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Editor's Introduction to the Special Issue "Intergenerational Transfers and Family in an Aging Society"

Junya Hamaaki

I am pleased to introduce a special issue of the Journal of International Economic Studies, entitled "Intergenerational Transfers and Family in an Aging Society." This issue consists of four papers, all of which are the outcomes of the research project "Empirical Analysis on Intergenerational Transfers and Family Relationships," which was conducted at the Institute of Comparative Economic Studies, Hosei University, from April 2016 to March 2018. One of the important goals of this project was to understand the mechanism underlying the elderly household behavior, including intergenerational asset transfers, consumption and saving behaviors, and their labor supply.

Gaining a better understanding of bequest motives and intergenerational relationships among family members was of considerable relevance for the goal of the project. To do so, in the first paper entitled "Motives for Inter Vivos Transfers in Japan," Junya Hamaaki examines Japanese parents' motives for inter vivos gifts to their children using microdata from the Japanese Panel Survey of Consumers (JPSC). The issue is examined mainly from the following three perspectives: (1) The frequency with which households received such transfers over a 22-year observation period, (2) At what age they typically received transfers, and (3) What kind of life events and characteristics of children affect the receipt of gifts. The results of this paper can be summarized as follows. First, the frequency of receiving gifts from parents is low, and nearly 70% of the respondents of the JPSC received gifts only in three or fewer years in the observation period. Second, they tended to receive gifts from their parents when they were young and the probability of receiving transfers gradually declines with age. Third, respondents were more likely to receive transfers when there was a major life event involving large expenditures and/or when respondents are economically distressed. These results suggest that one of the parents' motives for making inter vivos gifts is to ease liquidity constraints faced by their children.

The research project also attempted to elucidate the impact of aging on Japanese society, especially regarding income inequalities. Therefore, in the second paper, entitled "Impact of Inter-Generational Transfer through Tax and Social Security Systems on Income Inequality in Japan," Fumihiko Suga investigates how the Japanese income redistribution policy has affected income inequalities between different generations. In order to measure income inequality more accurately than previous studies, Suga corrects the bias in the sample distribution of the Comprehensive Survey of Living Conditions, conducted by the Ministry of Health, Labour and Welfare, such that the distribution of respondents' characteristics is consistent with the population distribution of the Population Census. Looking at the changes in a variety of income inequality indexes at 10-year intervals, in 1989, 1999, and 2010, while inequality tended to increase regardless of whether based on the income before or after government redistribution, the trend in widening inequality (as well as the degree of income inequality) is considerably reduced by the income redistribution policy through the tax and social security systems.

The third and fourth papers examine the determinants of elderly people's retirement decisions

in Japan. In the third paper, entitled "Does a Wife's Employment Affect her Husband's Retirement Decision? Evidence from Japanese Longitudinal Data," Tadashi Sakai, Akihito Toda and Atsuhiro Yamada examine whether and how a wife's employment affects her husband's employment, based on a nationally representative and large-scale longitudinal survey of middle-aged and elderly individuals. It is important to understand the determinants of elderly people's labor supply when devising policies to promote their labor participation. Since a husband and wife may possibly determine the timing of their retirement jointly, and since their decisions may influence each other, the authors address this endogeneity problem by using instrumental variables (IVs), such as the wife's health status, the existence of household members in need of care, and dummies indicating whether the wife's age exceeds her pensionable age. They find while the wife's employment is positively and significantly correlated with her husband's employment in the estimation by the fixed-effects model (without using IVs), this tendency disappears after the endogeneity is dealt with.

In the fourth paper, entitled "Health Impacts on Labor Participation of Elderly Japanese Males," Junya Hamaaki and Haruko Noguchi attempt to identify the causal effects of individuals' health status on labor participation among middle-aged and elderly males. To adjust for the potential endogeneity, e.g., a reverse causality from labor participation to health status, of the health variables, they use individuals' body mass index at age 30 and their parents' medical history as IVs. Their analyses indicate that health deterioration has a significant negative impact on the probability of working and working hours per week. This is particularly so for those who suffer from one of the three killer diseases. Further, results from their analysis using a split sample (those under 60 years of age versus those 60 years of age and older) also reveals that while for those under 60, health deterioration has no significant effect on their labor supply, for those aged 60 and over, the probability of working and working hours decrease significantly after health deterioration.

Finally, I would like to express my deepest appreciation to the authors of this special issue for their cooperation. I am also grateful to the members of my research project, including Masahiro Hori, Koichiro Iwamoto, Wataru Kureishi, Daisuke Moriwaki, Keiko Murata, Kazuko Nakata, Takeshi Niizeki, Kazuyasu Sakamoto and Midori Wakabayashi, for their comments and continued support.

