ESRI Discussion Paper Series No.393

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June 2024

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June, 2024

Abstract

This study examines the effect of inheritance receipt on labor supply, exploring empirical issues associated with inheritance expectations, informal caregiving, and liquidity constraints. Using a dataset on Japanese women, we find that inheritance from respondents' parent decreases labor supply, mainly due to changes in the extensive margin. Notably, respondents in their 50s and those under 40 with children experience a more pronounced effect. The labor supply reduction is replaced with an increase in time spent on domestic work and personal maintenance. Unlike labor supply, household expenditures hardly change after an inheritance. Furthermore, the results reveal that unanticipated inheritances are more likely to reduce the post-inheritance labor supply than anticipated ones and that ignoring the labor supply increase associated with the end of caregiving leads to an underestimation of the reduction in labor supply after inheritance. Finally, the change in labor supply does not depend on respondents' pre-inheritance liquidity constraints.

JEL classification codes: E24, H31, J22
Keywords: labor supply; inheritances; wealth effect; Japan

Acknowledgements

We thank Yoko Niimi, Haruko Noguchi, Jongsang Park, Saki Sugano for their useful comments and suggestions on an earlier draft of this paper. We also thank Taiyo Fukai, Kazuhito Higa, Masahiro Hori, Koichiro Iwamoto, Keiko Murata, Takeshi Niizeki, Yoshitomo Ogawa, Fumihiko Suga, as well as seminar participants at Hosei University, Seijo University, and other online workshops for their comments and support. We are grateful to the Panel Data Research Center at Keio University for providing the microdata from the Japanese Panel Survey of Consumers. A special thanks goes to Ralph Paprzycki for his excellent English editing service. This work is supported by JSPS KAKENHI Grant Numbers 20K01731 (Hamaaki and Ibuka), 19K01703, and 20H01513 (Hamaaki). The views expressed in this paper are personal and do not represent those of any of the institutions with which we are affiliated.

1. Introduction

In a country like Japan with a declining fertility rate, intergenerational asset transfers have become important in recipients' asset holdings. Such transfers potentially lead recipients to reduce their labor supply. Thus, the issue of recipients' labor supply response has recently garnered attention, particularly from the perspective of tax policy (Kopczuk, 2013; Kindermann et al., 2020; Nekoei and Seim, 2022). Assuming that leisure is a normal good, inheritance receipt is expected to decrease labor supply. Suppose now that we consider the effect of an increase in inheritance taxes. The increase in inheritance taxes will reduce the size of post-tax inheritances and hence reduce the decline in labor supply. This would have an additional positive impact on income tax revenues. Such fiscal externalities, i.e., the impact on different types of tax revenues caused by taxpayers' labor supply response, should be taken into account when devising the inheritance tax system.

Against this background, some studies have estimated the impact of the wealth shock of receiving an inheritance on labor supply. Existing studies have addressed two related empirical issues to obtain unbiased estimates of this impact: individuals' inheritance expectations (Joulfaian and Wilhelm, 1994; Brown et al., 2010; Doorley and Pestel, 2020) and liquidity constraints (Brown et al., 2010; Doorley and Pestel, 2020). Ignoring the two factors leads to biased estimates. Specifically, ignoring inheritance expectations leads to an underestimation of the labor supply reduction following the inheritance, since individuals would likely reduce their labor supply as soon as the expectation is formed. In contrast, ignoring liquidity constraints would result in an overestimation of the decrease in labor supply among those who anticipated the inheritance. Those who prefer not to work but have to work due to liquidity constraints would adjust their labor supply immediately upon inheritance. This is because they are unable to smooth their labor supply intertemporally due to the lack of liquid assets. This implies that the post-inheritance labor supply response of individuals expecting an inheritance is much like that of those not expecting an inheritance due to liquidity constraints.

Moreover, informal caregiving for parents is an important but neglected factor in the existing literature. Caregiving might induce a correlation between heirs' labor supply and the inheritance receipt in two distinct manners. First, those hoping to receive an inheritance so that they can reduce their labor supply are more likely to provide informal care to their parents. In this case, the wealth effect of inheritance receipt is overestimated because caregiving is a confounder in the association between labor supply and inheritance receipt (or the size of the inheritance). Second, caregiving may also lead to an underestimation of the wealth effect of inheritance if we do not consider the possibility that inheritance recipients who provided care to their parents start to participate in the labor market after the parent's death. Since women are more likely to be caregivers than men in many countries, including Japan, we use a dataset on women in our empirical analyses.

The present study contributes to the literature by estimating the impact of the wealth shock of receiving an inheritance on labor supply taking advantage of Japanese survey data that tracks three

key variables, namely, the dynamics of inheritance expectations, liquidity constraints, and informal caregiving by respondents. To the best of our knowledge, this is the first study in this literature to estimate the wealth effect of inheritance incorporating the impact of caregiving for parents. The survey has collected information on these three aspects in the same format on an annual basis. Unlike surveys used in previous studies, the survey records changes in these variables around the time of inheritance receipt and makes it possible to separate the labor supply impact of receiving an inheritance from that of expectations, liquidity constraints, and informal care.

Furthermore, for two of these three variables, the survey data provides advantages in the measurement of the variables. Specifically, our dataset records inheritance expectations every year, so that we can use information on expectations immediately before the inheritance. Most previous studies use expectations in a particular year long before the year of inheritance.[1] This measurement error may lead to an underestimation of the difference in the labor response of recipients expecting and not expecting an inheritance.

Another important variable is liquidity constraints. While most studies use the amount of assets held by respondents or households as a proxy for such constraints, this does not represent liquidity constraints in a strict sense. From a theoretical perspective, whether an individual is liquidity-constrained should be represented by a (dummy) variable capturing that an individual (or household) would like to borrow money but is prevented by market imperfections from doing so. In practice, however, the proxies used in previous studies simply assume that liquidity-constrained individuals/households were those owning a relatively small amount of assets.[2] By contrast, the survey we use directly measures whether an individual/household is liquidity-constrained. Specifically, we used survey respondents' answer to questions assessing whether they had a loan application declined or gave up applying for a loan before submitting it.

A further advantage of using the key variables is that they help to elucidate the reasons for the heterogeneity in the labor supply response to inheritance receipt - an important empirical issue in the recent literature. For instance, examining the role of inheritance expectation and liquidity constraints sheds light on why the labor supply response differs by age, given that younger individuals are less likely to expect inheritance and more likely to be liquidity-constrained.

Although this paper primarily focuses on the labor supply response, we supplementarily explore the post-inheritance changes in other variables like time use, household expenditure, and heirs' asset holdings. It is important to understand whether the post-inheritance reduction in hours worked

[1] For instance, the Panel Study of Income Dynamics (PSID) used by Joulfaian and Wilhelm (1994) and the German Socio-Economic Panel Study (SOEP) used by Doorley and Pestel (2020) only provide inheritance expectations over the next ten years as of 1984 and future expectations as of 2001, respectively.

[2] As discussed by Brown et al. (2010), households that expect a large inheritance may rely on the inheritance to increase their pre-inheritance consumption to smooth out their marginal utility from consumption. This would reduce their pre-inheritance asset holdings, i.e., a proxy for liquidity constraints, and a correlation between the size of inheritances and liquidity constraints may emerge.

goes to childcare or to time for heirs' own activities such as sleeping and personal care. This has policy implications for the design of inheritance tax systems. Specifically, the need to consider such externalities depends on understanding how the heir's time utilization changes after inheritance.

Moreover, if most heirs tend to deplete their inherited assets through a decrease in labor supply and an increase in expenditure, the impact on wealth inequality of the windfall would disappear shortly after receiving an inheritance. While there are studies on Scandinavian countries focusing on these behavioral responses to examine the impact of inheritance on wealth inequality (Elinder et al., 2018; Nekoei and Seim, 2022 for Sweden; Boserup et al., 2016 for Denmark), the present study is the first to examine the responses of both labor supply and household expenditure using data for an Asian country.

Our empirical analysis begins with an examination of recipients' asset profiles and shows a sharp increase in recipients' asset holdings only in the year of the inheritance. This suggests that recipients did not receive other asset transfers in the years preceding the inheritance. We then find that respondents tend to reduce their working hours mainly as a result of leaving the labor market after receiving an inheritance. Looking at the heterogeneity in the effect by recipients' age and whether they have children, we find a reduction in labor supply especially for respondents in their 50s, particularly those without children, and those aged under 40 with children. Furthermore, we find that the larger the inheritance, the greater is the likelihood of individuals decreasing their labor supply. This is consistent with the assumption that a larger positive wealth/permanent income shock leads to a greater reduction in labor supply. Examining post-inheritance changes also shows that the decrease in labor supply leads to an increase in time spent on education, leisure, and personal maintenance (on weekdays), and housework and childcare (on weekends/holidays), although household expenditure hardly changes after the receipt of an inheritance.

We also find that failing to distinguish the wealth effect of inheritance from the impact of the end of informal caregiving would lead to an underestimation of the wealth effect. Moreover, while the reduction in labor supply is more pronounced among respondents who did not expect the inheritance, liquidity constraints do not appear to play a significant role in the magnitude of the labor supply reduction. Hence, our results suggest that liquidity constraints are not the primary factor contributing to the heterogeneity in the impact of inheritance receipt.

The remainder of this study is organized as follows. Section 2 explains the estimation results obtained in previous studies. Section 3 provides a description of the data we used for our analysis and the definitions of the variables, while Section 4 presents our estimation model. Next, Section 5 presents our baseline estimation results, while Section 6 presents the estimations taking the role of inheritance expectations, liquidity constraints, and informal caregiving into account. Finally, Section 7 provides concluding remarks.

2. Estimation results of previous studies

The analysis of the impact of inheritance on labor supply was initially limited to studies for the United States. The pioneering studies in this field are by Holtz-Eakin et al. (1993) and Joulfaian and Wilhelm (1994). The former, using U.S. tax returns data, found that those who received a large inheritance were more likely to quit their job than those who received a small inheritance. The latter, using both survey data and tax returns, found only a moderate decline in labor supply after inheritance.

Subsequent studies have highlighted that the wealth effect of inheritance in the earlier studies was likely underestimated because inheritance expectations were not taken into account. Brown et al. (2010) and Doorley and Pestel (2020) considered inheritance expectations to respectively examine the impact of inheritance on the probability of retirement and hours worked. Both studies found that an unanticipated inheritance was more strongly associated with a post-inheritance decline in labor supply than an anticipated one. In addition to the effect of inheritance expectations, Brown et al. (2010) and Doorley and Pestel (2020) examined whether the response of post-inheritance labor supply differs when workers are liquidity-constrained. While Brown et al. (2010) failed to find a significant difference in the probability of retirement, Doorley and Pestel (2020) found that the labor supply of liquidity-constrained women was more responsive to inheritance receipt.

Recent studies show that labor supply responses differ by heirs' characteristics, such as age and gender. For example, Bø et al. (2019) found that the effect of inheritance on labor supply was larger when heirs are younger (21–42 years old) or closer to retirement (56–60 years old), and when they did not have anyone to bequeath to. A similar result was obtained by Doorley and Pestel (2020), who found that the decrease in labor supply after inheritance was larger for those without children. Splitting their sample by heirs' age into those aged 50–59 and 21–49, Elinder et al. (2012) found a significant decrease in post-inheritance labor income only for the older group. In addition, previous studies have repeatedly found significant wealth effects on female labor supply but not on men (e.g., Bø et al., 2019; Doorley and Pestel, 2020).

Some recent studies have extended the analysis to other European countries. Eder (2016) used data from the 2004–2012 Survey of Health, Ageing and Retirement in Europe to estimate the impact of inheritances as well as *inter vivos* gift receipts on the probability of retirement and found that receiving a transfer increases the likelihood of retirement. By contrast, subsequent studies by Suari-Andreu (2018) and Tur-Sinai et al. (2022) failed to find any significant effects on retirement using data up to more recent years. Moreover, Malo and Sciulli (2021) used the Household Finance and Consumption Survey for 14 European countries to analyze the effect of inheritance on the labor supply of the working-age population and failed to find a significant impact.

In Japan, the only studies to have estimated the impact of inheritance on labor supply are those by Sugano and Matsuyama (2017) and Niizeki and Hori (2019). Using the Japanese Study of Aging and Retirement, the former showed that inheritance receipt significantly increases the

probability of retirement for middle-aged and elderly workers. The latter study, based on original survey data, found that inheritance significantly reduced women's probability of working. Both studies also indicated that unanticipated inheritances were associated with a larger decline in labor supply than anticipated ones. These existing studies, however, examined only the effect on the extensive margin, i.e., whether people continued to work after receiving an inheritance. In contrast, in our study, we use both a binary variable that indicates whether a respondent stopped working and various continuous measures of labor supply, including the number of hours and days worked. Furthermore, examining the effect on other margins, such as time use and household expenditures, and accounting for liquidity constraints are the first attempts in the Japanese literature.

Finally, we summarize the results of previous studies on the impact of inheritance on time use and expenditure. The only study to estimate the impact of inheritance receipt on time use is that by Doorley and Pestel (2020). They focus on the following three types of time use (other than market work): (i) domestic work, (ii) education, and (iii) leisure. They did not find any significant change in time use after individuals received an inheritance except for one outcome variable, namely, increase in domestic work for men. As for the inheritance effect on expenditure, Joulfaian and Wilhelm (1994) and Nekoei and Seim (2022), using data for the United States and Sweden respectively, found a significant increase in expenditure immediately after the receipt of an inheritance, while Suari-Andreu (2018) did not find any significant effects of transfer from parents on food consumption. For Japan, Sugano (2019), the only study examining the impact on expenditure, found a significant increase in expenditure on durables after an inheritance.

3. Data

3.1 Japanese Panel Survey of Consumers (JPSC)

We use the longitudinal data of the Japanese Panel Survey of Consumers (JPSC) conducted by the Panel Data Research Center (PDRC) at Keio University until 2021. The survey focused only on women and commenced in 1993 with 1,500 individuals aged 24–34. Several hundred individuals aged 24–29 were added every five years. Each panel traced the same individuals on a yearly basis, recording their consumption and saving, as well as individual demographic variables. Survey participants were chosen based on nationwide stratified two-stage random sampling.[3] The survey was implemented in October each year.

In addition to providing information on the three key variables mentioned earlier, the JPSC has the following advantages over the data used in previous studies. First, while the Health and Retirement Study, the German Socio-Economic Panel, and the Panel Study of Income Dynamics ask about inheritances at the household level, the JPSC provides information on the inheritance amount

[3] Sampling for the JPSC was conducted so that the distribution of respondents mirrors that of Japan's female population based on the Population Census in terms of the area where they reside, their age structure, and their marital status.

received at the individual level. Knowing who actually received an inheritance is important because the collective model implies that it is necessary to look at the impact of inheritance on the labor supply of the heirs themselves.[4] Second, the JSPC also provides data on financial assets at the individual level, making it possible to examine the extent to which the heirs' asset holdings increased in the inheritance year and whether they faced any other substantial changes in their asset holdings due to the receipt of inter vivos transfers prior to the death of their parent. Third, the JPSC consists of long-term panel data, making it possible to estimate changes in individuals' labor supply from a relatively long-term perspective. Fourth and finally, the JPSC includes a range of information to measure individuals' labor supply, including whether they are working, how many hours they work (on weekdays and on weekends/holidays), the number of working days per year, and their labor income.

3.2 Definitions of variables

We start by explaining the definitions of variables related to inheritance receipt. Although the JPSC did not collect information on inheritances in all years, starting with the 11th wave in 2003, the survey has consistently contained a set of questions asking whether respondents had received an inheritance from their own parent(s) during the past year and the amount received (see Appendix A.1 for more information on the questionnaire on inheritance receipts). Next, we construct an unbalanced panel for 13 years (a maximum of six years before and after the year of an inheritance) consisting of respondents who lost only one parent during the period from 2003 to 2019 because we cannot distinguish the effects of two inheritances when they occur in a short period of time.[5][6] For the analysis, we deflated inheritances, income, asset variables, and household expenditure by the consumer price index (CPI).

