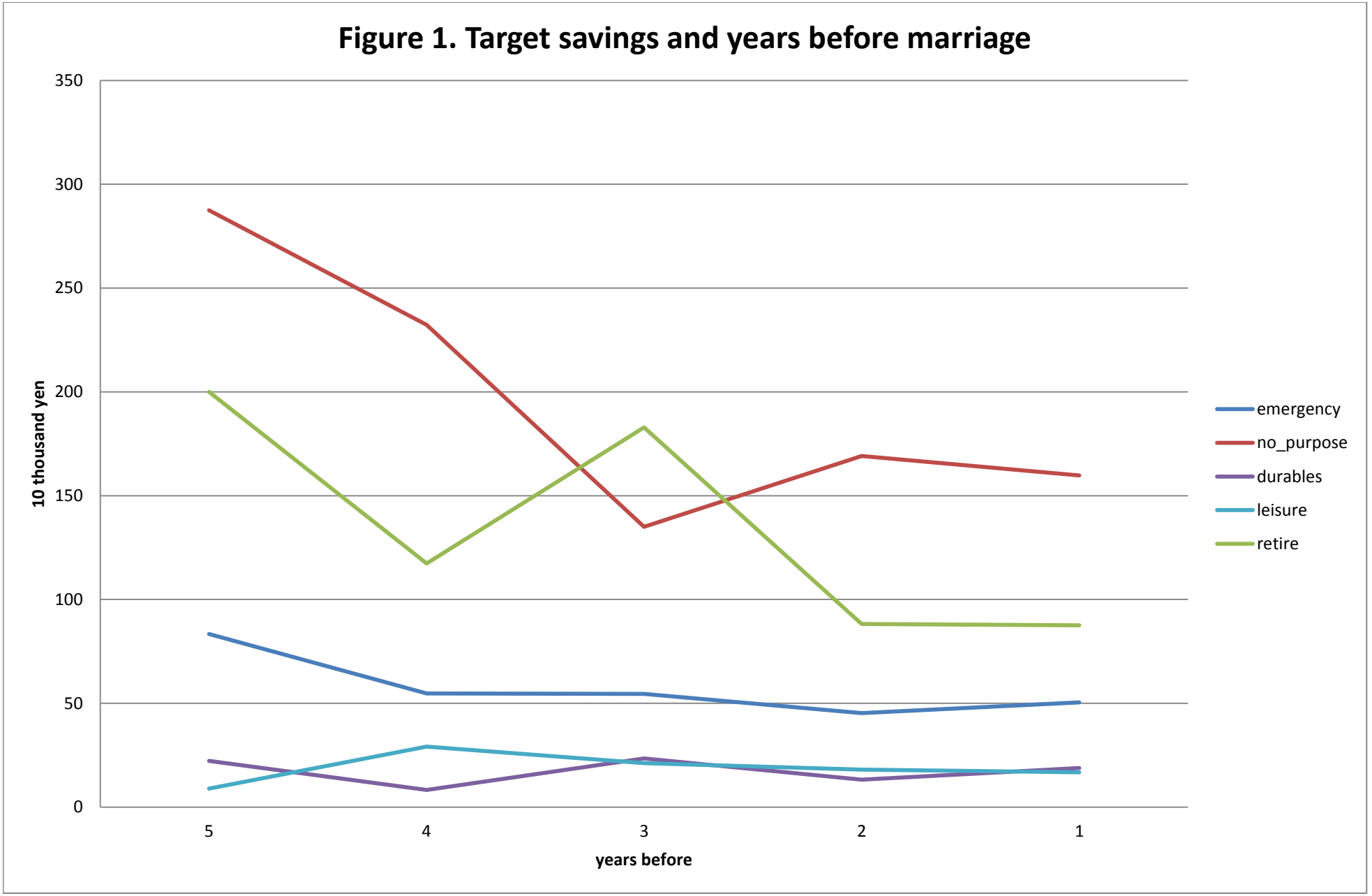
Figure 1. Target savings and years before marriage
350
300
250
200
150
100
50
0
10 thousand yen
5
4
3
2
1
years before
emergency
no_purpose
durables
leisure
retire