# The impact of time preference on bequest behavior: Evidence from Japanese survey data

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## Abstract

The plan of whether people leave an inheritance to their children is one of the important decision-making on how to spend money after retirement. In this paper, we examine the effect of time preference on bequest behavior by using data obtained from a questionnaire survey entitled "Preference Parameters Study". Despite of the benefits from possible help or care by their children in the future, if individuals' time discount rates are high (i.e., their discounts placed on returns available in the future are high) , they may seek their own current consumption without leaving an inheritance to their children. We use two types of time discount rates with different conditions for estimation. The estimation result is that the higher the respondents' time discount rates, the greater the probabilities of choosing not to leave an inheritance to their children. This result also indicates that the respondents with a high time discount rate usually leave their property for themselves. In addition, we also find out that besides time preference, a number of socio-demographic characteristics play an important role in bequest behavior.

Keywords: Time preference; Time discount rate; Bequest behavior; Socio-demographic characteristics; Japan

JEL classification: D10; D81; D90

1. Introduction

Japanese people have the longest life expectancy in the world. In this situation, we need to consider how people spend their money after retirement. Aside from consumption, decisions must be made on whether to bequeath money to one's children. When it comes to personal financial choices, time discounts may deeply impact the decisions made. Therefore, in this study, we clarify the effect of the time discount rate on bequest behavior, and we examine what factors influence bequest decision making.

The life cycle savings hypothesis provides a theoretical framework about consumption throughout a person's life. It says that people work and earn money when they are young, and they live by using their savings after their retirements. However, in many empirical analyses, the elderly do not reverse savings as much as the theoretical prediction of the life cycle hypothesis. One explanation is preliminary savings. This is the theory that money is left in preparation for (1) uncertainty in life expectancy and (2) uncertainty in medical expenses. De Nardi (2010) reported people save money for possible future medical expenses [1]. However, people deal with uncertainties with various forms of insurance. Moreover, savings rates of the elderly differ before and after their retirements, and these decisions are made after retirements [2]. Another explanation is the bequest motive. This theory claims money is saved for altruism and strategic reasons. In this situation, someone plans to leave an inheritance to their children for their future either for purely altruistic reasons or to incentivize some behavior [3, 4]. Horioka et al. (2018), reported that bequest behavior is influenced by the expectation of a bequest, the degree of altruism, and whether the bequestors received an inheritance from their parents [5].

Discount rates, that is, the time value of money, also affect consumer behavior and bequest decision making. The discount rate represents a preference for a current utility versus a future utility[1]. The higher the time discount rate, the higher the current utility weight [6, 7, 8]. Thus, people with a high time discount rate place higher importance on the utility gained from current consumption. For this reason, people may have a greater preference for the utility gained from current consumption than the utility a bequest would give their children in the future. Huffman et al. (2019), report that elders' wealth is associated with lower discount rates, expressed as lower impatience [13]. In our research, we examine causal relationships between discount rates and bequest behavior. Our purpose is to find out how time preference affects the bequest motive. We also analyze the effect of several types of time discount rates.

In this study, we investigate the relationship between bequest behavior, time preference, and

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[1] Time preference is an individual characteristic of intertemporal choice, and it may vary depending on the period and amount of money. In particular, it has been reported that hyperbolic discount describes a real event [9, 10, 11, 12].

the effect of the discount rate on bequest behavior.

## 2. Methodology

### 2-1 Estimation model

We use a multinomial logit model with questions that have more than two options. The multinomial logit model does not assume the order of options.