We use the following five variables as measures of the labor supply of individuals who received an inheritance: (1) hours worked per day, (2) hours worked per week, (3) days worked in the

[4] The collective model suggests that the intra-household allocation of resources is decided through bargaining among household members and members' bargaining power depends on their available resources. The findings of Lise and Yamada (2019), based on the JPSC, indicate that the collective model holds for Japanese households.

[5] The sample consists entirely of individuals who received a primary inheritance from their parent, except for 7 individuals.

[6] According to the Japanese statutory division stipulated by the civil law of primary inheritances (i.e., inheritances where one of the parents has died and the other one is still alive), which is the main subject of our analysis, the statutory share of a surviving spouse is one-half of the inherited assets, and the rest of the inheritance is equally divided between children. Unlike countries such as the United States and the United Kingdom, where testamentary freedom is stipulated and decedents can disinherit their children, Japanese civil law does not allow the exclusion of any of the children from the list of heirs without their approval.

In practice, however, since it is possible for heirs to deviate from the statutory division through negotiation among heirs, we need to take this into account in our analysis. As highlighted in Hamaaki et al.'s (2019) empirical analysis of the division of bequests in Japan, surviving spouses tend to give part of their statutory inheritance share to their children, which contrasts with Western countries, where the surviving spouse tends to receive most or all of the inheritance. Moreover, while statutory shares are generally regarded as the benchmark in the division of bequests in Japan, in primary inheritances, around 70 to 80 percent of bequests are divided in a way that differs from the statutory equal division among children (see figure 1 in Hamaaki et al., 2019). This suggests that there is room for bequests to be distributed among children based on their characteristics and/or whether they provided informal care. Therefore, since the amount of inheritance received is not automatically fixed by the statutory division, Section 6 considers the endogeneity of the inheritance due to informal care provision and the heterogeneity of inheritance expectations.

past year, (4) participation in the labor market, and (5) labor income. The first variable is based on a question on daily time use and is defined separately for weekdays and weekends/holidays. (See Appendix A.2 for the survey questions that we used for the labor supply measures). Specifically, respondents were asked to answer the question on time use so that the total of (a) working, (b) commuting to work or school, (c) housework and childcare, (d) studies, (e) hobbies, entertainment, socializing, etc., and (f) other (such as sleeping, meals, taking a bath, and personal errands other than the above) adds up to 24 hours. We use the hours reported for (a) as hours worked, (c) as hours spent on housework and childcare, and the sum of (d), (e) and (f) as hours spent on education, leisure, and personal maintenance, respectively. As for the second and third variables, respondents working at the time of the survey were asked to choose among ten categories ranging from "less than 15 hours" to "65 hours or more" regarding their hours worked, and categories ranging from "less than 25 days" to "300 days or more" regarding their days worked during the year. We converted these categorical variables into continuous ones by replacing each category with its median.[7] The fourth variable is a binary variable that takes 1 if a respondent was working (including those temporarily on leave due to childcare, caregiving for parents, illness, etc.) or unemployed (i.e., not working but looking for a job) on the survey date and 0 otherwise (e.g., student, full-time homemaker, etc.).[8] In other words, this variable indicates whether the respondent participates in the labor market or not. The fifth variable is constructed as the sum of the annual before-tax earnings from employment and annual before-tax self-employment income.

We also used household expenditure as an outcome variable. Household expenditure is defined as the respondent's household's total monthly expenditure on living expenses during the month prior to the survey, i.e., September.[9] In our estimations, we use the equivalent expenditure values obtained by dividing household expenditure by the square root of the number of household members.

Finally, we use the following as control variables: binary variables for the five-year age group of the respondent; a binary variable for those who are married; a binary variable indicating whether the youngest child had not yet entered elementary school, and the number of children. The

[7] When converting hours worked per week and days worked per year to continuous variables, we replaced the "65 hours or more" in the former and the "300 days or more" in the latter with 65 hours and 332.5 days (=[300+365]/2), respectively.

[8] In addition to the dummy for participation in the labor market, we also estimate the inheritance effect on the following two dummy variables: (1) working full-time and (2) working part-time. These variables indicate whether a respondent was working either full-time with an indefinite-period contract or, alternatively, full-time or part-time with a definite period contract.

[9] Specifically, household expenditure includes spending on food, rent, utilities, furniture, clothing, healthcare, transportation, communication, education, culture and entertainment, social expenses, remittances to family members, and other expenses. Unfortunately, the JPSC asked about the number and value of purchases of durables (specifically, automatic dishwashers, washing machines, room air-conditioners, televisions, personal computers, cars, and mobile phones) in the preceding year only from the 19th survey onward. Because of the low frequency of respondents making such purchases in a given year, obtaining reliable estimates on the impact of inheritance on the purchase of durable goods proves challenging based on the JPSC data.

last two variables are added to control for a potential decrease in labor supply due to child-rearing. Although we do not explicitly control for households' economic strength, time-invariant economic strength (e.g., permanent income) is controlled through fixed effects because all the estimations are conducted using fixed effect models.

3.3 Descriptive statistics

Figure 1 shows the distribution and the descriptive statistics of the size of inheritances for those who received one. We find a substantial difference between the mean and median size of inheritances. Specifically, the average inheritance is 8.06 million Japanese yen (approximately 74,200 USD at the 2019 exchange rate) and the median is 3.14 million yen (approximately 29,000 USD).[10] While inheritances in terms of their size are concentrated around the median, some respondents received considerably larger inheritances. Inheritances of 5 million yen (approximately 46,000 USD) or more account for roughly 40 percent of the number of inheritances.

<Place Figure 1 here>

Table 1 presents descriptive statistics. Panel A presents descriptive statistics of respondents' characteristics in the year of inheritance, while Panels B and C show variables representing their labor supply and monthly (equivalent) household expenditure in the year before the inheritance, respectively.[11] Column (i) presents descriptive statistics for all inheritance recipients, while column (ii) shows the same for those who received an inheritance worth 5 million yen (approximately 46,000 USD) or more. The number of observations in Panel A is 118 persons, and it only shows the number of observations for the year of inheritance.[12] Our estimation in Section 5.1 is based on a sample consisting of 1,185 person-year observations, consisting of unbalanced observations covering the six years before and after the year of inheritance. Each respondent in the sample is observed at least twice, once before and once after their parent's death. Over a time window of up to 13 years, respondents are observed an average of 10 times, with a minimum of 3 times and a maximum of 13 times.

[10] The size of inheritances in the JPSC is comparable with that (for female heirs) of other survey data for Japan (e.g., Niizeki and Hori, 2019) and other countries (e.g., Joulfaian and Wilhelm, 1994, and Brown et al., 2010, for the United States and Doorley and Pestel, 2020, for Germany).

[11] The reason for using respondents' labor supply in the year before receiving the inheritance is to focus on their labor supply before any effects of the inheritance receipt.

[12] The reason why the number of observations in our sample is only 118 is that we focus on respondents that received primary inheritances during our observation period. Specifically, of the 1,500 respondents in the initial survey and the several hundred respondents added afterward, roughly 700 experienced the death of a parent during our observation period. Since we focus on primary inheritances, we restrict our sample to those who lost their first parent. Further restricting our sample to those for whom the inheritance amount, all labor supply variables, and other control variables are available, we end up with 118 respondents whose parent died with a bequest and 281 whose parent died without a bequest.

<Place Table 1 here>

Columns (i), (ii), and (iii) of panel A indicate that the average age of respondents whose parent died with and without a bequest lies between 43–46 years.[13] Turning to respondents' educational attainment, less than one-fifth of respondents had an undergraduate degree or higher. The reason for the relatively low share of university graduates is that the sample consists entirely of women born and raised at a time when attending university was not as common as today. Around 70 percent were married, they had 1.3–1.6 children on average, and the share of respondents whose youngest child had not yet entered elementary school ranges from 14 to 19 percent.[14]

Turning to panel B of Table 1 focusing on respondents' labor supply variables, comparing columns (i) and (ii) reveals no substantial differences in labor supply and time use between the two groups, except for the share of respondents participating in the labor market and their employment status (i.e., whether they are working full-time or part-time). In other words, although the sociodemographic characteristics of respondents who received a large inheritance do not differ from those receiving a smaller inheritance, they were less likely to participate in the labor market and work full-time. Comparing columns (i) and (iii) also suggests that respondents whose parents left a bequest are likely to work more than those whose parents did not.

Finally, Panel C shows the descriptive statistics of monthly household expenditure for respondents whose parent died with a bequest. The average monthly expenditure of our sample households is 266,000 yen (approximately 2,500 USD). While the average (equivalent) household expenditure in column (ii) is slightly larger than that in column (i), this difference diminishes for the median values. Thus, household expenditure in the pre-inheritance period does not appear to be correlated with the size of inheritance heirs eventually received.

We also examine whether the respondents' characteristics in our sample changed significantly before and after the death of a parent and whether the changes in characteristics, rather than inheritance receipt, led to a decline in labor supply. Table 2 presents descriptive statistics of characteristics before and after parental death for respondents whose parents died *with* a bequest (in columns (i) and (ii)) and those whose parents died *without* a bequest (in columns (iii) and (iv)),

[13] The age distributions of respondents in our analyses are displayed in Appendix Figure B. There, Cohort A consists of those included in the initial wave of the JPSC, while Cohorts B to E consist of those who were added in later waves of the survey.

[14] To examine whether the size of inheritances is associated with the number of siblings, columns (i), (ii), and (iii) of Appendix Table B present the number of siblings and the share of only daughter for "above zero inheritance recipients," "large inheritance recipients," and "zero inheritance recipients," respectively. Specifically, respondents receiving larger inheritances tend to be those with fewer siblings and those who are the only daughter. This reflects the fact that the inheritance amount per heir is larger if the inheritance is divided among fewer heirs. Moreover, respondents receiving larger inheritances tend to be those with fewer male siblings. This is consistent with the cultural tradition in Japan that men, especially the eldest son, are treated more favorably than women in the division of bequests among heirs. Our estimation is not subject to any bias due to the non-inclusion of the sibling composition as this is controlled for by respondent fixed effects.

respectively. The table also shows whether the differences in means for each variable before and after parental death are statistically significant. A significant difference can be observed in respondents' age. In addition, the share of respondents with a pre-school child significantly decreases from before to after the parental death. To control for the impact of these changes on labor supply, we added respondents' age dummies and a dummy indicating whether the youngest child had not yet entered elementary school to the estimated equation. We find no significant differences in the means for other variables.

<Place Table 2 here>

4. Estimation model

We aim to understand how receiving an inheritance affects the labor supply, time use, and expenditure of heirs. Additionally, we explore if the effect of inheritance receipt differs depending on whether individuals expect receiving an inheritance, whether they provide informal care to their parent(s), and whether they/their household is liquidity constrained. For these purposes, we employ two different types of event study analysis.

In the first type, we examine how outcome variables change after the receipt of an inheritance and compare the trajectory of these variables for those who received a greater than zero inheritance and those who received an inheritance of 5 million yen (approximately 46,000 USD) or more. We will refer to these as "above zero inheritance recipients" and "large inheritance recipients," respectively.

In the event study approach, the following specification is estimated separately for "above zero inheritance recipients" and "large inheritance recipients":

$$y_{it} = \beta_0 + \sum_{\substack{d=-6 \\ d\neq -1}}^{6} \beta_1^d \times 1\left(\Delta_{it}^I = d\right) + X_{it}'\gamma + \alpha_i + \varepsilon_{it} \qquad \text{Eq. (1)}$$

where y_{it} stands for the variables representing labor supply, time use, and household expenditure. $1\left(\Delta_{it}^I = d\right)$ is an indicator variable that takes a value of 1 when survey year t minus the year of inheritance (Δ_{it}^I) is equal to d. X_{it} is a vector of control variables, including the binary variables for the five-year age groups for respondents' age, the dummy for married respondents, the number of children, and the dummy for respondents whose youngest child has not yet entered elementary school. α_i represents individual fixed effects. ε_{it} is an error term. We set the year preceding the inheritance (i.e., $\Delta_{it}^I = -1$) as the reference year.

If the only cause of changes in individuals' behavior is the receipt of an inheritance, the estimated β_1^d should not deviate from zero in the pre-inheritance period. Meanwhile, the estimated

coefficient is expected to discontinuously become negative after inheritance receipt. Moreover, if inheritance receipt has an impact on individuals' behavior through the wealth effect (captured by the coefficients β_1^d), then the larger the inheritance that respondents receive, the larger the behavioral response after inheritance receipt should be.

In the second type, to examine whether the impact of inheritance on outcome variables differs depending on inheritance expectations, informal caregiving, or liquidity constraints, we conducted another event study analysis using the following specification:

$$\begin{aligned} y_{it} = \beta_0 &+ \beta_1[POST_{it} \times Inheritance_i \times Z_i] \\ &+ \beta_2[POST_{it} \times Inheritance_i \times (1 - Z_i)] \\ &+ X_{it}'\gamma + \alpha_i + \theta_t + \varepsilon_{it} \end{aligned} \qquad \text{Eq. (2)}$$

where $POST_{it}$ is a dummy variable that takes 1 if respondent *i* received an inheritance prior to year *t*, and $Inheritance_i$ represents the inheritance amount that respondent *i* received from her parent. We also include year fixed effects (θ_t) to control for macroeconomic conditions and other year-specific effects. Z_i is a dummy variable indicating whether a respondent expected an inheritance, a dummy variable indicating whether a respondent provided informal care to her parent(s), or a dummy variable indicating whether a respondent was liquidity-constrained. β_1 and β_2 in Eq. (2) represent the magnitude of the change in outcome variables after the inheritance for respondents with $Z_i = 1$ and $Z_i = 0$, respectively, when the inheritance amount increases by one unit (10,000 yen, i.e., approximately 92 USD).

We do not employ Eq. (1) to estimate the impact of these determinants because the inheritance amount differs substantially between respondents with $Z_i = 1$ and $Z_i = 0$. For example, the mean of inheritances received by respondents who expected to receive an inheritance (roughly 11 million yen, or approximately 101,200 USD) is about 3.7 times greater than that of inheritances received by respondents who did *not* expect to receive an inheritance (roughly 3 million yen; approximately 27,600 USD). If we estimate Eq. (1) separately for these two groups of respondents, the estimated β_1^d would reflect not only the effect of inheritance expectations but also the difference in the size of inheritances. We therefore consider the impact of an increase in one unit of the inheritance amount separately for the two groups by estimating Eq. (2) following Brown et al. (2010).

In addition to the two types of analyses, we also conducted an event study DID analysis. In this analysis, we set respondents whose parents died without a bequest as a control group (referred to as "zero inheritance recipients" hereafter) and those who received an inheritance as a treatment group. This analysis attempts to control for the effects of non-inheritance factors that occur concurrently with the timing of inheritance, such as the termination of caregiving or the loss of a parent who helps with the household. We estimate the following specification:

$$
\begin{aligned}
y_{it} = \beta_0 &+ \sum_{\substack{d=-6 \\ d\neq -1}}^{6} \beta_1^d \times 1(\Delta_{it}= d) \times Care_i \\
&+ \sum_{\substack{d=-6 \\ d\neq -1}}^{6} \beta_2^d \times 1(\Delta_{it}= d) \times Care_i \times Treat_i \\
&+ \sum_{\substack{d=-6 \\ d\neq -1}}^{6} \beta_3^d \times 1(\Delta_{it}= d) \times (1 - Care_i) \\
&+ \sum_{\substack{d=-6 \\ d\neq -1}}^{6} \beta_4^d \times 1(\Delta_{it}= d) \times (1 - Care_i) \times Treat_i \\
&+ X_{it}'\gamma + \alpha_i + \varepsilon_{it}
\end{aligned}
\qquad \text{Eq. (3)}
$$

where $1(\Delta_{it}= d)$ is an indicator variable that takes 1 when survey year t minus year of inheritance (for the treatment group) or parental death (for the control group) is equal to d. $Care_i$ is an indicator variable that takes 1 if respondent i and/or her spouse provided care to the respondent's parent(s) in the year before the inheritance. $Treat_i$ is an indicator variable that takes 1 if a respondent i is an "above zero inheritance recipient" (i.e., a member of the treatment group). We set the year preceding the inheritance or parental death (i.e., $\Delta_{it}= -1$) as the reference year. Since the control group consists of 281 respondents, as shown in column (iii) of Table 1, we have a larger sample in this estimation than in those based on Eqs. (1) and (2).