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Motives for Inter Vivos Transfers in Japan

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Abstract

Japanese parents' motives for inter vivos gifts to their children are investigated in this paper. Firstly, the frequency of gift receipts is examined to obtain information in order to make conjectures about the motives. For instance, if respondents receive gifts annually, this provides reason to think that the motive is to reduce inheritance taxes; conversely, if respondents receive gifts only rarely, other motives are likely to be more important. Since the results of this paper indicate that gift receipts are not frequent, it seems that few parents make gifts on a regular basis to save inheritance tax. Finally, an estimation of the effects of life events and recipients' characteristics on gift receipts and their amounts is given. The regression results suggest that the motive for gifts stems from a parental desire to ease children's liquidity constraints, since respondents tend to have received gifts when they were young, and when there was a major life event involving large expenditures.

Keywords: Inter vivos gifts; Altruism; Exchange motive; Liquidity constraints; Japan

JEL Classification Codes: **D64, D14, D31**

1. Introduction

What motivates people to makes intergenerational asset transfers is an important aspect to consider when devising gift and inheritance taxation systems. In Japan, factors such as the flattening of the wage curve and the increase in non-regular employment are thought to have led to a decrease in younger people's incomes and to act as a drag on consumption. In addition, with parents living longer, children inherit at a later age, making it more difficult for the working generation to build up assets. Against this background, the Japanese government has, in recent years, increased the taxation on inheritances while at the same time introducing tax exemptions up to a certain amount for inter vivos gifts for education-related expenses and the like.

However, whether tax reductions help to promote inter vivos transfers from parents to their children and, if they do, whether this spurs consumption and asset formation by children depends on parents' motives for inter vivos transfers. For example, if parents make transfers to their children to relieve liquidity constraints and such transfers increase as a result of a reduction in taxes on inter vivos gifts, consumption may increase through the relieving of liquidity constraints, but such transfers are unlikely to lead to asset formation (investment). Moreover, if parents do not have a bequest motive (i.e., if they plan to use up all their wealth themselves), gifts are unlikely to increase much despite the reduction in associated taxes. On the other hand, if parents, based on altruistic motives, give gifts to children that are less well off (than their siblings), such gifts are likely to help

with children's consumption and asset formation.

Against this background, the aim of this study is to examine parental gift giving in Japan using microdata from the Japanese Panel Survey of Consumers by the Panel Data Research Center (PDRC) at Keio University in order to determine the motives underlying inter vivos transfers. [1] Specifically, the issue will be examined from the following three perspectives. First, the proportion of households receiving inter vivos transfers in any given year is examined. Second, the frequency with which households received such transfers over a 22-year period and at what age they typically did so are examined. Third and finally, regression analysis is used to examine the effect of life events on the receipt and the amounts of gifts as well as the characteristics of those that were particularly likely to receive inter vivos transfers.

The results can be summarized as follows. First, the frequency of receiving gifts is low, and about 67 percent of respondents received gifts only in three or fewer years during the 22-year period examined in this study. Second, survey respondents (or their spouses) received transfers when they were relatively young and the probability of receiving transfers gradually declined with age. Third, the regression results indicate that parents make inter vivos gifts mainly during life events involving large expenditures such as purchasing a home or marriage. In terms of individuals' characteristics, the regression results suggest that those in less stable employment and those with lower incomes tended to be more likely to receive transfers, and the amounts they received also tended to be larger. Fourth and finally, the regression results also indicate that, contrary to the exchange-related motive, past financial help from parents is not closely tied with the provision of any kind of informal care to their elderly parents.

The results obtained in this study provide clues regarding the motives underlying inter vivos transfers. Parents may make transfers to ease a child's liquidity constraints, since transfers tend to be made when children are relatively young or during a life event involving substantial expenditures. The finding that the probability of receiving transfers and the amounts received vary greatly depending on children's stability of employment or amount of income (in a particular year) suggests that parents also make transfers to help children make ends meet.