The estimation model for an individual $i$ selecting option $j *$ is as follows.

$$Bequest_i = \begin{cases} 2 & if \ Bequest^*_{2,i} > Bequest^*_{1,i}, Bequest^*_{2,i} > Bequest^*_{0,i} \\ 1 & if \ Bequest^*_{1,i} > Bequest^*_{2,i}, Bequest^*_{1,i} > Bequest^*_{0,i} \\ 0 & if \ Bequest^*_{0,i} > Bequest^*_{2,i}, Bequest^*_{0,i} > Bequest^*_{1,i} \end{cases}$$

$$Bequest^*_{j,i} = \alpha + \beta_j DR_i + \beta_j X_i + u_i \quad (1)$$

Regarding whether or not to leave an inheritance to their children, we take $Bequest_i$=0 if they absolutely will leave a bequest, or if they have a strategic motivation for leaving one, $Bequest_i$=1 if they will leave a bequest if they can afford it, and $Bequest_i$=2 if they will not leave a bequest. The parameters $\beta_j$ and $Bequest^*_{j,i}$ are different for each option. We expect people with a higher time discount rate to select $Bequest_i$=2 because they focus on their current utility.

### 2-2 Data: bequest behavior

The data used in this study is obtained from a survey entitled "Preference Parameters Study" that was conducted in four countries by the Global Centers of Excellence (Global COE) program at Osaka University: in Japan in 2004; in the U.S. in 2005; in India in 2009; and in rural and urban areas in China in 2006 and 2007. We use data from the 2010 surveys in Japan.

The data analyzed is based on the following question and its eight associated possible responses:

How do you feel about leaving an inheritance to your children?

(1) I plan to leave an inheritance to my child(ren) no matter what.
(2) I plan to leave an inheritance to my child(ren) if they provide care (including nursing care) during my old age.

(3) I plan to leave an inheritance to my child(ren) only if they provide financial assistance during my old age.

(4) I plan to leave an inheritance to my child(ren) only if they carry on the family business.

(5) I do not plan to make special efforts to leave an inheritance to my child(ren) but will leave whatever is left over.

(6) I do not plan to leave an inheritance to my child(ren) under any circumstances because doing so may reduce their will to work.

(7) I do not plan to leave an inheritance to my child(ren) under any circumstances because I want to use my wealth myself.

(8) I want to leave an inheritance to my child(ren) but I won't because I don't have the financial capacity to do so.

When respondents selected (1), (2), (3) or (4), the response was coded as "will leave an inheritance to my children no matter what" or as "having strategic motive" ($Bequest_i$=0). When (5) was selected, it was treated as "whatever is leftover" ($Bequest_i$=1), and when (6), (7) or (8) were selected, it was handled as "will not leave an inheritance" ($Bequest_i$=2).

## 2-3 Data: time preference

Time preference is assessed from responses to Q1, shown in Table1-1 and 1-2. Q1 is about the respondent's intertemporal choices. We elicited time preference based on the respondent's choices in the following situation: "Let's assume you have two options to receive some money. You may choose Option A, to receive ¥10,000 today, or Option B, to receive a different amount in seven days. Compare the amounts and timing in Option A with Option B and indicate which you would prefer for each of the 9 alternatives."

We measured the discount rate (DR) as the mean of the interest rate at the point where there was a shift in the preferred option from A to B [14, 15]. For example, if a respondent chose Option A for an interest rate from -10% to 10% and then shifts to Option B for a rate from 40% to 5000%, his/her time discount rate was calculated as 25%—the mean of 10% and 40%. Responses that went back and forth between Option A and Option B and those with a negative discount rate were excluded from the analysis. We analyzed two types of discount rates. DR1 is a discount rate for today versus seven days and DR2 is a discount rate for 90 days versus 97 days.