When caregiving ends with the death of a parent, respondents who were previously unable to work due to caregiving may begin to work. If this is the case, β_1^d would be estimated to be positive for ds greater than or equal to zero. β_3^d represent the change in labor supply for the respondents who did not provide care and did not receive any assets from their deceased parent. It does not reflect either the effects of caregiving or inheritance but simply reflects the effect of parental death. Thus, β_3^d would be negative if the respondent was able to work outside before the parental death because the deceased parent helped with housework and childcare. Otherwise, it equals zero. β_2^d and β_4^d represent the wealth effect of receiving an inheritance separately from the other two effects that may occur concurrently (i.e., the effects of the end of caregiving and the loss of involvement of a parent in housework and childcare).

5. Estimation results

5.1 Event study analysis for labor supply

Before discussing the effect of inheritance receipt on labor supply (and other outcome variables), we estimate respondents' asset profiles around the time of inheritance receipt and parental death for "above zero inheritance recipients," "large inheritance recipients," and "zero inheritance recipients." The JPSC asks respondents about their own financial assets (separate from their household assets),

including savings and marketable securities. Figure 2 shows respondents' asset profiles estimated based on Eq. (1) when y_{it} represents respondents' financial assets. While no discontinuous change in financial assets can be observed around the inheritance year for "zero inheritance recipients," respondents' assets increased dramatically by approximately 4 million and 9 million yen (approximately 36,800 and 82,800 USD) in the inheritance year for "above zero inheritance recipients" and "large inheritance recipients," respectively.[15] The asset profiles for these recipients do not show any other discontinuity within a few years of the inheritance receipt, suggesting that respondents did not experience any other wealth shocks during the observation period.

<Place Figure 2 here>

Turning to the impact of inheritance receipt on labor supply, we start with the impact on hours worked. In the estimation, we include zeros for those who did not work. Figures 3(a) and (b) show the estimates of β_1^d in Eq. (1) for hours worked on weekdays and weekends/holidays, respectively, together with 95 percent confidence intervals.[16] In Figure 3(a), hours worked decrease significantly following an inheritance for both "above zero inheritance recipients" and "large inheritance recipients," and the size of the decrease is larger for the latter. The decline in labor supply begins immediately after the inheritance, with the largest decline of 67.8 minutes per day in the fourth year after inheritance recorded for "large inheritance recipients." Looking at hours worked on weekends/holidays, Figure 3(b) shows a downward trend in hours worked until the fourth year after the inheritance receipt, although with one exception the coefficient estimates are not statistically significant through the observation period. Furthermore, Figure 3(a) shows that for the years leading up to inheritance receipt, none of the estimated coefficients for the two groups of inheritance recipients are significantly different from zero. We can interpret the decrease in recipients' hours worked after inheritance in Figure 3(a) as representing the wealth effect of inheritance receipt. However, one may wonder whether there are other factors that might drive such effects associated with the death of a parent. These include the loss of parental help with housework and childcare. We will explore this

[15] While Figure 1 shows that the average inheritance amount for "above zero inheritance recipients" is 8.1 million yen (approximately 74,200 USD), in Figure 2 the amount of financial assets held by respondents increases by only about 4 million yen (approximately 36,800 USD) in the year of inheritance. The main reason for this discrepancy is that Figure 2 does not consider the increase in real assets held by respondents that may form part of an inheritance. One of the survey questions asks about the form of inheritance and shows that, of the average 8.1 million yen inheritance amount, an average of 5.5 million yen are financial assets, and the remaining 2.6 million yen are real assets.

It is also worth noting that a possible reason why Figure 2 shows only a 4 million yen increase in financial assets even though respondents inherited an average of 5.5 million yen in financial assets is that respondents may have started using their inherited assets after receipt of inheritance up to survey date. Another explanation is that respondents gave part of their inherited assets to their spouses (i.e., they transferred the assets to the jointly managed account of both spouses instead of keeping them as individual assets).

[16] The estimation results, including not only the estimates of β_1^d but also the estimates of the coefficients of other control variables, are presented in Appendix Table C.1 (for "above zero inheritance recipients") and Appendix Table C.2 (for "large inheritance recipients").

possibility in detail in Section 6.3 and confirm that the loss of parental help does not drive the post-inheritance labor supply decline.

<Place Figure 3 here>

Figure 4(a) presents the results of the event study for the share of respondents participating in the labor market. Again, the coefficients obtained are small and insignificant for the pre-inheritance period. Furthermore, we find that the labor participation rate falls by up to about 10 percentage points compared to one year before the inheritance, when more than 70 percent of heirs were participating in the labor market. To examine the results for labor force participation in more detail, Figures 4(b) and (c) show the effects of inheritance receipt on the probabilities of working full-time and part-time, respectively. Although almost all the coefficients are not significant even for "large inheritance recipients," the estimation results suggest that "large inheritance recipients" are more likely to leave their part-time job after receiving an inheritance than "above zero inheritance recipients."

<Place Figure 4 here>

Finally, we compare our estimation results on labor supply with those obtained by Doorley and Pestel (2020), who used German survey data for working age adults. Their study is the study that is most directly comparable to ours in terms of the age range of the surveyed population. Moreover, their and our study use the same labor supply outcome (namely, hours worked). In their analysis, women's average inheritance is EUR 58,000 (about 6.96 million yen), leading to a reduction of 1.377 actual hours worked per week. This translates into a 0.119-minute decrease per 10,000 yen (approximately 92 USD) inherited (i.e., [1.377 hours x 60 minutes]/6.96 million yen). Similarly, in the current study, the average inheritance of 8.06 million yen for "above zero inheritance recipients" is associated with a decrease in hours worked on weekdays by about 27 minutes (per day) on average over the seven years from the inheritance year to six years after inheritance receipt. This implies that each 10,000 yen (approximately 92 USD) inherited is associated with a 0.167-minute decrease in hours worked per week (i.e., [27 minutes/day x 5 weekdays]/8.06 million yen). Thus, the size of the estimated impact on working hours in the current study is approximately 30 percent larger than that obtained in Doorley and Pestel (2020).

5.2 Effects on the extensive and intensive margins

In this section, we break down the decrease in hours worked in Figure 3 into the extensive and intensive margins. Appendix Figure C.1 shows the estimation results for the intensive margin, where

observations of zero working hours are excluded throughout the entire sample period.[17] According to Appendix Figure C.1(a), the working hours of respondents who work after their inheritance are, on average, almost the same as before inheritance. This suggests that the decrease in working hours shown in Figure 3 is not likely to be driven by a change in the intensive margin, and rather driven by that in the extensive margin.[18] This is likely because of Japanese labor market practices, which offer little flexibility in the working hours of full-time employees who are required to work eight hours a day. If full-time employees want to reduce their labor supply after receiving an inheritance, they have almost no choice but to leave their job. Furthermore, as indicated in Table 1, the average labor income of our sample is only 2.15 million yen (approximately 19,800 USD), and the low opportunity cost of quitting a job may be one of the reasons for the large decrease in the extensive margin for women. This low labor income is probably due to the fact that more than half of working women in our data have been working part-time in recent years, as shown in Table 1.[19]

Appendix Figure C.1(b) shows the estimation results obtained by applying the same exercise to "large inheritance recipients" as in Appendix Figure C.1(a). This figure shows that "large inheritance recipients" tend to work fewer hours after they receive an inheritance when we restrict our sample to those who work. However, significant reductions are seen only for the four and six years after the inheritance, and the point estimates are smaller (in absolute value) than those shown by the red markers in Figure 3. Taken together with the results in Figure 4(a), the main driver of reduced working hours is also the changes in extensive margin among "large inheritance recipients."

5.3 Heterogeneity in the response of labor supply

This section examines whether there is heterogeneity in the response of labor supply after inheritance depending on respondents' age, whether they have children, and the type of assets inherited (i.e., real or financial assets). First, to estimate differences in the labor supply response by age group, we define three dummy variables for respondents' age in the year of inheritance: $Under40_i$ for those under 40,

[17] We do not show the results for weekends/holidays, because excluding respondents with zero working hours leaves very few observations for weekends/holidays. For this reason, we only present estimation results for weekdays.

[18] This interpretation is supported by the decomposition of the change in average hours worked from the year before receiving the inheritance to the fourth year after the inheritance (the year of the largest decline in hours worked) into the following three changes: (i) an increase in hours worked by respondents who were not working before the inheritance (i.e., positive change in the extensive margin), (ii) a decrease in hours worked by respondents who were working before the inheritance but left their jobs after the inheritance (i.e., negative change in the extensive margin), and (iii) a change in hours worked by respondents who continued to work before and after the inheritance (i.e., change in the intensive margin). Focusing on respondents existing in both years (i.e., the year before the inheritance and the fourth year after the inheritance), the change in average hours worked is -19.22 minutes per day. Of these, +8.82, -27.06, and -0.98 minutes are attributable to (i), (ii), and (iii), respectively. This indicates that the decrease in hours worked largely comes from a negative change in the extensive margin of (ii).

[19] The fact that part-time workers account for more than half of all working women is not specific to the JPSC but is also confirmed by government statistics. According to the Labor Force Survey (conducted by the Ministry of Internal Affairs and Communications), which shows the share of part-time workers among working women (i.e., full-time and part-time workers) since 2006, the share of part-time workers (for total age) exceeds 50 percent in all years and has slightly increased from 52.8 percent in 2006 to 56 percent in 2019.

$40s_i$ for those in their 40s, and $Over49_i$ for those aged 50 and over. After replacing the two interaction terms in Eq. (2) with $POST_{it} \times Inheritance_i \times Under40_i$, $POST_{it} \times Inheritance_i \times 40s_i$, and $POST_{it} \times Inheritance_i \times Over49_i$, we estimate the coefficients of these terms and present them in Appendix Figure C.2.[20] The figure shows a significant decrease in labor supply only for respondents in their 50s, although most point estimates are also negative, albeit not statistically significant, for the younger age groups. Compared to younger age groups, those 50 and over have fewer years until their expected retirement, so that the income lost by retiring earlier than originally planned is smaller. This is likely one of the main reasons why their labor supply tends to fall significantly. Our results are generally in line with the age-specific estimates obtained by both Elinder et al. (2012) and Bø et al. (2019) as discussed in Section 2, except that Bø et al. (2019) also found a significant response for the 21–42 age group in addition to those in their 50s.

Second, we examine possible differences in post-inheritance responses in labor supply depending on whether a respondent has children or not. We define respondents without child(ren) as those who did not have child(ren) throughout the observation period. As shown in Appendix Figure C.3, respondents with child(ren) are more likely to reduce their labor supply after inheritance than those without child(ren). This probably reflects age differences, or differences between generations, as respondents without child(ren) are likely to be younger, while those with child(ren) are likely to be middle-aged or older. Therefore, we run another regression analysis by respondents' age in the year of inheritance.[21] The result in Appendix Figure C.4 shows that respondents aged 50 and over without child(ren) are more likely to reduce their labor supply after their inheritance than those with child(ren). This result suggests that those with child(ren) do not reduce their labor supply and thus do not deplete much of their inherited assets. One possible reason for this is that they wish to leave the assets they have received from their parents to their children based on Japanese social norms, under which an estate is typically regarded as belonging to the family, not an individual.[22] Meanwhile, Appendix Figure C.5 shows that respondents under 40 with child(ren) significantly reduce their labor supply after inheritance, while this is not the case for respondents of the same age category without child(ren). It is not unreasonable to imagine that young respondents with small child(ren) reduce their labor supply to spend more time taking care of their children.[23]

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[20] The reason for using Eq. (2) to estimate the role of individuals' characteristics in the labor supply response is that using Eq. (1) does not yield reliable estimates, because the number of respondents with specific characteristics (i.e., their age, whether they have children, and the type of assets inherited) is too small.

[21] We divided the respondents into three age categories: under 40, in their 40s, and aged 50 and over. However, none of the coefficients of the cross terms were statistically significant in the estimation for the respondents in their 40s. Therefore, to reduce the number of figures, we only present the estimation results for the two age categories: those aged under 40 and those aged 50 and over.

[22] Bø et al. (2019) discuss other possible explanations for the contrasting post-inheritance labor supply pattern depending on whether respondents have child(ren). Specifically, they pointed out that when people have child(ren), they cannot quit their jobs easily as they need to earn money to cover the costs of raising child(ren) (e.g., university tuition, etc.). Conversely, the lack of child(ren) means that it is easier to stop working.

[23] This is also confirmed when we estimate post-inheritance responses in labor supply by children's age. We restrict the analysis to respondents who had at least one child during the sample period (831 observations of 81 respondents)

Finally, we also examine whether respondents' labor supply is affected by whether they inherited real or financial assets. To do so, we replace the two interaction terms in Eq. (2) with $POST_{it} \times RealInheritance_i$ and $POST_{it} \times FinancialInheritance_i$ and estimate the coefficients on these two terms. The results are shown in Appendix Figure C.7. $RealInheritance_i$ and $FinancialInheritance_i$ represent the amount respondent i inherited in real and financial assets, respectively. The coefficients gauge how much the labor supply outcomes change in response to inheriting one unit of real and financial assets, respectively. We find that all the coefficients for the effect of inheriting financial assets are insignificant. While most of the coefficients for the effect of inheriting real assets are also insignificant, they are larger (in absolute value) than those for financial assets for almost all labor supply outcomes, and the effects on hours worked and labor income are statistically significant. Although real assets are illiquid and cannot be used for consumption as quickly as financial assets, these assets can be used for consumption if they are sold or rented to others. Moreover, even if assets are neither sold nor rented, those who inherit residential land or a house no longer need to save to buy a home, which possibly explains why inheriting illiquid real assets appears to reduce heirs' labor supply.[24]

5.4 Event study analysis for time use and household expenditure

We estimate the impact of inheritance receipt on time used for non-working activities and on household expenditure. As for time use, we focus on hours spent on housework and childcare, and hours spent on education, leisure, and personal maintenance to examine how a reduction in hours worked following inheritance receipt affects the time spent on these activities.[25] The results are shown in Figures 5 and 6 and indicate that the time inheritance recipients spent on housework and childcare on weekends/holidays increases significantly. For "large inheritance recipients," the impact was largest in the fourth year after the inheritance, with such recipients spending 100 minutes more on these activities than in the year before the inheritance. By contrast, time spent on housework and childcare on weekdays remains more or less unchanged. Instead, the decrease in hours worked on weekdays appears to be replaced with a significant increase in hours spent on education, leisure, and personal maintenance.

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and estimate whether the post-inheritance responses are heterogeneous depending on whether the youngest child has not yet entered elementary school in the year of inheritance. Appendix Figure C.6 shows a significant post-inheritance decline in all labor supply measures except the dummy for part-time workers.

[24] Some studies have estimated the wealth effect on labor supply by focusing on housing price changes instead of inheritance receipt. They found that an unanticipated increase in housing prices leads women to work fewer hours (see e.g., Henley, 2004; Disney and Gathergood, 2018) or to leave the labor market (see e.g., Fu et al., 2016; Zhao and Burge, 2017; Li et al., 2020). Our result that inheritances in the form of real assets lead to a reduction in labor supply is consistent with these findings.

[25] If we add commuting time (to work or school) to the other categories of time use, the total exactly adds up to 24 hours (i.e., 1440 minutes). Consequently, the sum of all the estimates for β_1^d on the different time use categories shown in Appendix Table C.3 (for "above zero inheritance recipients") equals zero. This means that a decrease in hours worked is always replaced with an increase in time spent on other activities.