The contribution of this study is to use long-term panel data which allows accounting for time-invariant unobserved heterogeneity (i.e., fixed effects) in regression analyses and tracking of the receipt of inter vivos gifts by the same individual over a long observation period. Although Hamaaki (2020) has also analyzed the receipt of inter vivos gifts based on panel data (Japan Household Panel Survey by the PDRC), which is different from the data used in this study, the present study differs from this previous one in the following three aspects. First, while Hamaaki (2020) focused on the birth of children, change in marital status and the purchase of a home as life events, this study considers a much broader range of events, including deterioration of the recipient's physical and mental health, being involved in an accident or disaster, etc. Second, while Hamaaki (2020) did not take into account the difference in the receipt of gifts due to the difference in the recipient's sibling structure, this study considers this difference (in the analyses by OLS and random effect models) in order to elucidate the role of traditional family values in the distribution of intergenerational transfers. Third, while Hamaaki (2020) focused on the contemporary relationship between transfers from parents and child-provided assistance, this study conducts an analysis considering the possibility that the receipt of gifts and recipients' assistance to their parent(s) occur many years apart.

The remainder of this study is organized as follows. Section 2 provides an overview of the related literature, while Section 3 presents an outline of the data used for the analysis and provides

[1] Until 2017, the Japanese Panel Survey of Consumers was conducted by the Institute for Research on Household Economics, but in 2018 the data were transferred to the Panel Data Research Center at Keio University.

a definition of inter vivos gifts. Sections 4 and 5 then present the descriptive and regression analyses, respectively, using these variables and provides a discussion of the results. Finally, Section 6 concludes the paper.

2. Literature review

This section provides an overview of previous research examining the motives for intergenerational asset transfers, focusing not only on inter vivos transfers but also on bequests. Specifically, Section 2.1 presents studies regarding other countries (primarily the United States), for which there is much more research on this issue than on Japan, while Section 2.2 discusses research on Japan.

2.1. Studies on other countries

A large number of studies – many of them focusing on the United States – have examined the bequest motives of decedents by looking at the division of bequests. If bequests are divided unequally among children, it may be possible to elicit parents' bequest motives by analyzing the characteristics of children receiving bequests. Such studies have been conducted by, for example, Menchik (1980, 1988), Wilhelm (1996), McGarry (1999), Behrman and Rosenzweig (2004), Light and McGarry (2004), Norton and Van Houtven (2006), and Groneck (2017) for the United States, Arrondel et al. (1997) for France, and Ohlsson (2007) for Sweden. These studies show that, in these countries, bequests are divided equally among children in at least 60 percent and up to more than 90 percent of cases.

The fact that bequests tend to be divided equally among siblings even though they differ in terms of a variety of characteristics (such as their innate ability, economic situation, relationship with their parents, etc.) is difficult to reconcile with explanations that focus on parental altruism, the strategic bequest motive (where parents reward their children for looking after them in old age), or an evolutionary motive (where parents prefer their own children to adopted children). Therefore, the finding that inheritances are divided equally among children has been called the "equal division puzzle."

On the other hand, since it has become clear that inter vivos transfers tend to be divided unequally [2] (see, e.g., Dunn and Phillips, 1997; McGarry, 1999; and Hochguertel and Ohlsson, 2009), it may be possible to discover the motives for parental transfers by examining the characteristics of offspring that tend to receive more transfers. Previous studies on inter vivos transfers can be broadly divided into those examining the link with providing care for parents and those examining the link with children's economic situation.

Studies on the link between caregiving and transfers have produced conflicting results. While some found a positive link between transfer receipts and caregiving at the same point in time (Norton and Van Houtven, 2006; Norton et al., 2013; Nivakoski, 2019), others found no (or even a negative) relationship (e.g., McGarry and Schoeni, 1997; Jiménez-Martín and Prieto, 2015). Studies have also focused on the possibility that the receipt of transfers and caregiving do not necessarily occur at the same time. Henretta et al. (1997) and Ciani and Deiana (2018), for instance, examined the link between inter vivos transfers in the past and caregiving at the time of the survey and found a positive relationship between the two.

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[2] The fact that inter vivos transfers are divided unequally also means that the equal division of bequests cannot be explained by the motive that parents want to treat their children equally. If parents wanted to treat their children equally, inter vivos gifts should also be divided equally among children.

Turning to the link between transfers and children's economic situation, a large number of studies have shown that offspring with lower income were more likely to receive inter vivos gifts and/or were likely to receive larger gifts (Dunn and Phillips, 1997; McGarry and Schoeni, 1995 and 1997; McGarry, 1999; Hochguertel and Ohlsson, 2009). Moreover, Olivera (2017) reports that greater income inequality among children made it significantly more likely that parents would make unequal inter vivos gifts to their children.