## 2-4 Descriptive statistics

Table 2 shows the descriptive statistics of the variables used for estimation. The sample size is 1623. The mean discount rate of DR1 is 392.9174 – the mean value for where there was a shift

Table1-1 Questions about time preference (DR1: today vs. 7days)

Let's assume you have **two options** to receive some money. You may choose Option A, to receive ¥10,000 **today**; or Option B, to receive a different amount **in 7 days**. Compare the **amounts** and **timing** in Option A with B and indicate which you would prefer to receive for each of the 9 choices.

| Option A (receive today) | Option B (receive in 7 days) | annual interest rate(%) |
|---|---|---|
| 10000 | 9980 | -10 |
| 10000 | 10000 | 0 |
| 10000 | 10019 | 10 |
| 10000 | 10076 | 40 |
| 10000 | 10191 | 100 |
| 10000 | 10383 | 200 |
| 10000 | 10575 | 300 |
| 10000 | 11917 | 1000 |
| 10000 | 19589 | 5000 |

Table1-2 Questions about time preference (DR2: 90days vs. 97days)

Let's assume you have **two options** to receive ¥10,000 **ninety days from today** or receive different amount **in ninety-seven days from today**. Compare the **amounts** and **timing** in Option A with B and indicate which you would prefer to receive for each of the 9 choices.

| Option A (receiving in 90 days) | Option B (receiving in 97 days) | annual interest rate(%) |
|---|---|---|
| 10000 | 9980 | -10 |
| 10000 | 10000 | 0 |
| 10000 | 10019 | 10 |
| 10000 | 10076 | 40 |
| 10000 | 10191 | 100 |
| 10000 | 10383 | 200 |
| 10000 | 10575 | 300 |
| 10000 | 11917 | 1000 |
| 10000 | 19589 | 5000 |

in preference. The unit of income and household financial assets is 10 thousand yen. The mean income is about 6.7 million yen and the mean of household financial assets is 17.5 million yen. Borrowing is a binary variable, with about 38% of people having some debt. This debt includes everything, such as a mortgage or a car loan. About 9% of the respondents had been hospitalized in the previous year. Respondents were evenly divided between males and females and were from 50 to 77 years old, with an average of approximately 60 years old. The largest household size was 9, while the average was 3.21. About 15% were self-employed, 31.6% were regular employees, 16.3% were part-time workers, 15.8% housewives, and 12% were unemployed. 23.1% of respondents had a college degree or higher, 55.5% were living with their parents, 37.8% had received an inheritance from their parents, and about 18.7% had partners who inherited from their parents. The average number of children was two, and their average age was 27.8, indicating that their children are adults and have jobs.

Table2 Descriptive statistics table

| | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| time discount rate 1 (DR1: today vs. 7days) | 1623 | 392.9174 | 707.5171 | 5 | 3000 |
| time discount rate 2 (DR2: 90days vs. 97days) | 1657 | 467.4019 | 826.7662 | 5 | 3000 |
| income | 1623 | 667.0364 | 403.4503 | 100 | 2000 |
| Financial assets | 1623 | 1749.384 | 2018.282 | 250 | 10000 |
| Borrowing | 1623 | 0.383857 | 0.486474 | 0 | 1 |
| hospital | 1623 | 0.090573 | 0.287089 | 0 | 1 |
| HealthAnxiety | 1623 | 3.311152 | 0.996253 | 1 | 5 |
| male | 1623 | 0.503389 | 0.500143 | 0 | 1 |
| age | 1623 | 60.8817 | 6.782298 | 50 | 77 |
| household size | 1623 | 3.214418 | 1.367985 | 1 | 9 |
| self employed | 1623 | 0.150955 | 0.358115 | 0 | 1 |
| fulltime | 1623 | 0.316698 | 0.465332 | 0 | 1 |
| parttime | 1623 | 0.163278 | 0.369733 | 0 | 1 |
| housewife | 1623 | 0.158349 | 0.36518 | 0 | 1 |
| umemployed | 1623 | 0.119532 | 0.324513 | 0 | 1 |
| College graduate | 1623 | 0.231054 | 0.421637 | 0 | 1 |
| Living with parents | 1623 | 0.555145 | 0.497103 | 0 | 1 |
| Inheritance from parents (partner) | 1623 | 0.377696 | 0.48496 | 0 | 1 |
| Inheritance from parents | 1623 | 0.187308 | 0.390278 | 0 | 1 |
| number of children | 1623 | 2.178065 | 0.709083 | 1 | 6 |
| age of children | 1623 | 27.8053 | 8.8536 | 1 | 52 |