<Place Figures 5 & 6 here>

A possible reason for the observed patterns – i.e., that the reduction in hours worked on weekdays does not lead to an increase in the hours spent on housework and childcare but in the time spent on education, leisure, and personal maintenance – is as follows. It is plausible that respondents had been short on sleep on weekdays and therefore devoted the reduced hours of work to increased sleeping time following their inheritance. In fact, according to the 2016 Survey on Time Use and Leisure Activities by the Ministry of Internal Affairs and Communications, women in their 20s to 50s slept 30 minutes to an hour less on weekdays than they did on weekends, suggesting that they likely suffer from a lack of sleep on weekdays. By contrast, time spent on housework and childcare on weekends/holidays increased after the inheritance. The increase in sleeping time during weekdays may have reduced sleeping time on weekends/holidays, making more time available for housework and childcare.

As for the effect of inheritance on household expenditure, the estimated effects after inheritance (for "above zero inheritance recipients") are shown in Figure 7.[26] In contrast to the significant decrease in the labor supply, there is no sizable change in equivalent household expenditure after inheritance receipt. Thus, as far as the period up to six years after inheritance is examined, the increased assets due to inheritance primarily lead to a decrease in the labor supply and not to an increase in household expenditure.

<Place Figure 7 here>

At least two possible explanations for the non-response to a wealth shock in household expenditure suggest themselves. The first is that JPSC respondents are relatively young. According to the life-cycle permanent income hypothesis (LC/PIH), the longer the time between a windfall and the expected time of death, the smaller will be the increase in consumption because of the longer period over which consumption will be smoothed. For this reason, one would expect the response of consumption to be less pronounced for younger people. Hori and Niizeki (2019), who examined the wealth effects of housing price changes on expenditure in Japan, found that the expenditure response of households with a household head aged 40 or younger was smaller than that of older households. Specifically, the response of younger households is almost zero for both total and non-durable expenditure.[27] Second, it is possible that respondents' expenditure on durables increased following

[26] The estimated coefficients of all explanatory variables are reported in column (x) of Appendix Table C.3.
[27] Based on panel data on middle-aged and older individuals from the Japanese Study of Aging and Retirement (JSTAR), Sugano (2019) found that expenditure on durables increased significantly after the receipt of an inheritance. Given that the average age of respondents in this study is 65.11 years, the significant response of this age group is not

their inheritance, which, however, we are unable to examine, since the JPSC does not contain data on durable expenditure. That said, studies such as those by Nekoei and Seim (2022), who estimated the impact of an inheritance, and Imbens et al. (2001) and Kuhn et al. (2011), who estimated the impact of lottery winnings, found that expenditure on durables such as a car tend to increase significantly after such windfalls, and it is quite possible that the expenditure of JPSC participants responded in a similar manner.

5.5 Robustness checks

This section presents various robustness checks of our estimation results. First, we attempted an estimation with year fixed effects to control for the impact of macroeconomic conditions and other annual changes in labor supply. In Eq. (1), we did not add year fixed effects because adding them could lead to (imperfect but serious) multicollinearity with the dummies for the number of years since the inheritance receipt (i.e., $1\left(\Delta_{it}^{I}= d\right)$).[28] In order to address this problem, we here replace $1\left(\Delta_{it}^{I}= d\right)$ in Eq. (1) with $1\left(\Delta_{it}^{I}= d\right) \times Inheritance_i$ and then add year fixed effects to this equation. Appendix Figures C.8(a) and (b) show the estimation results (for hours worked and labor force participation) of the modified Eq. (1), both with and without year fixed effects.[29] Although the estimated equation with year dummies tends to yield slightly less significant and smaller coefficient estimates on the interaction terms for the post-inheritance period, the finding that hours worked and the share of respondents participating in the labor market decline after inheritance receipt remains essentially unchanged regardless of which specifications is used.

We also examine whether other labor supply measures yield findings consistent with those in Section 5.1. Appendix Figures C.9(a) and (b) show that hours worked per week and the number of days worked in a year also exhibit a downward shift after inheritance, especially for "large inheritance recipients."[30] We further examine the effect of inheritance receipt on labor income. As shown in Appendix Figure C.10, while labor income begins to decrease after the inheritance (albeit not significantly), no major difference in the decrease in labor income was observed between "above zero inheritance recipients" and "large inheritance recipients." This is probably because the likelihood of

inconsistent with our results.

[28] If the years of inheritance receipt were uniformly distributed over our sample period, then adding year dummies to Eq. (1) would not cause multicollinearity, or the problem would be minor. In fact, Doorley and Pestel (2020) controlled for year fixed effects in their estimated equation. However, since inheritances are distributed disproportionately, with 78 percent falling in the second half of the observation period, adding year dummies would cause a serious multicollinearity problem.

[29] In order to avoid the effect of outliers on the estimation results, two observations where the inheritance amount exceeds 80 million yen are excluded from our estimation. It should also be noted that we do not exclude the outliers from the event study analyses in Section 5, because these analyses do not rely on any variation in the amount of inheritance received (i.e., $Inheritance_i$) in estimating β_1^d in Eq. (1).

[30] Based on the estimation results for hours worked per week in Appendix Figure C.9(a), hours worked per week on average decrease by 1.70 hours (i.e., 102 minutes) over the seven years after the inheritance. Thus, each 10,000 yen (approximately 92 USD) inherited reduces hours worked per week by 0.127 minutes (i.e., 102 minutes/8.06 million yen). This is about three-fourths the size of the estimate based on hours worked per weekday, 0.167.

withdrawing from the labor market is almost identical for these two groups (as shown in Figure 4(a)) and the reduction in hours worked is only slightly different, although it is larger for "large inheritance recipients" (as shown in Figure 3(a)).

We examined the following two possibilities for the insignificant decrease in labor income: (i) receiving an inheritance makes respondents more likely to leave their old job and look for a better one, and (ii) they go into self-employment. However, neither is likely to be the main reason because both the share of those who changed jobs from the previous year and the amount of self-employment income did not change much between before and after receiving an inheritance. Specifically, regarding the first possibility, the share of those who changed their job from the previous year is not significantly different between before and after the inheritance (7.8% and 7.6%, respectively) among those who worked. Nevertheless, a back-of-the-envelope calculation reveals that the magnitude of the coefficients of Eq. (1) on labor income is consistent with the predicted income loss from the estimated reduction in labor supply.[31]

Next, we examine whether our estimation results for "large inheritance recipients" depend on the threshold value for "larger inheritances" (which is 5 million yen, or approximately 46,000 USD, in the baseline analysis). Specifically, we conduct the same estimations as in Figures 3(a) and 4(a) for the following four groups: "zero inheritance recipients," and those who received an inheritance of more than 1 million yen (approximately 9,200 USD), 5 million yen (approximately 46,000 USD), and 9 million yen (approximately 82,800 USD). As shown in Appendix Figures C.11(a) and (b), we find that both hours worked and the labor participation rate decline after inheritance with the alternative threshold values. Moreover, although the 95 percent confidence intervals are wider for the recipients of large inheritances due to the smaller sample size, the post-inheritance labor supply decline tends to be larger for respondents who received larger inheritances, suggesting that our estimates reflect the wealth effect of inheritance receipts.

We also estimate the impact of inheritance receipts on household expenditure using alternative expenditure measures. If the collective model holds, then the expenditure of heirs themselves may have increased more significantly after the inheritance receipt than the total household expenditure used as the dependent variable in Section 5.4. We therefore conduct an additional estimation using a variable that represents the separate expenditure of each household member.[32]

[31] If we multiply the change in the days worked per year (shown in Appendix Figures C.9(b)) by the average daily wage of respondents in our sample. Taking the third year after inheritance as an example, we multiply the decrease in the days worked (9 days) of "above zero inheritance recipients" by the daily wage (11,470 yen; approximately 106 USD), resulting in a 103,230 yen (= 9 days x 11,470 yen per day; around 950 USD) reduction in labor income. This value is slightly larger than the reduction of about 70,000 yen (approximately 645 USD) in Appendix Figure C.10, but is of a similar magnitude. Applying the same calculation to "large inheritance recipients," we also obtain a decrease of 247,752 yen (= 21.6 days x 11,470 yen per day; approximately 2,280 USD), which is very close to the estimated reduction in labor income of 232,000 yen (about 2,136 USD in Appendix Figure C.10).

[32] This variable represents the expenditure of each household member during the month prior to the survey (i.e., September), and we obtain from this the following information (in addition to the total expenditure of all household members together): (1) the respondent's expenditure, (2) her husband's expenditure, (3) expenditure on her child(ren),

Appendix Figures C.12(a) to (f) show that neither the expenditure of individual household members nor the total household expenditure change significantly following the inheritance receipt.

It is also possible that heirs may have repaid a housing loan (earlier than initially planned) rather than spending the inheritance on the purchase of goods and services. As neither of the two expenditure variables used in Section 5.4 nor those in this section include housing loan repayments, we examine how annual housing loan repayments changed after an inheritance. Additionally, we also estimate whether the probability of purchasing marketable securities in the past year (e.g., stocks and bonds) increased after an inheritance.[33] The estimation results are presented in Appendix Figure C.13 and do not show any discontinuous upward trends after an inheritance for both variables.

Finally, we examine whether our estimates reflect the effects of events other than inheritances. One possibility, for example, is that respondents gave birth to a child around the time of the inheritance. Childbirth could simultaneously lead to a decrease in hours worked and an increase in time spent on childcare. To see if this is the case, we conduct another event study analysis with a dummy variable indicating whether a respondent gave birth to a child in the preceding year as the dependent variable in Eq (1). Appendix Figure C.14 shows that there is no significant increase in the share of those who gave birth around the time of the inheritance. Another possibility is that the husband's wealth and/or income increased around the time of the respondent's inheritance, possibly reducing the respondent's labor supply. Appendix Figures C.15(a) and (b) show estimation results for Eq. (1) when the amount of financial assets held by the husband and the husband's annual total income (including all types of income listed in the questionnaire shown in Appendix A.2.5) are used as the dependent variable. We do not find any significant increase in these variables.[34] These results confirm that the reduction in labor supply following an inheritance is brought about by the inheritance.

6. Inheritance expectations, informal care, and liquidity constraints

6.1 Dynamics of inheritance expectations, informal care, and liquidity constraints

As discussed in the introduction, inheritance expectations, the provision of informal care to parents, and liquidity constraints may affect the way labor supply changes after an inheritance. Starting with inheritance expectations, the LC/PIH suggests that household behavior (such as consumption, saving,

(4) expenditure for all household members, and (5) other expenditure. When we use the expenditure on children and for all household members, we divide the expenditure by the square root of the number of children and of household members, respectively. Since this information is only available for married households, the size of the sample that can be used for our estimation is reduced to roughly 60 percent of that used in Section 5.2. See Panels A.1 and A.2 of Appendix Table C.4 for descriptive statistics of household members' expenditure and the equivalent expenditure.

[33] See Panel B of Appendix Table C.4 for descriptive statistics of the variables such as the amount of housing loan repayments and the probability of respondents purchasing securities.

[34] Husbands' assets are defined as household financial assets minus respondents' financial assets. Husbands' income is defined as the total income including labor income and other various incomes (e.g., property income and social security benefits). Since in this estimation we limit our sample to respondents who were married throughout the sample period (roughly 50 households), reliable estimates cannot be obtained for longer years before and after the inheritance due to the reduced number of observations. Appendix Figure C.15 therefore presents only estimates for the four years before and after the inheritance.

and labor supply) should change at the time when the expectation is formed, not when the inheritance is received.

Several previous Japanese studies argue that children who take care of their elderly parents tend to receive a larger inheritance (see, e.g., Horioka, 2014). This possibly reflects endogeneity in that those who wish to stop working devote more time to informal care to receive a larger inheritance.[35] Moreover, it is also possible that children that cared for their parent start working after the parent has died because they have more time for formal work.

Finally, the relaxation of liquidity constraints due to inheritance receipt may exaggerate the downward shift in labor supply in the post-inheritance period among those who expected the inheritance. This is because liquidity-constrained individuals, even if they anticipate an increase in their assets upon inheritance, cannot reduce their labor supply until they receive the inheritance. In this case, we cannot identify whether the reason for the decline in labor supply after inheritance is the unexpected inheritance or relaxed liquidity constraints.

To understand the extent to which inheritance expectations make it difficult to identify the effect of inheritance on labor supply, we start by examining the share of respondents who expected to receive an inheritance. If this share is quite high in our sample of respondents whose parent died with a bequest, the impact of inheritance receipt on labor supply is likely to be underestimated relative to the case where all inheritances are unanticipated. Table 3 indicates that among those who received a large inheritance of 5 million yen (approximately 46,000 USD) or more, 81 percent answered in the year before the inheritance that they expected to receive a future inheritance from the respondent's parent(s), while the corresponding figure for those who received an inheritance greater than zero is 63 percent.

<Place Table 3 here>

To examine this further, we estimate Eq. (1) using a dummy indicating whether respondents in each survey expected receiving an inheritance as the dependent variable (see Appendix A.3.1 for the survey questions on inheritance expectations). Figure 8(a) shows the estimated coefficient β_1^d for respondents whose inheritance was greater than zero.[36] Looking at the period prior to inheritance, the size of the estimated coefficients increases from ten years prior to the inheritance until just before the inheritance. This means that the closer the individuals were to receiving an inheritance, the more likely

[35] In econometrics terms, this endogeneity can be regarded as reverse causality due to an omitted variable issue, in that the time-variant preference not to engage in formal work is not controlled for in Eq. (1). The role of this preference would be included in the error term of Eq. (1), which would be positively correlated with the probability of receiving a large inheritance (in return for the provision of informal care). Meanwhile, this preference would also be associated with lower (post-inheritance) labor supply. As a result, the wealth effect of inheriting is likely to be exaggerated.

[36] The estimated coefficients of all explanatory variables are reported in column (i) of Appendix Table D.1. Similarly, the estimation results for Figures 8(b) and 8(c) are presented in columns (ii) and (iii) of the table, respectively.

they were to expect to receive an inheritance. If labor supply is also adjusted in response to such updates of expectations, the impact of inheritance on labor supply will be larger if we estimate it only using the sample of respondents who did not expect to receive an inheritance until just before the inheritance.[37]

Next, we examined whether large inheritance recipients were more likely to have provided care to their parent(s) than other recipients (see Appendix A.3.2 for the survey questions on caregiving). Table 3 shows that among those who received a large inheritance, about 47 percent answered that they and/or their husband provided care (e.g., housework, nursing care, visits) for the respondent's parent(s) in the year before receiving the inheritance, while the corresponding value among those who received an inheritance (greater than zero) is about 40 percent.[38] This is consistent with the empirical findings obtained in previous studies for Japan that respondents that provided care to their parent(s) were more likely to receive a large inheritance. Moreover, in a similar manner as in Figure 8(a), we also examined whether and how the share of respondents indicating that they and/or their husband provided care changed after the inheritance receipt. The result is presented in Figure 8(b), which shows that the share of respondents providing care (which would be for the remaining parent) sharply declined after the inheritance receipt. This suggests that changes in the labor supply of respondents that received an inheritance may be affected by the termination of caregiving.

<Place Figure 8 here>

Finally, we examine the share of respondents indicating that they/their household faced liquidity constraints before the inheritance and whether the constraints were more likely to be alleviated after the inheritance for those who received an inheritance than for those who did not. Specifically, as mentioned, we used questions in the JPSC asking whether respondents had a loan application rejected or withdrew an application in the preceding year, and defined those who answered

[37] In Figure 8(a), the share of respondents who expected to receive an inheritance did not decline after the primary inheritance, suggesting that respondents expected to receive an inheritance from the surviving parent in the secondary inheritance. Therefore, some of the respondents who expected receiving a secondary inheritance may have reduced their labor supply after the primary inheritance in anticipation of receiving more in the secondary inheritance. If this is the case, even those who did not receive any assets in the primary inheritance also reduced their labor supply because they would be able to receive an inheritance from the surviving parent. In fact, 36.2 percent of "zero inheritance recipients" (in the primary inheritance) expected to receive a secondary inheritance one year after the parent's death. However, "zero inheritance recipients" did not decrease their labor supply after their parent's death, as shown in Figures 11(a) and (b), in which the estimates of β_1^d and β_3^d of Eq. (3) are plotted. We therefore conclude that, in Figures 3 and 4, the reduction in labor supply is due not to the expectation of receiving assets in a secondary inheritance but to the assets received in the primary inheritance.