While many of these studies examine the link between children's income at the time of the survey and transfer receipts (within the year preceding the survey), [3] McGarry (2016) examined the relationship between the two over the preceding 17 years, using nine waves of the Health and Retirement Study. She found that not only low income at the time of the survey but also adverse life events such as unemployment or a divorce increased the probability and size of transfer receipts. These results suggest that even over a long-term horizon parents do not try to equalize inter vivos gifts across children.

2.2. Studies on Japan

Studies in Japan examining bequest motives have relied mainly on questionnaire surveys, and to date there have been hardly any attempts to investigate the motives for intergenerational asset transfers based on the actual division of bequests and inter vivos gifts following the approach used in other countries. The notable exception is a study by Horioka (2002). Using the Survey on the Financial Asset Choice of Households (Kakei ni okeru Kinyu Shisan Sentaku ni kan suru Chosa) by the Postal Services Research Institute, Horioka (2002) examined how respondents and their siblings divided the assets inherited from their parents and found that only about 30 percent of them divided inheritances equally among themselves. [4] This figure is in line with the results of various surveys conducted by Japanese think tanks and other research institutes indicating that the share in Japan is only around 30 percent. The findings thus suggest that the share of bequests that are divided equally among children is considerably lower in Japan than in other countries, where, as mentioned above, bequests are divided equally among children in at least about 60 percent of cases.

The only study examining bequest motives based on data showing who received bequests and how much they received is that by Hamaaki et al. (2019). The authors examined how the different pattern observed in Japan can be explained. The starting point of the discussion is the assumption that, for a variety of reasons, parents would like to divide their assets unequally but do not want their children to know this. Asset transfers can be divided into those that are difficult for siblings to observe and those that are easy to observe. Under these circumstances, parents are likely to choose transfers that are difficult to observe for the unequal division of assets and divide assets equally when transfers are easy to observe.

Since in Japan there are few ways to make (a large amount[s] of) intergenerational asset transfers prior to death, intergenerational asset transfers are mainly carried out through inheritances. This means that if parents want to divide their assets unequally, this is more likely to be reflected in

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[3] That said, of the studies mentioned in the preceding paragraph, Hochguertel and Ohlsson (2009) examine the link between inter vivos transfers and children's income based on estimated permanent income, not income at the time of the survey.

[4] Meanwhile, in a later study, Horioka (2014) attempted to reveal the bequest motives of the Japanese using a survey asking respondents about "the strength of bequest motives," "the stated bequest motives," and "bequest division plans," although he did not use data on the actual division of bequests. As for the question asking respondents how they were planning to divide their assets among their children, 72.7 percent of respondents answered that they were planning to divide their assets equally among their children. This share is more than twice as large as that reported in Horioka (2002), suggesting that decedents' intentions and actual bequest divisions may differ substantially.

the division of bequests than in the United States. [5]

Examining bequest motives using Japanese household microdata on the division of bequests, Hamaaki et al. (2019) found that the unequal division of bequests in Japan was consistent with traditional Japanese family values, according to which the heir to the family line receives a larger inheritance share, as well as the strategic bequest motive, while they did not find any evidence for altruistic motives, where parents bequeath more to economically disadvantaged children. However, this result does not necessarily mean that parents are not altruistic, since intergenerational asset transfers based on altruistic motives may be carried out in the form of inter vivos gifts. Since in the case of inter vivos gifts, unlike in the case of bequests, parents can freely choose the timing of transfers, parents may make such transfers (for example, in the form of providing support with living expenses) when a child is economically distressed.

Studies on the motives for inter vivos gifts in Japan initially focused on gifts to help with purchasing a home (Idee, 2006; Zhou, 2007; Yukutake et al., 2015). Idee (2006), for example, showed that those that received such a gift were more likely to be able to obtain a housing loan from financial institutions (in other words, their liquidity constraints were eased). Meanwhile, Zhou (2007) found when first-time home buyers struggled with the down payment for a home (i.e., were liquidity constrained), financial help from parents meant that children would purchase a home at a younger age and/or would buy a more expensive home. Finally, Yukutake et al. (2015) similarly found that, when restricting the analysis to home buyers under the age of 35, those receiving help from their parents in the form of a gift tended to buy significantly more expensive homes. These findings suggest that receiving an inter vivos gift from parents to help with home-buying eased children's liquidity constraints.

Idee's (2006) study further suggests that in cases where parents started to live with a child after the child's house had been rebuilt, extended, or structurally altered, such children were significantly more likely to receive gifts than children where this was not the case. Meanwhile, Zhou (2007) showed that the higher the frequency of contact with parents, the higher was the probability that children received gifts and the larger was the gift amount received. Both studies therefore conclude that parents giving gifts to their children to help with purchasing a home provides evidence for the exchange motive. On the other hand, Yukutake et al. (2015) showed that parents tend to give gifts based on the exchange motive in the case of children aged 35 or above, but no such tendency was found for children below that age.