## 3. Estimation results

In this study, estimates were made using two types of time discounts. DR1 used in Table 3-1 is the discount rate derived from Table 1-1. This represents the time preference for the "today or 7 days later" choice. DR2 used in Table 3-2 represents the time preference for the "90 days or 97 days" choice. The difference between the two types of discount rates relates to how time-value changes as the impact of a choice is moved further into the future. DR1 is the selection at a point relatively close to the present, while DR2 is the selection at a point relatively far from the present. We investigate particularly how these parameters affect the choice of not leaving an inheritance (Bequest = 2).

In this multinomial logit model, we derived coefficients based on Bequest=0 (to leave an inheritance to my children no matter what or by having a strategic motive). Tables 3-1 and 3-2

show the marginal effects of each option.

3-1 Estimation results: DR1 (today vs. 7days)

(1) Bequest=0

First, the estimation result using DR1 is confirmed in Table 3-1. Respondents who make this choice are planning to leave an inheritance to their children no matter what. According to the estimation results, the discount rate is insignificant. Other variables, including income, financial assets, male gender, self-employment, part-time employment, and inheritance experiences from parents, are all significant. Respondents with higher incomes show an increased probability of planning to leave an inheritance no matter what, and the higher the financial assets of the household, the more likely they are to leave an inheritance. Men were more likely to be willing to leave an inheritance than women. Self-employed workers are more likely to leave an inheritance to their children, and those who inherited from their parents are more likely to plan to leave an inheritance to their children.

(2) Bequest=1

Respondents who make this choice is planning to leave by "strategic motive or whatever is left over." According to the estimation results, the time discount rate is insignificant. Income and financial assets are significant as in (1) and have a positive effect. Furthermore, borrowing, health anxiety, gender, household size, and college degree are significant. Contrary to income and financial assets, borrowing has a negative effect on leaving an inheritance. Anxiety about health also has a negative effect, reducing the willingness to leave an inheritance if he/ she is concerned about his/her future health. Unlike (1), women were more likely to make this choice than men. As well, the higher the respondent's educational background, the more likely they were to choose to leave an inheritance.

(3) Bequest=2

Respondents who made this choice "do not plan to leave their inheritance to their children". Discount rates here showed a small but significant and positive effect. Those who have large discount rates, and are active in their current utility, are more likely to not be willing to leave their children an inheritance. Income, financial assets, borrowing, the experience of a visit to a hospital, anxiety of health, part-time employment, college graduation, inheritance from parents, and number of children are all significant. People with higher incomes are less likely to choose not to leave an inheritance to their children. This result is consistent with the result of (1) because people with higher incomes can leave an inheritance. In addition, the higher the financial asset, the lower the probability of choosing to leave no inheritance. Those with higher debt were more likely to

not to leave an inheritance, as were those who had been hospitalized in the last 1 year and those with concerns about their health. Moreover, compared to regular employees, part-time workers are were likely to not leave an inheritance. College graduation decreased the probability of planning not to leave and inheritance, in other words, those with higher educational levels are more likely to leave an inheritance, consistent with (2). Respondents who received an inheritance from their parents were less likely to plan not to leave an inheritance. Thus, inheritance from the parent leads to the willingness to leave an inheritance for their children. Finally, the greater the number of children, the higher the probability of not leaving and inheritance. This is explained by the financial assets left for each child decreasing as the number of children increases.

### 3-2 Estimation results: DR2 (90days vs. 97days)

The estimation results using DR2 are presented in Table 3-2.

#### (1) Bequest = 0

The discount rate (DD2) is significant and has a negative effect. This result indicates that the higher the time discount rate, the lower the probability of leaving an inheritance. It is conceivable that the higher the time discount rate is, the more positive the current utility is, and the lower the probability of leaving an inheritance.