[38] When comparing respondents with an inheritance of more than 5 million to those with an inheritance of less than 5 million, the former were more than 10 percentage points more likely to have provided care than the latter. To check whether there are statistically significant differences in the share of households providing care by inheritance amount, we conducted a *t*-test on the null hypothesis that respondents with an inheritance of more than 5 million yen (approximately 46,000 USD) were less likely to provide care than those with an inheritance of less than 5 million yen. The null hypothesis was not rejected with a *p*-value of 0.1129 (probably due to the small number of observations).

"yes" to either of these questions as liquidity constrained (see Appendix A.3.3 for the survey questions on liquidity constraints).[39] Table 3 indicates that only 2.3 percent of "large inheritance recipients" were liquidity constrained, while 2.9 percent of "above zero inheritance recipients" were. Thus, regardless of whether respondents received a large inheritance, the share of those that were liquidity constrained is quite low. To examine this further, Figure 8(c) shows developments in the share of liquidity-constrained respondent households among households that received an inheritance and those that did not. As for the former, the share declines after the inheritance, though none of these estimates are significant. The figure also shows a similar downward trend for those that did not receive an inheritance, except for the third year after the death of the parent. Although these findings suggest that inheritance receipt may not significantly relax liquidity constraints, it is still possible that the labor supply decline after inheritance shown in Figures 3 and 4 was brought about, at least in part, by a relaxation of liquidity constraints.

Taken together, these analyses suggest that inheritance expectations, informal care, and the relaxation of liquidity constraints may have biased the estimated effect of inheritance on labor supply. Sections 6.2 to 6.4 therefore present estimations taking the role of inheritance expectations, informal caregiving, and liquidity constraints in the effect of inheritances on labor supply into account.

6.2 Effect of inheritance expectations on labor supply

As we saw in Section 6.1, more than 60 percent of "above zero inheritance recipients" expected to receive an inheritance in the year before the inheritance. Therefore, because changes in respondents' labor supply may manifest themselves in advance, it is possible that the estimates in Section 5.1 of the effect of an inheritance on labor supply may understate the true effect. We therefore estimate Eq. (2) using a fixed effect model with the sample for the period from six years before to six years after the year of an inheritance (as in Section 5) and examine the role that anticipating an inheritance plays before and after receiving the inheritance. In doing so, we replace Z_i by a dummy variable that takes 1 when respondent i did not expect to receive an inheritance from the respondent's parent(s) in the year prior to the inheritance. To avoid the effect of outliers on the estimation results, the two observations where the inheritance amount exceeded 80 million yen (approximately 736,000 USD) are excluded from the estimation below.

Figures 9(a) and (b) show the estimates of β_1 and β_2 in Eq. (2) for a variety of labor supply measures, together with 95 percent confidence intervals.[40] The estimates for respondents that did not anticipate receiving an inheritance from their parent(s) are larger in absolute value than those for

[39] Liquidity-constrained households include those who were able to borrow but did not receive the full loan amount they applied for.

[40] The estimated coefficients of all explanatory variables are reported in Appendix Table D.2. Since about 90 percent of the respondents do not work any hours on weekends/holidays, it is difficult to precisely estimate the (causal) relationship between the amount of inheritance received and the changes in hours worked on weekends/holidays. Therefore, we do not consider hours worked on weekends/holidays in Figure 9 and later figures.

respondents that did.[41] Moreover, the coefficients for hours and days worked and labor income are larger (in absolute value) and more statistically significant for unanticipated inheritances than for anticipated inheritances. This is because we use information on inheritance expectations immediately before the inheritance to identify respondents who experienced an unanticipated wealth shock.

<Place Figure 9 here>

Even for expected inheritances, the coefficients of the interaction terms are all negative, probably because some respondents received a larger inheritance than expected, which reduced their labor supply. Appendix Figure D.2 also displays the estimation results obtained by excluding respondents who were liquidity-constrained in at least one of the three years before receiving an inheritance. Although the coefficient estimates for anticipated inheritances are insignificant, they are still all negative. This suggests that the relaxation of liquidity constraints does not exaggerate the impact of anticipated inheritances on labor supply.

6.3 Effect of informal caregiving on labor supply

As discussed in Section 6.1, there is likely to be link between caregiving and the size of inheritance and heirs' labor supply response. As in Section 6.2, we estimate Eq. (2), with Z_i being replaced by a dummy variable that takes 1 when respondent i and/or her husband provided care to the respondent's parent(s) in the year before receiving an inheritance.

Figures 10(a) and (b) show the estimated coefficients of the interaction terms in Eq. (2).[42] While none of the coefficients are significant for respondents that did not provide care to their parent(s), for caregiving respondents a significant decline after inheritance can be observed for some labor supply indicators such as labor income and the probability of working full-time. We also find a slight increase in the probability of respondents working part-time, although the coefficient is not significant. This result is consistent with the potential endogeneity arising from respondents providing informal care to their parent(s) to receive a larger inheritance in order to reduce their labor supply (through changing their employment status from full-time to part-time) after the receipt. However, we do not find any systematic differences in the estimation results for other labor supply measures with respect to whether respondents or their husbands were caring for the respondent's parent(s).[43] Thus, this does

[41] As reference for Figures 9, 10 and 13, Appendix Figure D.1 shows the estimation results of Eq. (2) where the interaction terms of the post-inheritance dummy and the dummies for inheritance expectations, informal caregiving or liquidity constraints are excluded and only an interaction term of the post-inheritance dummy and the inheritance amount is included.

[42] The estimated coefficients of all explanatory variables are reported in Appendix Table D.3.

[43] Physical as well as mental health problems due to informal care giving may also lead to a reduction in caregiver's labor supply around the receipt, which would contaminate the effect of inheritance receipt on labor supply. In order to examine this possibility, we conduct an analysis in Appendix E. However, we could not find any supporting evidence of this possibility.

not appear to be the primary reason for the decrease in labor supply after inheritance receipt shown in Figures 3 and 4; instead, the main reason appears to be the wealth effect of receiving an inheritance. This is also supported by other estimation results (though not shown to reduce the number of figures) that the labor supply decline can be observed even focusing on the sample of respondents receiving an inheritance divided according to the statutory share (27 of 118 respondents fall into this sample). Since the statutory division is an equal division among children without any consideration regarding whether they provided care, it is less likely to be subject to the endogeneity issue.

<Place Figure 10 here>

Besides the endogeneity issue caused by a correlation between caregiving and the size of inheritance, there are other potential concerns that could bias the estimate of the wealth effect. We will consider two such factors: termination of caregiving and loss of a parent who helps with housework or childcare. To consider these factors, we conducted an event study DID analysis based on Eq. (3). As for the termination of caregiving, if the heir provided care to a parent, the caregiver may start working when the caregiving ends with the parent's death. In this case, the reduction in labor supply due to an inheritance receipt would be underestimated by the labor supply increase. As for the loss of help from a parent, if a respondent was able to work outside the home before the parent's death because their parent helped with housework or childcare, the respondent stopped working when they no longer had the help. In this case, a decrease in labor supply after inheritance can be seen even in the absence of the wealth effect of inheritance.

We plot four important coefficients in Eq. (3) in Figures 11 and 12. Figure 11(a) shows a change in hours worked on weekdays among the control group ("zero inheritance recipients") for caregivers (β_1^d) and non-caregivers (β_3^d) in the left- and right-hand panels, respectively. Figure 12(a) shows the DID estimates that represent a change in the same outcome for the treatment group ("above zero inheritance recipients") relative to the control group, again for caregivers (β_2^d) and non-caregivers (β_4^d). In addition, we show the coefficients for an alternative outcome, the probability of labor participation in panel (b).

As explained in Section 4, whether the two factors mentioned above could bias the estimates of the wealth effect can be assessed by looking at the change in labor supply of the control group. First, as shown in the left-hand panels of Figure 11, the labor supply of those who provided care but did not receive inheritances tends to increase after the parental death. This suggests that when caregiving comes to an end, those who were previously unable to participate in the labor market due to caregiving started working.[44] Given that this upward trend is common to both the control and the treatment groups, the analyses based on Eqs. (1) and (2) cause underestimation of the wealth effect of inheritance.

[44] This result is in line with Niizeki and Hori's (2019) finding that the probability of working increases for women who

Second, as shown in the right-hand panels of Figure 11, the labor supply of those who were neither caregivers nor inheritance recipients did not change after the death of a parent. This confirms that the decline of labor supply found in Figures 3 and 4 was not simply due to the loss of parents' help with housework or childcare but to the wealth effect of receiving an inheritance.

<Place Figure 11 here>

The DID estimates presented in Figure 12 show a downward trend in the post-inheritance labor supply, especially for those who provided care to their parent(s). We compare the reduction in labor supply here with the estimates shown in Figure 3, which were estimated without taking caregiving into account. For this purpose, we calculate the average inheritance amount for those who provided care and obtained 8.32 million yen (approximately 76,600 USD). The 8.32 million yen inheritance is associated with a decrease in hours worked on weekdays by about 71 minutes (per day) on average over the seven years from the inheritance year to six years after inheritance receipt. This implies that each 10,000 yen (approximately 92 USD) inheritance is associated with a 0.427-minute decrease in hours worked per week (=[71 minutes/day x 5 weekdays]/8.32 million yen). Compared to the 0.167-minute decrease calculated from the estimates of Figure 3, the 0.427-minute decrease is about 2.6 times larger.

<Place Figure 12 here>

6.4 Effect of liquidity constraints

As explained in Section 6.1, in theory, the labor supply of liquidity-constrained households should decrease after inheritance, even if they had anticipated their inheritance. To empirically examine whether this is the case, we divide respondents that had anticipated their inheritance into (i) those that were liquidity constrained before the inheritance and (ii) those that were not, and then compare the labor supply responses of the two groups. For this purpose, we estimate Eq. (2) for households that expected to receive an inheritance, with Z_i being replaced by a dummy variable that takes 1 when respondent i (and her spouse) was liquidity constrained in at least one of the three years before receiving the inheritance.

Figures 13(a) and (b) show the estimated coefficients of the interaction terms in Eq. (2).[45] Comparing the estimation results for the two groups indicates that although the point estimates for those that were liquidity constrained before the inheritance are in some cases larger, the difference is not significant. This suggests that the relaxation of liquidity constraints does not have a substantial impact on the way labor supply changes after inheritance.[46] However, there are other measures of

did not receive any inheritances after their parents' death.

[45] The coefficient estimates for all explanatory variables are reported in Appendix Table D.4.

[46] Since the share of liquidity-constrained respondents is quite low (i.e., only about 3 percent in the year before the

liquidity constraints, and in our robustness checks in the next section we examine whether using these yields different results.

<Place Figure 13 here>

6.5 Robustness checks

6.5.1 Interactions between inheritance expectations and informal caregiving

While we considered inheritance expectations and caregiving for parents as independent factors in Section 6.3, these two may be closely correlated. For example, it is possible that the more time and/or money people spend caring for their parents, the larger the inheritance they expect to receive. If there is such correlation, a post-inheritance decline in labor supply would be found even for those who anticipated their inheritance (due to the endogeneity of caregiving). We therefore attempt to eliminate this possibility by restricting the sample to those who did not provide care before their inheritance.

The results of the estimation with the restricted sample are shown in Appendix Figure D.3. They are consistent with our prediction in the sense that we find smaller declines in post-inheritance labor supply (for labor income, the share of participating in the labor market and the share of full-time workers) for respondents who anticipated their inheritance than in Figure 9, where the sample was not restricted to respondents who did not provide care. However, the difference is not substantial.

6.5.2 Alternative definitions of liquidity-constrained households

In this section, we examine whether our estimation results are robust to alternative measures of liquidity constraints. In Section 6.4, we defined a liquidity-constrained household as one whose loan application was rejected or who gave up applying for a loan; however, the percentage of households meeting this definition is very low. We therefore use alternative measures of liquidity constraints that have been used in previous studies. Specifically, we use the following three definitions for liquidity-constrained households: (1) households whose financial assets amount to less than 20 percent of their annual income (this definition is used, e.g. by Brown et al., 2012); (2) households with financial assets worth less than 1 million yen, i.e., approximately 9,200 USD (similar to Brown et al., 2012, who use values of 5,000 and 10,000 USD), and (3) households whose financial assets are zero (following Kohara and Horioka, 2006).

The shares of liquidity-constrained households based on these three different definitions are 21.1 percent, 18.3 percent, and 14.0 percent, respectively. To examine how representative these figures are, we compare the shares for (2) and (3) with those obtained from other statistical sources. The first two are the Family Income and Expenditure Survey (FIES, conducted by the Ministry of Internal

inheritance), the confidence intervals of the estimates for those households are much wider than those for non-constrained households. If more observations on liquidity-constrained households were available for our analysis, we might be able to obtain results that are more consistent with the theoretical prediction.

Affairs and Communications) and the Comprehensive Survey on the Living Conditions (CSLC, conducted by the Ministry of Health, Labour and Welfare), two sets of publicly available government statistics.[47] The third is the Japan Household Panel Survey (JHPS), which, like the JPSC, is conducted by the PDRC at Keio University and is widely used in empirical studies on Japan. The shares for (2) and (3) obtained based on these data sources are shown in Appendix Figure D.4. The figure indicates that the share of the liquidity-constrained households in our sample lies in the middle of the values obtained from the other data sources, suggesting that our sample is not substantially biased.

The estimation results on the estimated effects of inheritance on labor supply dividing respondents that had anticipated their inheritance based on the three alternative definitions of liquidity-constrained households are shown in Appendix Figures D.5 to D.7. We find that while the point estimates in Appendix Figure D.6 tend to be larger (in absolute value) for respondents who were liquidity constrained prior to the inheritance year than for those who were not, this is not the case in the other two figures. Hence, it is unlikely that liquidity-constrained households tend to reduce their labor supply to a greater extent than non-constrained households, thus confirming the baseline result in Section 6.4.

7. Conclusion

The aim of this study was to examine the impact of inheritance receipt on heirs' labor supply while dealing with the potential empirical issues associated with inheritance expectations, informal caregiving, and liquidity constraints. Before considering these issues, we estimated the average impact of inheritance receipt on labor supply, time use, and household expenditure. The estimation results showed that inheritance receipt significantly reduces labor supply, especially the labor force participation rate, and increases the time spent on education, leisure, and personal maintenance on weekdays and housework and childcare on weekends/holidays. By contrast, it does not increase household expenditure. Although the effect on labor supply was found consistently for a variety of measures, the size of the impact was not economically large: the average inheritance of those who received an inheritance, namely, 8.06 million yen (approximately 74,200 USD), only reduces working hours by 27 minutes per weekday. When considering the heterogeneity of the impact across different age groups and those with and without children, we observed a notable decrease in labor supply among those in their 50s, especially those in their 50s without children, and those under 40 with children.

We also estimated the impact of inheritance receipt on labor supply taking the three mentioned empirical issues into account. We found the following. First, respondents who did not anticipate an inheritance but received one significantly reduced their labor supply afterwards. On the

[47] We calculate the figures from the FIES and the CSLC based on the amount of household-level financial assets for households with two or more persons (for the FIES-based figures) and all households (for the CSLC-based figures). All figures are not broken down by age but the total for all ages. Figures from the CSLC are available only every three years.

other hand, we did not find such a reduction in labor supply for those who anticipated their inheritance. Second, when considering the possible correlation between the size of inheritances and whether respondents provided care to their parent(s), the results revealed that the endogeneity issue due to this correlation does not necessarily lead to a decline in labor supply after the inheritance. However, ignoring the labor supply increase associated with the end of informal care leads to an underestimation of the labor supply reduction following the inheritance. Third, we did not find that among households that had anticipated their inheritance, liquidity-constrained households tend to reduce their labor supply to a greater extent after inheritance than those who were not constrained.