The studies considered thus far focus on gifts to help with home purchases. Studies that examine the underlying motives for a much broader range of inter vivos gifts using Japanese data are Zhou (2006) and two recent studies by the author (Hamaaki 2018 and 2020). Zhou (2006) empirically examines the impact of children's and parents' characteristics on the probability of two types of inter vivos gifts – gifts for buying a home and gifts to help with living expenses – to find that the higher the child's income, the smaller is the probability of receiving either of the two types of gifts. Based on this finding, she concludes that parents give gifts based on the altruistic motive. Hamaaki (2018) examines the link between inter vivos transfers, on the one hand, and co-resident parents or caregiving, on the other, and shows that transfer receipts were positively correlated with co-resident

[5] In the United States, as will substitutes and inter vivos gifts such as the transfer of trust assets and life insurance claims provide tax advantages over traditional bequests, there are incentives to conduct intergenerational asset transfers through these means to the greatest extent possible. Since will substitutes and gifts can be regarded as unobservable to others, asset transfers through these means are more likely to be unequal among children. On the other hand, many of the previous studies on the United States have used data on traditional bequests and have examined what kind of bequest division is instructed in wills. Since such bequests are observable to others, it is not surprising that the bequests through this route are divided more equally.

parents and caregiving. Further, Hamaaki (2020) investigates the determinants of the receipt of inter vivos gifts in order to identify the parental motives for intergenerational transfers. In this paper, it is shown that parents tend to make inter vivos gifts when their children face major expenditures such as when buying a home, getting married, or raising children. Overall, the results of Hamaaki (2018 and 2020) indicate that parents transfer their assets while they are alive in order to receive care from their children and/or to ease liquidity constraints of their children.

3. Data sources

This section starts by providing an outline of the Japanese Panel Survey of Consumers, which is used for the analysis in this study. It then provides definitions of the variables related to inter vivos transfer receipts by survey respondents (or their spouses), and finally presents descriptive statistics of the data.

3.1. The Japanese Panel Survey of Consumers

The Japanese Panel Survey of Consumers (JPSC) is a survey of women and their families. It is a panel survey that tracks the consumption, saving, employment situation, family circumstances, etc., of the same households once a year in October. Survey participants are chosen based on a nationwide two-stage stratified random sampling process. When it began in 1993, the survey covered 1,500 women aged 24-34 from across Japan. To make up for attrition over the years, several hundred survey participants aged 24 to 29 were added in each of the fifth year of the survey (1997), the 11th year (in 2003), the 16th year (in 2008), and the 21st year (in 2013). For the analysis in this study, data from 1993 to 2015 are used. The advantage of this dataset for analyzing inter vivos gifts is that each year the survey in principle asked respondents about the receipt of inter vivos gifts within the preceding year. This means that the information on inter vivos gifts should be much more accurate than in the case of surveys where respondents are asked to remember receipts in the past.

3.2. Variables representing the receipt of inter vivos gifts

The JPSC contains numerous questions concerning the receipt of inter vivos gifts from respondents' and their spouses' parents. For instance, regarding assistance from parents, such as for living expenses, the survey has asked respondents since the initial survey whether at the time of the survey their parents paid any of the following (multiple answers allowed): Housing loan repayments, rent, living expenses, and/or expenses for children (educational expenses, clothing, other costs). These will be summarily referred to as "assistance with living expenses" hereafter. Moreover, the survey asks whether respondents received assistance from parents when buying a home and/or to pay for wedding expenses. [6],[7] In addition, the survey provides information on whether respondents received assistance with the costs of giving birth and assistance with medical expenses if they had been ill.

Since the 11th survey, the survey also contains questions asking whether respondents had

[6] Wedding expenses include expenses for engagement souvenirs; engagement-related expenses; the wedding ceremony and reception; a thank-you gift to the matchmaker; the honeymoon; furniture, electrical goods, kitchen utensils, etc.; a kimono, clothes, ornaments; a residence (if newly rented); and others.