Similar to the result of DR1, income, financial assets, gender, self-employment, and inheritance from parents are significant.

#### (2) Bequest = 1

The discount rate is not significant for bequest=1. Income, financial assets, and college graduation have a positive effect, while debt, health anxiety, male gender, and household size have a negative effect.

#### (3) Bequest = 2

In this case, the discount rate is significant and had a positive effect. This is consistent with DR1. In other words, the higher the time discount rate, the higher the probability of not leaving an inheritance to their children. Borrowing, health anxiety and number of children have a positive effect, while income, financial assets, male gender, college graduation, and inheritance from parents have a negative effect.

Table3-1　Estimation results of multinomial logit model　(today vs. 7days)

| | (1) Bequest=0 | (2) Bequest=1 | (3) Bequest=2 |
|---|---|---|---|
| time discount rate (today vs. 7days) | -2.50e-05 | 3.00e-06 | 2.20e-05** |
| | (1.70e-05) | (1.73e-05) | (1.09e-05) |
| income | 7.55e-05** | 0.000129*** | -0.000205*** |
| | (2.99e-05) | (3.86e-05) | (3.77e-05) |
| Financial assets | 4.24e-05*** | 4.22e-05*** | -8.46e-05*** |
| | (6.44e-06) | (1.20e-05) | (1.53e-05) |
| Borrowing | -0.00867 | -0.0612** | 0.0699*** |
| | (0.0246) | (0.0278) | (0.0210) |
| hospital | -0.0516 | -0.00868 | 0.0603** |
| | (0.0383) | (0.0419) | (0.0305) |
| Health anxiety | 0.00737 | -0.0351*** | 0.0277*** |
| | (0.0109) | (0.0122) | (0.00934) |
| male | 0.0930*** | -0.0604** | -0.0326 |
| | (0.0254) | (0.0293) | (0.0219) |
| age | -0.00259 | 0.00291 | -0.000319 |
| | (0.00303) | (0.00337) | (0.00261) |
| household | 0.00698 | -0.0179* | 0.0110 |
| | (0.0103) | (0.0108) | (0.00784) |
| Self-employed | 0.0598** | -0.0325 | -0.0274 |
| | (0.0303) | (0.0370) | (0.0301) |
| Part time | -0.0648* | 0.00260 | 0.0622** |
| | (0.0342) | (0.0373) | (0.0247) |
| housewife | -0.0291 | 0.0331 | -0.00394 |
| | (0.0363) | (0.0403) | (0.0304) |
| unemployed | -0.0338 | -0.00868 | 0.0425 |
| | (0.0373) | (0.0415) | (0.0317) |
| College graduate | -0.00578 | 0.0835*** | -0.0777*** |
| | (0.0257) | (0.0322) | (0.0277) |
| Living with parents | 0.0318 | -0.0315 | -0.000314 |
| | (0.0265) | (0.0291) | (0.0221) |
| Inheritance from parents | 0.0371* | 0.00992 | -0.0470** |
| | (0.0215) | (0.0253) | (0.0197) |
| Inheritance from parents (partner) | 0.0250 | 0.00843 | -0.0334 |
| | (0.0270) | (0.0310) | (0.0257) |
| number of children | -0.0231 | -0.00532 | 0.0284** |
| | (0.0170) | (0.0180) | (0.0126) |
| age of children | 0.00245 | -0.00138 | -0.00107 |
| | (0.00224) | (0.00253) | (0.00199) |
| Observations | | 1,623 | |
| Log pseudolikelihood | | -1442.647 | |