Our findings allow us to consider the reasons for the heterogeneity in the impact of inheritance on labor supply across respondents with different characteristics highlighted in recent studies. Our finding of the strong negative impact of an unexpected inheritance on labor supply suggests that the larger impact among the young observed, e.g., by Bø et al. (2019) may be because of their low expectation of receiving an inheritance.

The findings of this study have several policy implications. First, our finding that heirs tend to reduce their labor supply after receiving an inheritance suggests that the increased inheritance taxes in Japan over the past two decades may have led heirs to reduce their labor supply by less than would otherwise have been the case. However, according to our estimates, the marginal increase in labor supply is unlikely to be large enough to significantly impact income tax revenues, since the impact on labor supply is limited in size. Second, our finding that the post-inheritance decline in labor supply is not economically large and household expenditure does not increase after inheritance indicates that Japanese heirs hardly deplete their inherited assets. If the retained wealth provides benefits (e.g., interest, dividends, capital gains, etc.) to the owners over time, then inheritance has a persistent effect on widening wealth (and income) inequality between (large) inheritance recipients and others. Third, our finding that the time spent on housework and childcare on weekends/holidays increases after inheritance suggests that receiving an inheritance affects the welfare of heirs themselves and that of their household members. Finally, the relatively small impact of inheritance on labor supply seems consistent with Japanese social norms, under which an estate is viewed as a family asset rather than an individual ones, and should be carefully maintained and then transferred to the next generation. This suggests that estimates of the inheritance-specific response of labor supply rather than its income elasticity should be used when examining the impact of inheritance tax reforms on household behavior.

References

Bø, E. E., Halvorsen, E., & Thoresen, T. O. (2019). Heterogeneity of the Carnegie Effect. *Journal of Human Resources*, *54*(3), 726–759.

Boserup, S. H., Kopczuk. W., and Kreiner, C. T. (2016) The Role of Bequests in Shaping Wealth Inequality: Evidence from Danish Wealth Records, *American Economic Review: Papers & Proceedings*, *106*(5), 656–661.

Brown, J. R., Coile, C. C., & Weisbenner, S. J. (2010). The Effect of Inheritance Receipt on Retirement. *Review of Economics and Statistics, 92*(2), 425–434.

Disney, R., & Gathergood, J. (2018). House Prices, Wealth Effects and Labour Supply. *Economica*, *85* (339), 449–78.

Doorley, K., & Pestel, N. (2020). Labour Supply after Inheritances and the Role of Expectations. *Oxford Bulletin of Economics and Statistics*, *82*(4), 843–863.

Eder, Andreas. (2016). The Impact of Inheritances on the Retirement Behavior of Older Europeans. *Empirica 43*(2), 299–331.

Elinder, M., Erixson, O., & Ohlsson, H. (2012). The Impact of Inheritances on Heirs' Labor and Capital Income, *B.E. Journal of Economic Analysis & Policy (Contributions)*, *12*(1), 1–35.

Elinder, M., Erixson, O., & Waldenström, D. (2018) Inheritance and Wealth Inequality: Evidence from Population Registers, *Journal of Public Economics*, *165*(C), 17–30.

Fu, S., Liao, Y., & Zhang, J. (2016). The Effect of Housing Wealth on Labor Force Participation: Evidence from China. *Journal of Housing Economics*, *33* (September), 59–69.

Hamaaki, J., Hori, M., & Murata, K. (2019). The Intra-Family Division of Bequests and Bequest Motives: Empirical Evidence from a Survey on Japanese Households. *Journal of Population Economics*, *32*(1), 309–346.

Henley, A. (2004). House Price Shocks, Windfall Gains and Hours of Work: British Evidence. *Oxford Bulletin of Economics and Statistics*, *66* (4), 439–56.

Holtz-Eakin, D., Joulfaian, D. & Rosen. H. S. (1993). The Carnegie Conjecture: Some Empirical Evidence. *Quarterly Journal of Economics*, *108*(2), 413–435.

Hori, M., & Niizeki, T. (2019). Housing Wealth Effects in Japan: Evidence Based on Household Micro Data. *B.E. Journal of Economic Analysis & Policy*, *19*(2), 1–28.

Horioka, C. Y. (2014). Are Americans and Indians more Altruistic than the Japanese and Chinese? Evidence from a New International Survey of Bequest Plans. *Review of Economics of the Household*, *12*(3), 411–437.

Imbens, G, W., Rubin D. B., & Sacerdote, B. I. (2001). Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players. *American Economic Review*, *91*(4), 778–794.

Joulfaian, D., & Wilhelm, M. O. (1994). Inheritance and Labor Supply. *Journal of Human Resources*, *29*(4), 1205–1234.

Kindermann, F., Mayr, L., & Sachs, D. (2020). Inheritance Taxation and Wealth Effects on the Labor Supply of Heirs. *Journal of Public Economics*, *191*, 1–16.

Kohara, M., & Horioka, C. Y. (2006). Do Borrowing Constraints Matter? An Analysis of Why the Permanent Income Hypothesis Does Not Apply in Japan. *Japan and the World Economy 18* (4), 358–77.

Kopczuk, W. (2013). Incentive Effects of Inheritances and Optimal Estate Taxation. *American Economic Review: Papers and Proceedings*, *103*(3), 472–477.

Kuhn, P., Kooreman, P., Soetevent, A., & Kapteyn, A. (2011). The Effects of Lottery Prizes on Winners and Their Neighbors: Evidence from the Dutch Postcode Lottery. *American Economic Review*, *101*(5), 2226–2247.

Li, H., Li, J. Lu, Y., & Xie, H. (2020). Housing Wealth and Labor Supply: Evidence from a Regression Discontinuity Design. *Journal of Public Economics*, *183* (March), 104139.

Lise, J., & Yamada, K. (2019). Household Sharing and Commitment: Evidence from Panel Data on Individual Expenditures and Time Use. *Review of Economic Studies*, *86*(5), 2184–2219.

Malo, Miguel Á., and Dario Sciulli. (2021). Wealth Transfers and Labour Supply: Impact of Inheritances and Gifts by Gender in Europe. *International Journal of Manpower 42*(8), 1450–78.

Nekoei, A., & Seim, D. (2022). How Do Inheritances Shape Wealth Inequality? Theory and Evidence from Sweden. *Review of Economic Studies*, forthcoming.

Niizeki, T., & Hori, M. (2019). The Effect of Inheritance Receipt on Individual Labor Supply: Evidence from Japanese Microdata. *Japan and the World Economy*, *49*, 176–186.

Suari-Andreu, Eduard. (2023). Labour Supply, Retirement, and Consumption Responses of Older Europeans to Inheritance Receipt. *Empirical Economics 64*(1), 33–75.

Sugano, S., & Matsuyama, H. (2017). Isan ga Ko no Keizaikatsudo ni Ataeru Eikyo: Chukoreisha Panel Data wo Mochiita Bunseki [The Effect of Bequests on Children: New Evidence from a Panel Data Survey of the Elderly]. *Kokumin Keizai Zasshi* [*Journal of Economics & Business Administration*], *215*(1), 35–46 (in Japanese).

Sugano, S. (2019). Isan no Uketori ga Chuukoureisha no Shouhi Koudou ni Ataeru Eikyo ni Tsuite [The Effect of Bequests on the Consumption Behavior of Middle-Aged and Elderly People]. Kikan Kojin Kinyu [*Quarterly Personal Finance*], *14*(1), 23–33 (in Japanese).

Tur-Sinai, Aviad, Harald Künemund, and Claudia Vogel. (2022). Inheritances and Work for Pay — Will the Expected Wave of Bequests Undermine Active Ageing Policies? *European Journal of Ageing 19*(4), 1251–61.

Zhao, L., & Burge, G. (2017). Housing Wealth, Property Taxes, and Labor Supply among the Elderly. *Journal of Labor Economics*, *35* (1): 227–63.

Table 1. Descriptive statistics

	(i)		(ii)		(iii)	
Sample	Respondents whose parent died with a bequest				Respondents whose parent died without a bequest	
Inheritance amount	Greater than zero		5 million yen or more		Zero	
A. Respondents' characteristics (in the year of inheritance)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	45.2	8.0	45.9	7.5	42.5	7.7
Educational attainment						
Junior high school	0.051	—	0.064	—	0.053	—
Senior high school/junior college/technical college	0.771	—	0.766	—	0.808	—
University	0.178	—	0.170	—	0.139	—
Married	0.703	—	0.681	—	0.737	—
Number of children	1.254	1.178	1.319	1.144	1.626	1.233
Youngest child has not yet entered elementary school	0.136	—	0.191	—	0.174	—
Inheritance amount (10,000 yen)	806.4	1359.2	1746.7	1778.8	0	0.0
Number of obs.	118		47		281	
B. Respondents' labor supply and time use (in the year before the inheritance)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Share of respondents participating in the labor market	0.764	—	0.705	—	0.695	—
Full-time workers	0.330	—	0.273	—	0.266	—
Part-time workers	0.387	—	0.409	—	0.367	—
Time use on weekdays (minutes)						
Hours worked (incl. 0 if not working)	334.3	227.7	332.7	258.0	310.8	235.1
Commuting time to work or school	43.0	51.2	43.9	56.1	31.0	38.6
Hours spent on housework and childcare	255.8	202.8	253.9	204.5	301.4	239.6
Hours spent on education, leisure and personal maintenance	806.9	189.4	809.5	207.2	796.8	208.6
Time use on weekends/holidays (minutes)						
Hours worked (incl. 0 if not working)	25.8	88.8	41.1	106.5	12.2	61.8
Commuting time to work or school	2.5	13.7	2.7	10.4	1.6	11.5
Hours spent on housework and childcare	300.8	193.9	294.5	197.5	367.1	234.9
Hours spent on education, leisure and personal maintenance	1110.8	202.8	1101.6	204.7	1059.2	237.8
Hours worked per week (incl. 0 if not working)	25.2	19.2	26.5	19.6	24.0	19.8
Days worked per year (incl. 0 if not working)	150.0	106.6	158.5	119.0	151.6	115.3
Labor income (10,000 yen, incl. 0 if not working)	214.8	229.9	235.5	244.3	160.0	183.7
Number of obs.	106		44		256	
C. Monthly household expenditures (in September of the year before the inheritance)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Household expenditures (10,000 yen)	26.6	18.9	29.1	22.8	—	—
Equivalent household expenditures (10,000 yen)	14.7	9.5	15.8	11.2	—	—
Number of obs.	99		40			

Notes: Inheritance amount, labor income and household expenditure are deflated by the CPI. The share of respondents participating in the labor market includes those who were working (including those temporarily on leave due to childcare, caregiving for parent[s], illness, etc.) or unemployed (i.e., not working but looking for a job) on the survey date. "10,000 yen" and "5 million yen" roughly equaled 92 USD and 46,000 USD at the 2019 exchange rate, respectively.

Source: JPSC, own calculations.

Table 2. Descriptive statistics for the periods before and after parental death

	(i)		(ii)			(iii)		(iv)		
Sample	Respondents whose parent died *with* a bequest				Test for difference between the means of columns (i) and (ii)	Respondents whose parent died *without* a bequest				Test for difference between the means of columns (iii) and (iv)
Before or after parental death	Before		After			Before		After		
	Mean	Std. Dev.	Mean	Std. Dev.	p-value	Mean	Std. Dev.	Mean	Std. Dev.	p-value
Age	42.4	7.7	47.3	7.7	0.000 ***	39.9	7.3	44.3	7.4	0.000 ***
Educational attainment										
Junior high school	0.049	—	0.047	—	0.881	0.056	—	0.044	—	0.130
Senior high school/junior college/technical college	0.779	—	0.792	—	0.592	0.810	—	0.820	—	0.490
University	0.172	—	0.161	—	0.614	0.134	—	0.136	—	0.856
Married	0.678	—	0.679	—	0.953	0.742	—	0.744	—	0.929
Number of children	1.250	1.127	1.279	1.128	0.655	1.590	1.214	1.639	1.227	0.284
Youngest child has not yet entered elementary school	0.128	—	0.096	—	0.083 *	0.200	—	0.125	—	0.000 ***
Inheritance amount (10,000 yen)	805.7	1287.6	847.8	1475.5	0.600	—	—	—	—	—
Number of obs.	633		552			1477		1349		

Notes: Inheritance amount is deflated by the CPI. “10,000 yen” roughly equaled 92 USD at the 2019 exchange rate. p-value shown in the fifth and tenth columns is for the null hypothesis that the means of the characteristics are equal for the periods before and after parental death.

Source: JPSC, own calculations.

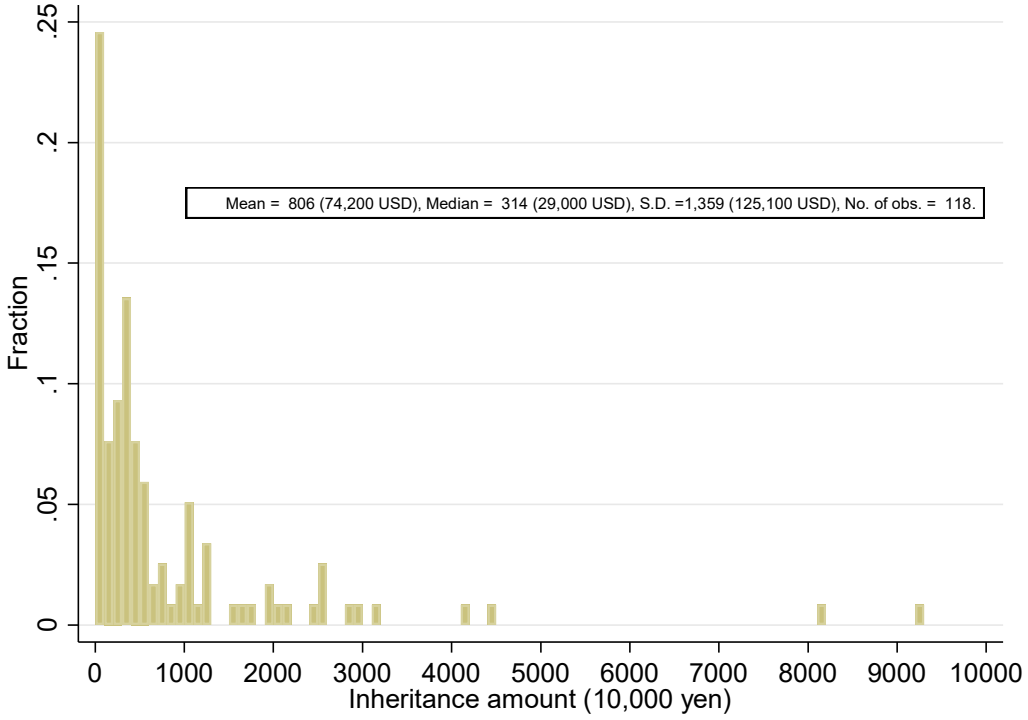
Table 3. Inheritance expectations, informal caregiving, and liquidity constraints

	(i)		(ii)	
Sample	Respondents whose parent died with a bequest			
Inheritance amount	Greater than zero		5 million yen or more	
	Obs.	Mean	Obs.	Mean
Expecting to inherit	103	0.631	42	0.810
Caring for parent	101	0.396	43	0.465
Liquidity constrained	105	0.029	44	0.023

Notes: All values are for the year before the inheritance. "Expecting to inherit" is a dummy variable that takes 1 when a respondent expected to receive an inheritance from the respondent's parent(s). "Caring for parent" is a dummy variable that takes 1 when a respondent and/or her spouse provided care to the respondent's parent(s). "Liquidity constrained" is a dummy variable that takes 1 when a respondent household was liquidity-constrained. "5 million yen" roughly equaled 46,000 USD at the 2019 exchange rate.