[7] The questions asking respondents whether they received assistance from parents when getting married has been asked of respondents that got married in the preceding year in the surveys from 1995 onward. Moreover, those who were married at the start of the survey in 1993 and those who got married between 1993 and 1994 were asked retrospectively in the 1994 survey. In addition, those who were added to the survey in 1997 were asked about the year in which they got married and about their wedding expenses. However, since those who were added in later surveys and were married at the time were not asked about wedding expenses and who paid for them, these observations are not used in the analysis.

received financial or real assets as inter vivos gifts from their parents in the preceding year and, if they had, what the value of those assets were at the time of the survey. However, it seems that respondents believe that this question does not include assistance from parents, such as help with living expenses as inter vivos gifts, and thus the number of respondents who replied to this question that they had received inter vivos gifts is limited to only 20 to 30 respondents a year. I therefore do not use these questions in the analysis of this paper.

To consider whether the results of this study are comparable to those obtained in previous studies, it is useful to take a brief look at the definition of inter vivos gifts in the Health and Retirement Study (HRS) used in many studies focusing on the United States. First of all, it should be noted that the HRS does not ask whether respondents received inter vivos gifts from their parents; instead, respondent couples were asked if they had given financial assistance of US$500 or more to their children in the past 12 months. Specifically, financial assistance consists of giving cash and covering expenses such as medical expenses, insurance fees, educational expenses, helping with the deposit when buying a home, and rent. For example, McGarry (2016), using such data, calculates the share of (respondents') children aged 18 or above and living separately from their parents that received financial assistance (inter vivos gifts). Thus, since inter vivos gifts (financial assistance) in the HRS include various kinds of financial exchange, the variables in this study are constructed in a similar manner taking the various kinds of inter vivos gifts mentioned above into account to make them comparable with the inter vivos gifts (financial assistance) in the HRS.

3.3. Descriptive statistics

Table 1 presents descriptive statistics for the years 1995, 2000, 2005, 2010 and 2015 of respondents included in the initial survey in 1993. The average age in 1995 was 30.9 years, and since then it has risen by about five years every five years. Turning to respondents' educational attainment, 83 percent are high school graduates or have a technical or junior college degree, while only about 12 percent have a university degree. [8] The share of married respondents rose from 75 to 82 percent from 1995 to 2000, but then declined. This may be due to married participants dropping out of the survey over time as they were too busy with child-rearing. The average number of children is about two. Household income for married households is the respondent's annual income, the spouse's annual income, or the sum of the two. This value has increased with the rise in respondents' age from around ¥6.4 million in 1995 to about ¥8 million in 2010, while it declines slightly during the period between 2010 and 2015. For unmarried respondents, household income is the annual income of respondents, and the average ranges from around ¥2.9 million to around ¥3.3 million during the investigation period, with no clear trend. The number of observations decreased by more than 50 percent from 1995 to 2015 due to attrition; however, looking at changes in respondents' age and educational attainment, no particular bias suggesting that those of a specific age or with a particular level of educational attainment were more likely to drop out can be observed.

4. Descriptive analysis

This section presents the results of the descriptive analysis. Specifically, Section 4.1 shows patterns of inter vivos gift receipts from parents for the years 1995, 2000, 2005, 2010, and 2015. Section 4.2 then shows findings regarding the frequency and timing of inter vivos gift receipts.

[8] This reflects the fact that the respondents are women, who, in Japan, are less likely than men to obtain a university degree.

4.1. Patterns of inter vivos gift receipts

This section examines basic patterns in inter vivos gift receipts. As mentioned in Section 3, the JPSC regularly adds participants to the survey; however, in order to avoid discontinuous changes in the age composition of the sample, the sample in this section is limited to participants of the initial survey to look at patterns in inter vivos gift receipts over the years. Further, I do not use respondents those who have already lost both parents for the analysis of this section (except for Table 1 and Figure 1).

Table 2 shows the share of households that received inter vivos gifts in 1995, 2000, 2005, 2010, and 2015 as well as the average amount received. Part A of the table shows the share of households that received financial assistance from parents, such as help with living expenses. The results indicate that the share of respondents that received such assistance from their parents is around 7 to 11 percent, while the share of spouses that received assistance from their parents is around 6 to 16 percent. Finally, the proportion of households that received assistance from at least one set of parents is 14 to 22 percent. The pattern that emerges is that a larger share of households receive assistance from the spouse's parents than from the respondent's parents and that the share of households receiving inter vivos gifts decreases over time (as respondents' age increases). The latter pattern probably reflects the fact that younger households are more likely to be liquidity constrained and therefore may need more assistance from their parents.