Standard errors in parentheses.　*** p<0.01, ** p<0.05, * p<0.1

Table3-2　Estimation results of multinomial logit model (90days vs. 97days)

| | (1) Bequest=0 | (2) Bequest=1 | (3) Bequest=2 |
|---|---|---|---|
| time discount rate (90days vs. 97days) | -2.83e-05** | -9.05e-08 | 2.84e-05*** |
| | (1.42e-05) | (1.47e-05) | (9.64e-06) |
| income | 8.61e-05*** | 0.000119*** | -0.000205*** |
| | (2.92e-05) | (3.83e-05) | (3.80e-05) |
| Financial assets | 4.46e-05*** | 4.46e-05*** | -8.92e-05*** |
| | (6.32e-06) | (1.17e-05) | (1.48e-05) |
| Borrowing | -0.00196 | -0.0580** | 0.0599*** |
| | (0.0244) | (0.0275) | (0.0209) |
| hospital | -0.0333 | -0.0162 | 0.0495 |
| | (0.0377) | (0.0417) | (0.0311) |
| Health anxiety | 0.00604 | -0.0306** | 0.0246*** |
| | (0.0108) | (0.0122) | (0.00939) |
| male | 0.0905*** | -0.0498* | -0.0407* |
| | (0.0249) | (0.0289) | (0.0216) |
| age | -0.000951 | 0.00191 | -0.000958 |
| | (0.00293) | (0.00333) | (0.00260) |
| household | 0.0110 | -0.0202* | 0.00930 |
| | (0.0101) | (0.0107) | (0.00781) |
| Self-employed | 0.0762*** | -0.0526 | -0.0236 |
| | (0.0294) | (0.0360) | (0.0289) |
| Part time | -0.0548 | 0.00256 | 0.0522** |
| | (0.0336) | (0.0367) | (0.0245) |
| housewife | -0.0276 | 0.0440 | -0.0164 |
| | (0.0358) | (0.0401) | (0.0309) |
| unemployed | -0.0364 | -0.00855 | 0.0450 |
| | (0.0369) | (0.0408) | (0.0317) |
| College graduate | -0.00383 | 0.0913*** | -0.0875*** |
| | (0.0252) | (0.0316) | (0.0277) |
| Living with children | 0.0372 | -0.0348 | -0.00238 |
| | (0.0261) | (0.0287) | (0.0221) |
| Inheritance from parents | 0.0485** | -0.00499 | -0.0435** |
| | (0.0211) | (0.0250) | (0.0195) |
| Inheritance from parents (partner) | 0.0183 | 0.0157 | -0.0340 |
| | (0.0270) | (0.0310) | (0.0258) |
| number of children | -0.0181 | -0.00513 | 0.0232* |
| | (0.0165) | (0.0176) | (0.0125) |
| age of children | 0.00190 | -0.00130 | -0.000603 |
| | (0.00218) | (0.00249) | (0.00196) |
| Observations | | 1,657 | |
| Log pseudolikelihood | | -1469.2526 | |

Robust standard errors in parentheses.　*** p<0.01, ** p<0.05, * p<0.1

## Table3-3 Estimation results of logit model

|  | (1) | (2) |
|---|---|---|
|  | bequest | |
| time discount rate (today vs. 7days) | -2.19e-05** | |
|  | (1.09e-05) | |
| time discount rate (90days vs. 97days) | | -2.84e-05*** |
|  | | (9.64e-06) |
| income | 0.000205*** | 0.000206*** |
|  | (3.76e-05) | (3.80e-05) |
| Financial assets | 8.46e-05*** | 8.94e-05*** |
|  | (1.53e-05) | (1.48e-05) |
| Borrowing | -0.0698*** | -0.0599*** |
|  | (0.0209) | (0.0209) |
| hospital | -0.0602** | -0.0494 |
|  | (0.0304) | (0.0310) |
| Health anxiety | -0.0276*** | -0.0245*** |
|  | (0.00934) | (0.00939) |
| male | 0.0330 | 0.0412* |
|  | (0.0220) | (0.0217) |
| age | 0.000368 | 0.000992 |
|  | (0.00261) | (0.00260) |
| household | -0.0108 | -0.00909 |
|  | (0.00785) | (0.00783) |
| Self employed | 0.0292 | 0.0266 |
|  | (0.0300) | (0.0288) |
| Part time | -0.0615** | -0.0516** |
|  | (0.0247) | (0.0245) |
| housewife | 0.00505 | 0.0180 |
|  | (0.0304) | (0.0309) |
| unemployed | -0.0429 | -0.0451 |
|  | (0.0317) | (0.0317) |
| College graduate | 0.0771*** | 0.0866*** |
|  | (0.0277) | (0.0277) |
| Living with children | -0.000410 | 0.00158 |
|  | (0.0221) | (0.0222) |
| Inheritance from parents | 0.0473** | 0.0442** |
|  | (0.0197) | (0.0195) |
| Inheritance from parents (partner) | 0.0331 | 0.0334 |
|  | (0.0257) | (0.0258) |
| number of children | -0.0285** | -0.0234* |
|  | (0.0126) | (0.0125) |
| age of children | 0.00102 | 0.000569 |
|  | (0.00199) | (0.00196) |
| Observations | 1,623 | 1,657 |
| Log pseudolikelihood | -662.76743 | -675.09828 |