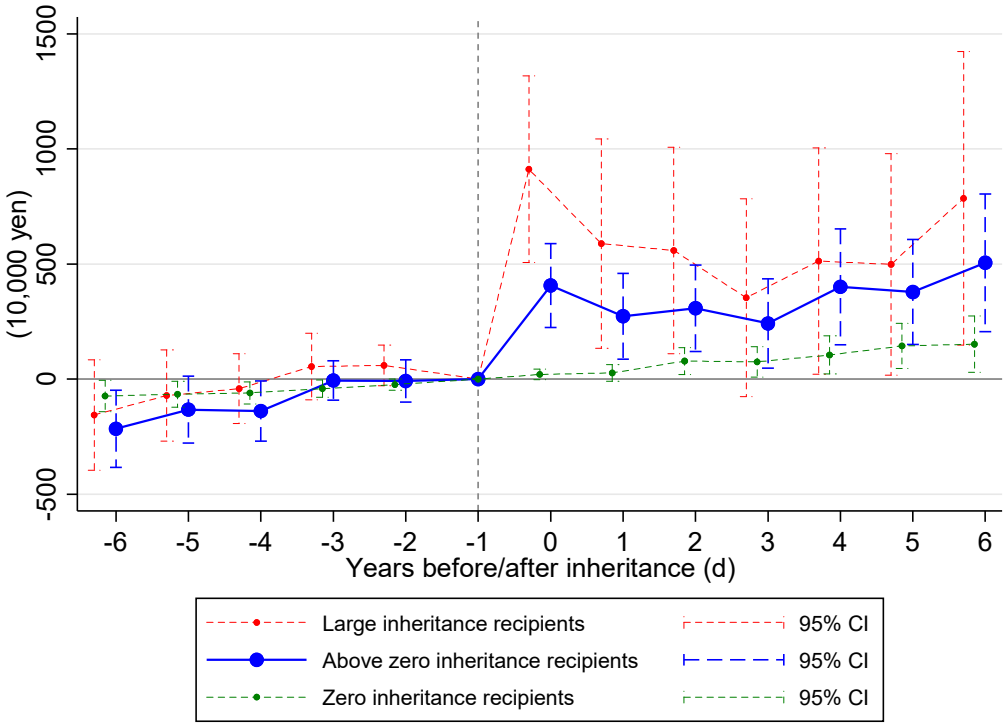
Source: JPSC, own calculations.

Figure 1. Amount received as inheritance (Average and median of inheritances greater than zero)



Notes: The figure shows the histogram of the amount received as inheritances that is greater than zero. The mean, median, standard deviation, and number of observations of the inheritances are shown in the square in the figure. “10,000 yen” roughly equaled 92 USD at the 2019 exchange rate.
Source: JPSC, own calculations.

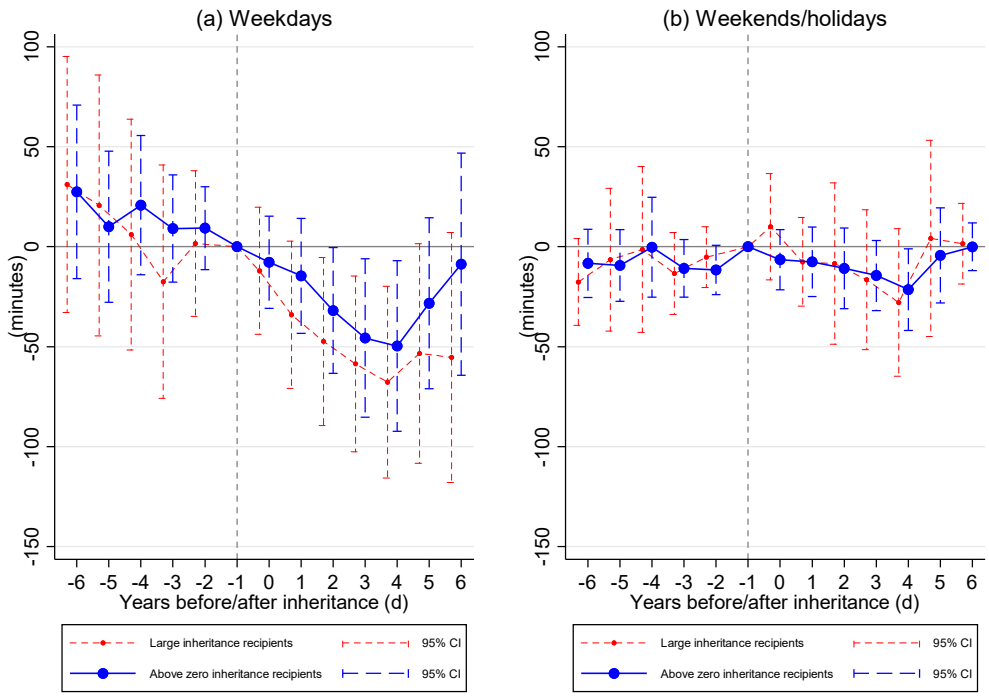
Figure 2. Change in financial assets after an inheritance



Notes: The figure charts the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by respondents' financial assets, from three different regressions for "large inheritance recipients," "above zero inheritance recipients," and "zero inheritance recipients." Each estimate marks the change in the respondents' financial assets around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance and the indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark. "10,000 yen" roughly equaled 92 USD at the 2019 exchange rate.

Source: JPSC, own calculations.

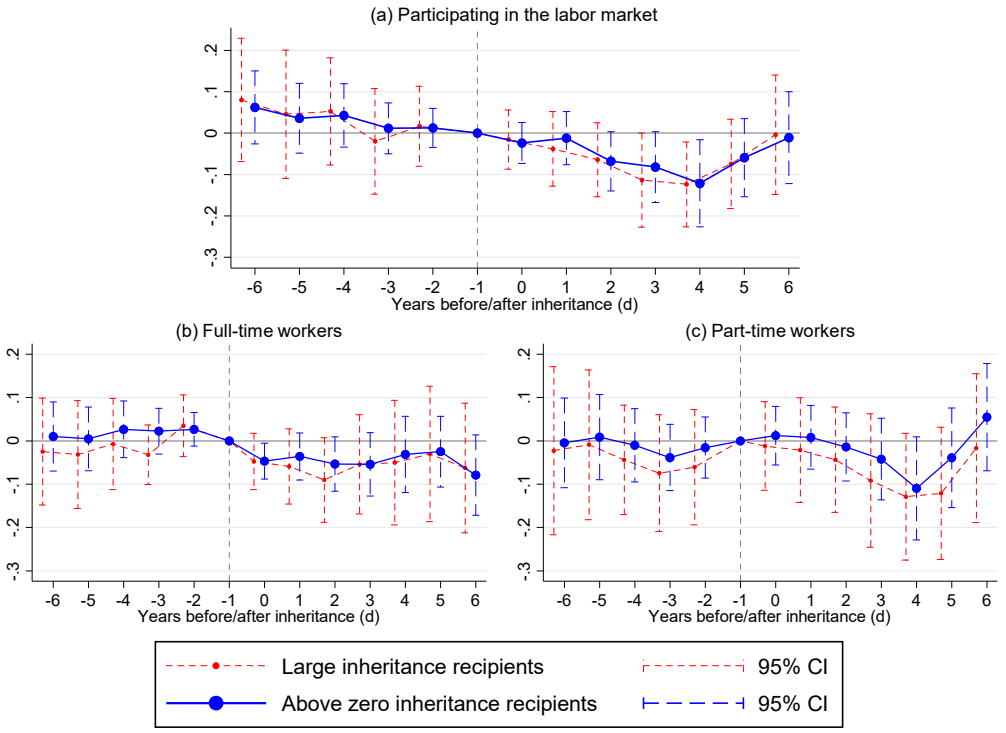
Figure 3. Change in hours worked after an inheritance



Notes: The figures chart the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by hours worked, from two different regressions for "large inheritance recipients" and "above zero inheritance recipients." The left and right figures display the estimation results for hours worked on weekdays and on weekends/holidays, respectively. Each estimate marks the change in hours worked around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance and the indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

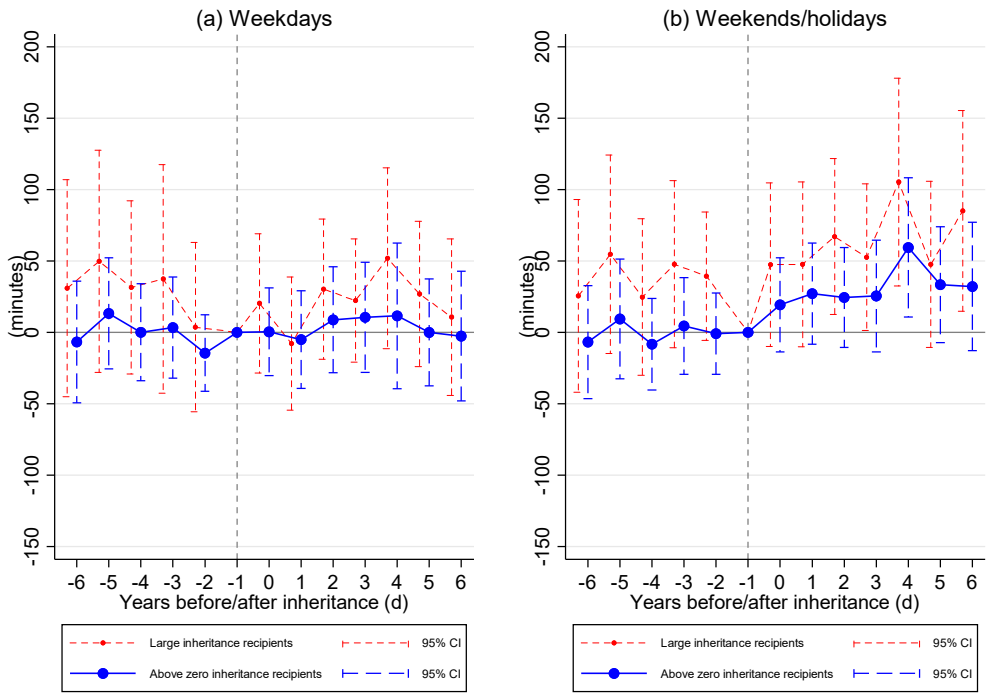
Figure 4. Change in the labor participation rate after an inheritance



Notes: The figures chart the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by a dummy indicating whether respondent i was participating in the labor market or a dummy indicating whether respondents was working full-time/part-time, from two different regressions for "large inheritance recipients" and "above zero inheritance recipients." The upper figure displays the estimation results for the share of respondents participating in the labor market. The figures on the left and right of the lower row display the estimation results for the share of respondents working full-time and part-time, respectively. Each estimate marks the change in those shares around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance and the indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

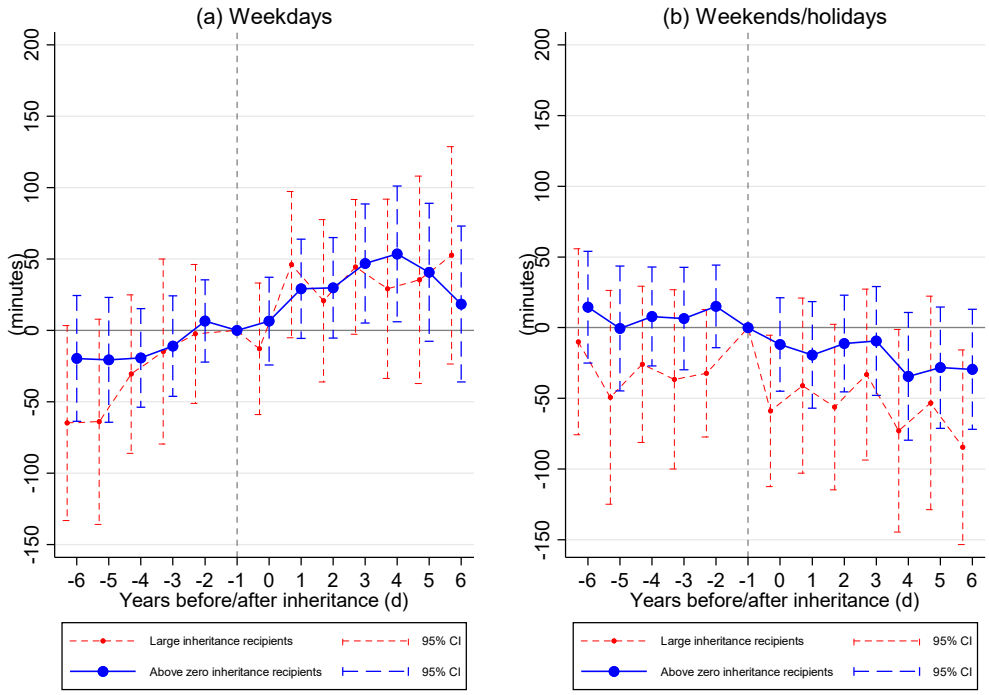
Figure 5. Change in hours spent on housework and childcare after an inheritance



Notes: The figures chart the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by hours spent on housework and childcare, from two different regressions for "large inheritance recipients" and "above zero inheritance recipients." The left and right figures display the estimation results for hours spent on housework and childcare on weekdays and on weekends/holidays, respectively. Each estimate marks the change in hours spent on housework and childcare around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance and the indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

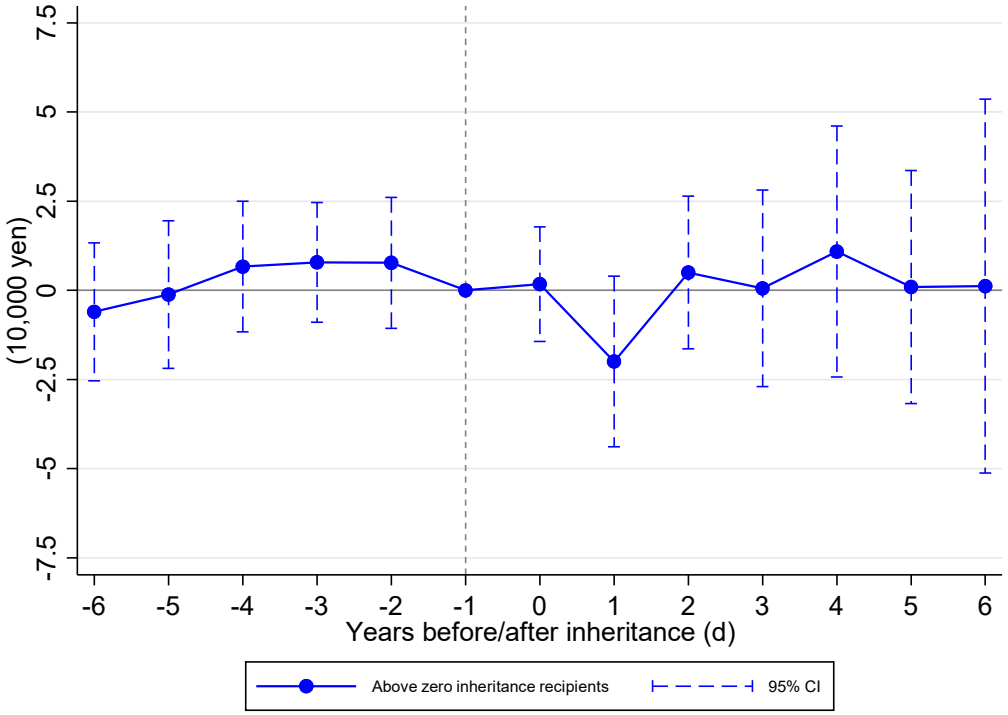
Figure 6. Change in hours spent on education, leisure, and personal maintenance after an inheritance



Notes: The figures chart the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by hours spent on education, leisure, and personal maintenance, from two different regressions for "large inheritance recipients" and "above zero inheritance recipients." The left and right figures display the estimation results for hours spent on education, leisure, and personal maintenance on weekdays and on weekends/holidays, respectively. Each estimate marks the change in hours spent on education, leisure, and personal maintenance around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance and the indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