Next, part B of the table shows the share of respondents reporting that they (or their spouse) received financial assistance from parents when buying a home among all respondents that bought a home in the preceding year. The figures indicate that between 6 and 19 percent of respondents that bought a home received help from their own parents, while between 9 and 23 percent of spouses received help with purchasing a home from their spouses' parents. Finally, part C of the table shows the share of respondents reporting that they (or their spouse) received assistance with wedding

Table 1. Descriptive statistics

Survey year	1995	2000	2005	2010	2015
	Mean	Mean	Mean	Mean	Mean
Age	30.9	35.9	41.0	45.9	50.9
	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)
Educational attainment					
Junior high school	0.051	0.049	0.050	0.051	0.047
High school, junior college, technical college	0.829	0.836	0.836	0.829	0.833
University	0.120	0.115	0.114	0.120	0.120
Married	0.745	0.820	0.805	0.779	0.746
Number of children (>0)	1.9	2.1	2.2	2.1	2.1
	(0.7)	(0.8)	(0.8)	(0.8)	(0.8)
Total annual household income (million yen, married)	6.4	6.9	7.8	8.0	7.6
	(4.0)	(3.3)	(3.9)	(3.8)	(3.6)
Respondent's total annual income (million yen, unmarried)	2.9	3.2	3.3	3.2	3.1
	(1.4)	(2.2)	(4.0)	(2.0)	(3.0)
No. of observations	1342	1102	904	778	676
No. of observations (for total annual household income of married respondents)	791	849	682	560	476
No. of observations (for total annual income of unmarried respondents)	339	194	174	169	171

Notes: Standard deviations are shown in parentheses. In order to avoid discontinuous changes in the average age of respondents due to the addition of new survey participants affecting the receipt of inter vivos gifts, the sample is limited to respondents taking part from the first survey onward. Total annual household income and respondents' total annual income are converted to 2015 prices.

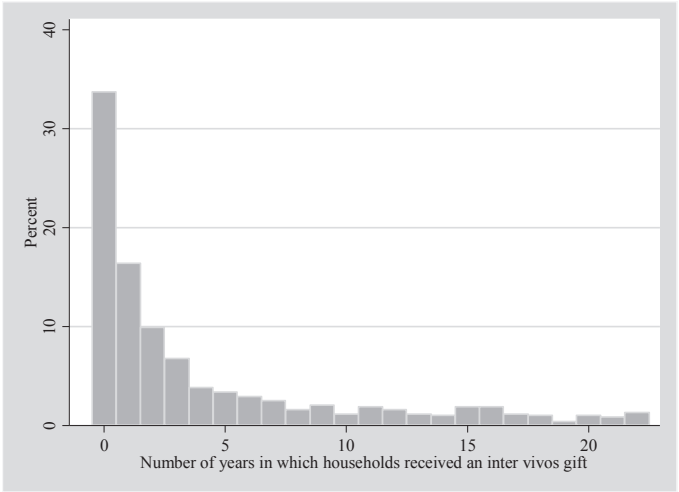

Figure 1. Histogram of the frequency of inter vivos gift receipts

Table 2. Share of households that received inter vivos gifts and amounts received

Survey year	1995	2000	2005	2010	2015
A. Monthly assistance with living expenses and the like					
From respondent's parents					
Share	0.084	0.073	0.108	0.089	0.083
Amount (>0, 1,000 yen)	N.A.	48.5	46.1	49.1	48.9
From spouse's parents					
Share	0.166	0.122	0.117	0.081	0.060
Amount (>0, 1,000 yen)	N.A.	59.4	53.3	53.2	50.7
From respondent's or spouse's parents					
Share	0.224	0.185	0.208	0.160	0.135
Amount (>0, 1,000 yen)	N.A.	62.9	57.6	56.2	57.7
B. Received help with the purchase of a home (among those who purchased a home in the preceding year)					
From respondent's parents					
Share	0.179	0.154	0.170	0.189	0.061
From spouse's parents					
Share	0.207	0.120	0.093	0.231	0.114
C. Received help with wedding expenses from respondent's or spouse's parents (among those who married in the preceding year)					
From respondent's parents					
Share	0.706	0.412	0.571	0.420	0.480
Amount (>0, 1,000 yen)	1638.7	544.9	628.3	682.9	607.8
From spouse's parents					
Share	0.451	0.324	0.500	0.360	0.300
Amount (>0, 1,000 yen)	678.3	340.8	626.2	375.2	411.7

Notes: In parts A and B, the sample is restricted to respondents that participated from the first survey onward in order to avoid discontinuous changes in the average age of respondents due to the addition of new survey participants affecting the receipt of inter vivos gifts. In all parts, the amounts of inter vivos gifts are converted to 2015 prices. N.A. indicates that data were not available.