Robust standard errors in parentheses.    *** p<0.01, ** p<0.05, * p<0.1

3-3 Robustness check

To confirm the above results, the robustness was checked using a binomial logit model (see Table 3-3). Answers to the question "How do you feel about leaving an inheritance to your children?", we expressed as a binary. Answers were coded as 1 when respondents chose (1), (2), (3), (4) or (5) and take 0 when they chose (6), (7) or (8). In Table4, (1) shows estimation results using DR1, and (2) shows estimation results using DR2.

(1) DR1: today vs. 7days

As a result of the estimation using DR1, the discount rate has a negative effect. The significance is small, however, it is consistent with the results in Tables 3-1 and 3-2, since the higher the discount rate and the more aggressive the current utility, the lower the probability of leaving an inheritance. Income, financial assets, college graduation, and inheritance from parents have a positive effect. On the other hand, borrowing, hospitalization, health anxiety, part-time employment, and the number of children have negative effects.

(2) DR2: 90days vs. 97days

As a result of the estimation using DR2, the discount rate has a significant, negative effect. Income, financial assets, male gender, college graduation, and inheritance from parents have a positive effect, and unlike (1), male gender is significant. On the other hand, borrowing, health anxiety, part-time employment, and number of children have negative effects as in (1).

As described above, as a result of checking robustness according to (1) and (2), it is confirmed that both DR1 and DR2 have an effect of increasing the probability of planning not to leave an inheritance and corresponded to results by using multinomial logit model in Table 3-1 and 3-2.

4. Conclusion

In this study, we examined the effect of time discounts on bequest behavior. If the discount rate is high, there is a possibility of not leaving a legacy because it puts a large weight on the utility derived from current consumption. Therefore, we made an estimation using the multinomial logit model for three discrete options: "plan to leave absolutely", " plan to leave if strategic or available" and "plan not to leave." As a result, it became clear that people with a high discount rate would be more likely to choose "plan not to leave." This is a meaningful result not only for bequest behavior but also for consumption and saving.

Two issues should be considered in future studies. First, in this research, we used two types

of time discount rates, DR1 and DR2. DR1 is a time preference for a period closer to the present, and DR2 is a time preference for a period farther from the present. Empirical studies have reported that for periods further from the present, there is a lower discount rate. The questions for eliciting time preference in our research are on a monetary choice, but the bequest choice is largely related to preliminary savings resulting from issues such as health anxiety and illness. Therefore, it is more ideal to examine by using the time preference for health.

Another issue for future research is how to classify decisions about leaving an inheritance. In this study, responses about a bequest were divided into three possibilities, and estimation performed using a multinomial logit model. However, it is more appropriate to treat only questions in which one's consumption or future utility influences bequest selection, where time preference can have a significant effect. In the current study, a response that indicates financial problems was necessarily combined with a response that considers children's working motivation. This does not isolate choices regarding the respondent's utility, something that future studies should consider.

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