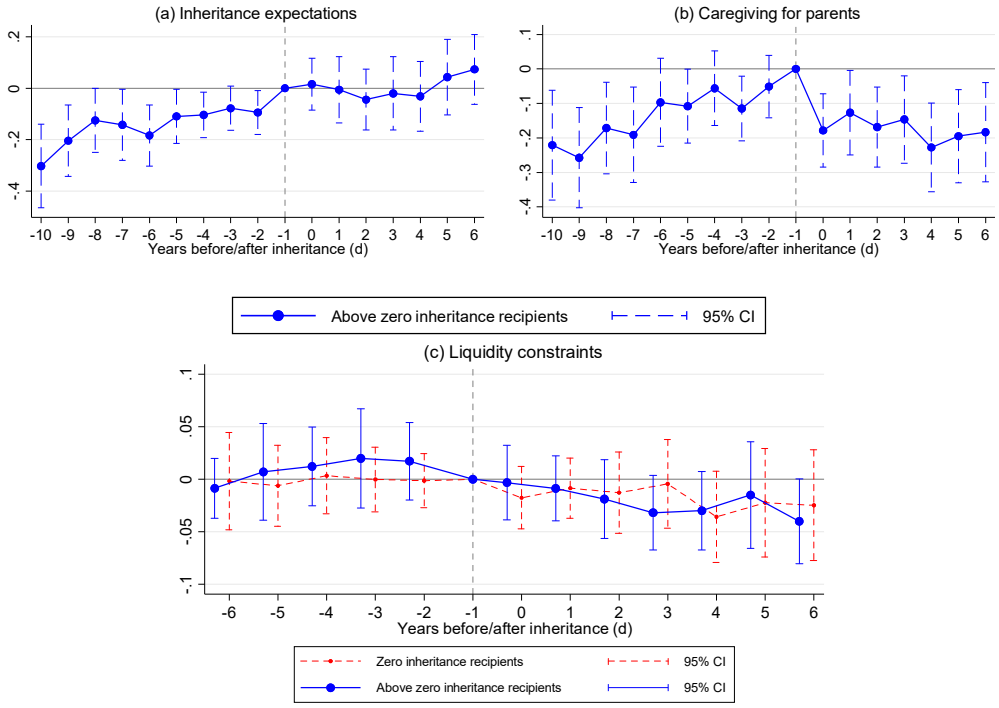
Figure 7. Change in equivalent household expenditures



Notes: The figure charts the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by equivalent household expenditures, from a regression for "above zero inheritance recipients." Each estimate marks the change in equivalent household expenditures around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance and the indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark. "10,000 yen" roughly equaled 92 USD at the 2019 exchange rate.

Source: JPSC, own calculations.

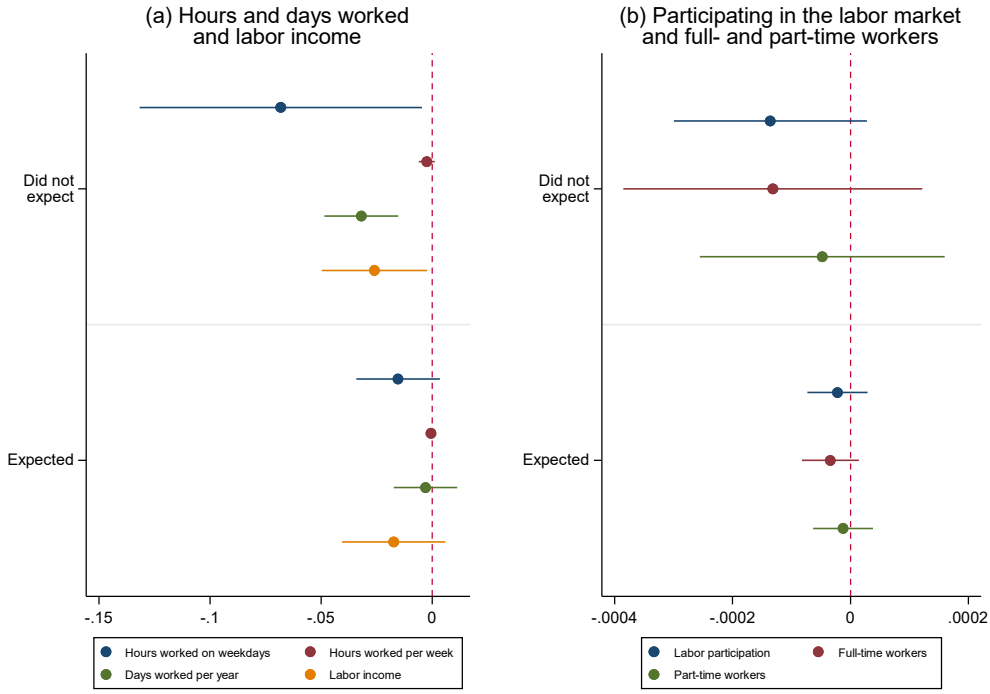
Figure 8. Developments in inheritance expectations, informal caregiving, and liquidity constraints



Notes: In the figures on the left and right of the upper row, we display the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by a dummy variable that takes 1 when respondent i expected to receive an inheritance from the respondent's parent(s) and a dummy variable that takes 1 when respondent and/or her spouse provided care to the respondent's parent(s) respectively, from a regression for "above zero inheritance recipients." In the lower figure, we display the estimated coefficients β_1^d in Eq. (1), with y_i being replaced by a dummy variable that takes 1 when respondent i's household was liquidity-constrained, from two different regressions for "large inheritance recipients" and "above zero inheritance recipients." Each estimate marks the change in those shares around an inheritance. The sample period for the figures of the upper row ranges from 10 years before to 6 years after the year of the inheritance. The sample period for the figure of the lower row ranges from six years before to six years after the year of the inheritance. The indicator for the year before the inheritance year ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

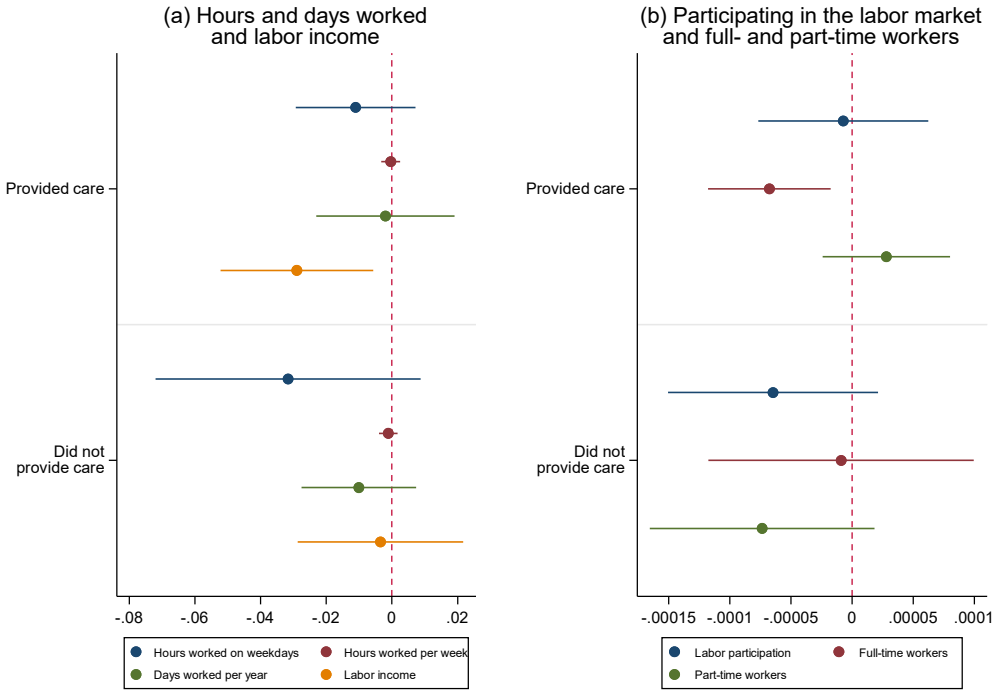
Figure 9. Effect of inheritance on labor supply: Inheritance expectations



Notes: The upper and lower halves of the figures chart the estimated coefficients β_1 and β_2 in Eq. (2) respectively, with Z_i being replaced by a dummy variable that takes 1 when respondent i (and their husband) did not expect to receive an inheritance from the respondent's parent(s) in the year before the inheritance. In the left figure, the dependent variable of each equation is hours worked on weekdays, hours worked per week, days worked per year, and labor income (in order from top to bottom). In the right figure, the dependent variable of each equation is a dummy indicating whether respondent i was participating in the labor market and a dummy indicating whether respondent i was working full-time/part-time (in order from top to bottom). Estimates are obtained from four (for the left figure) or three (for the right figure) different regressions for "above zero inheritance recipients." Each estimate marks the change in those labor supply outcomes around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance. The horizontal whiskers represent 95 percent confidence intervals.

Source: JPSC, own calculations.

Figure 10. Effect of inheritance on labor supply: Caregiving for parents



Notes: The upper and lower halves of the figures chart the estimated coefficients β_1 and β_2 in Eq. (2) respectively, with Z_i being replaced by a dummy variable that takes 1 when respondent i and/or her spouse provided care to the respondent's parent(s) in the year before the inheritance. In the left figure, the dependent variable of each equation is hours worked on weekdays, hours worked per week, days worked per year, and labor income (in order from top to bottom). In the right figure, the dependent variable of each equation is a dummy indicating whether respondent i was participating in the labor market and a dummy indicating whether respondent i was working full-time/part-time (in order from top to bottom). Estimates are obtained from four (for the left figure) or three (for the right figure) different regressions for "above zero inheritance recipients." Each estimate marks the change in those labor supply outcomes around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance. The horizontal whiskers represent 95 percent confidence intervals.

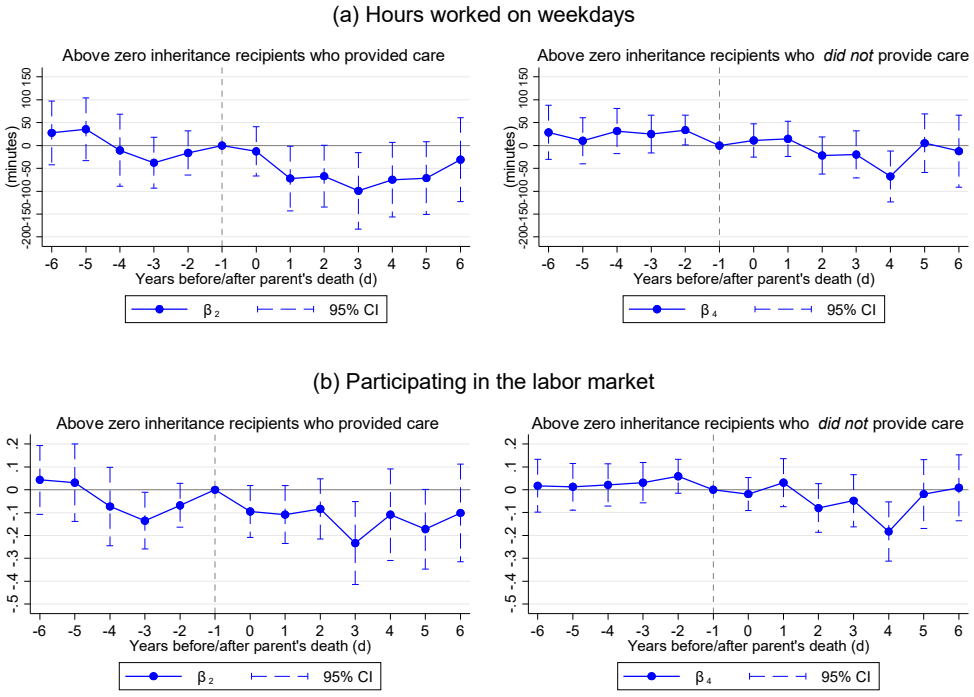
Source: JPSC, own calculations.

Figure 11. Estimation results of event study DID analysis (the estimates of β_1^d and β_3^d)

Notes: The figures chart the estimated coefficients β_1^d (in the left figure) and β_3^d (in the right figure) in Eq. (3), with y_i being replaced by hours worked on weekdays and a dummy indicating whether respondent i was participating in the labor market. Each estimate marks the change in the change in those labor supply outcomes around an inheritance. The sample period ranges from six years before to six years after the year of the parent's death and the indicator for the year before the year of the parent's death ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

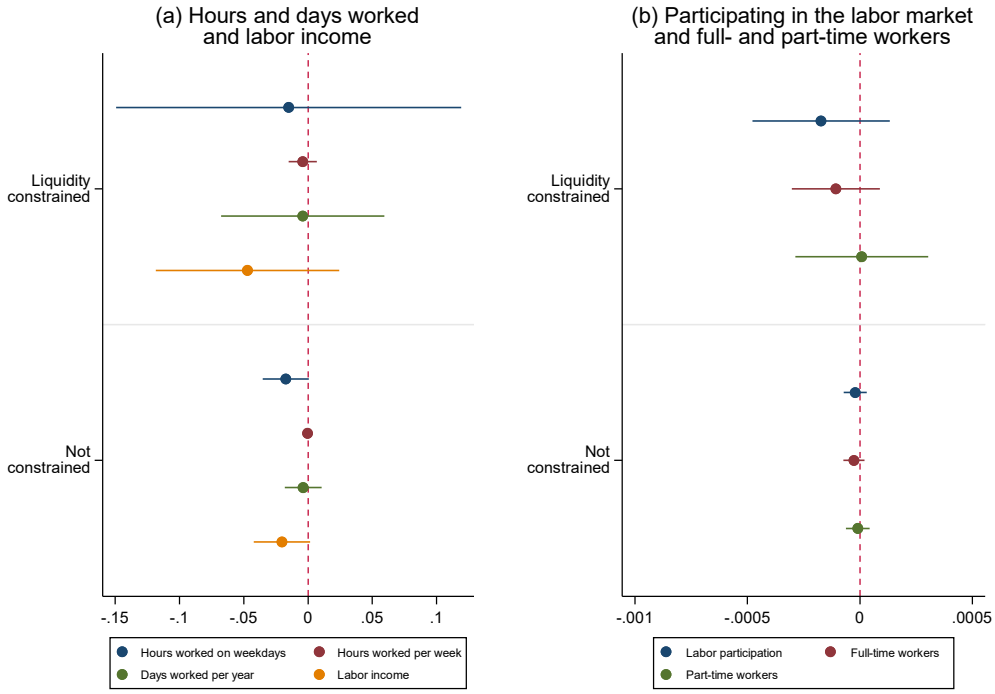
Figure 12. Estimation results of event study DID analysis (the estimates of β_2^d and β_4^d)



Notes: The figures chart the estimated coefficients β_2^d (in the left figure) and β_4^d (in the right figure) in Eq. (3), with y_i being replaced by hours worked on weekdays and a dummy indicating whether respondent i was participating in the labor market. Each estimate marks the change in the change in those labor supply outcomes around an inheritance. The sample period ranges from six years before to six years after the year of the parent's death and the indicator for the year before the year of the parent's death ($\Delta_{it}^I = -1$) is omitted to serve as a benchmark.

Source: JPSC, own calculations.

Figure 13. Effect of inheritance on labor supply: Liquidity constraints



Notes: The upper and lower halves of the figures chart the estimated coefficients β_1 and β_2 in Eq. (2) respectively, with Z_i being replaced by a dummy variable that takes 1 when respondent i (and their husband) was liquidity constrained in at least one of the three years before receiving the inheritance. In the left figure, the dependent variable of each equation is hours worked on weekdays, hours worked per week, days worked per year, and labor income (in order from top to bottom). In the right figure, the dependent variable of each equation is a dummy indicating whether respondent i was participating in the labor market and a dummy indicating whether respondent i was working full-time/part-time (in order from top to bottom). Estimates are obtained from four (for the left figure) or three (for the right figure) different regressions for "above zero inheritance recipients" that had anticipated their inheritance in the year before the inheritance. Each estimate marks the change in those labor supply outcomes around an inheritance. The sample period ranges from six years before to six years after the year of the inheritance. The horizontal whiskers represent 95 percent confidence intervals.

Source: JPSC, own calculations.