expenses among those that got married in the preceding year. The table also shows the average amounts received. The share of respondents that received assistance with their wedding expenses varies quite substantially over the years, ranging from around 30 to 71 percent. These shares,

Table 3. Share of households without co-resident parents that received inter vivos gifts and amounts received

Survey year	1995	2000	2005	2010	2015
From respondent's parents					
Share	0.083	0.048	0.050	0.044	0.033
Amount (>0, 1,000 yen)	N.A.	38.3	36.7	28.4	30.4
From spouse's parents					
Share	0.084	0.035	0.032	0.025	0.010
Amount (>0, 1,000 yen)	N.A.	51.4	37.0	55.3	64.3
From respondent's or spouse's parents					
Share	0.133	0.077	0.071	0.060	0.042
Amount (>0, 1,000 yen)	N.A.	59.2	39.5	61.0	64.3

Notes: The sample is restricted to respondents that participated from the first survey onward in order to avoid discontinuous changes in the average age of respondents due to the addition of new survey participants affecting the receipt of inter vivos gifts. In all parts, the amount of inter vivos gifts is converted to 2015 prices.

however, are substantially larger than for those who received assistance with buying a home. While gifts (financial assistance) for the purchase of a home beyond a certain threshold are subject to gift tax, gifts to cover wedding expenses are generally exempt from tax, which may explain this difference.

If a respondent's household includes a(n elderly) parent (or parents), it is possible that the parent(s) give(s) money to the child (i.e., the respondent or her spouse) to pay for their own living expenses (or rent). In this case, such transactions may look like inter vivos gifts in the data, but it cannot really be said that these are inter vivos gifts. Therefore, in order to exclude exchanges of money between parents and children resulting from cohabitation, it is useful to examine inter vivos gift receipts by restricting the sample to households where parents do not cohabit with the respondent. Households without co-resident parents are households that in the JPSC are not classified as "co-resident households" or "quasi co-resident households." [9] Meanwhile, households where all parents have died are not included in households that have no co-resident parents.

Table 3 shows gift receipts for households without co-resident parents. The share of households that received assistance with living expenses in the preceding year is less than half of that in Table 2, except for the figure of monthly assistance from respondents' parents in 1995, although the average amounts are not much smaller. The figures suggest that in households where parents, especially the spouse's parents, live with their children, exchange of money is quite common, and what is picked up as "assistance with living expenses" in the survey often consists of parents paying their share of household expenditures.

Thus far, the analysis has focused on the share of households receiving a particular kind of inter vivos gift and the average amount. Next, let us examine the share of households that received any inter vivos gift in the preceding year, regardless of the kind of gift. To do so, gifts taken into account also include assistance with expenses related to childbirth and assistance with medical treatment expenses for family members other than the respondent, which were not considered in Tables 2 and 3. Part A of Table 4 shows the share of households that received inter vivos gifts in the preceding year for all households, including households with co-resident parents. As also already seen in Table

[9] "Co-resident households" are households in which parents live in the same building and household finances are shared, while "quasi co-resident households" are households in which parents live in the same building but household finances are separate or in which parents live in a different building on the same plot of land.

Table 4. Share of households that received inter vivos gifts (all households vs. households without co-resident parents)

Survey year	1995	2000	2005	2010	2015
A. Received inter vivos gifts of any kind in the preceding year (all households)	0.256	0.194	0.218	0.176	0.139
B. Received inter vivos gifts of any kind in the preceding year (households without co-resident parents)	0.179	0.087	0.092	0.080	0.053

Note: The sample is restricted to respondents that participated from the first survey onward in order to avoid discontinuous changes in the average age of respondents due to the addition of new survey participants affecting the receipt of inter vivos gifts.

2, the share of households receiving inter vivos gifts in some form tends to decrease over time (as respondents' age increases) from 25.6 percent to 13.9 percent for all households.

Finally, to compare inter vivos gifts in Japan with those in the United States, part B of Table 4 shows the share of households that received gifts focusing only on households without co-resident parents. This is more or less comparable with the situation examined by McGarry (2016), who analyzed gift receipts by children over the age of 18 who live separately from their parents. Specifically, the mean age (30.9 years old) of the recipients of her survey (the 1992 HRS survey) is exactly the same as the 1995 JPSC survey. The results in part B of Table 4 indicate that although the share in 1995 is considerably large, from 2000 onward the share of respondents reporting that they (or their spouse) received inter vivos gifts from their parents in the preceding year make up slightly less than 10 percent. McGarry (2016) found that about 12 to 15 percent of children received gifts from their parents in the preceding year, regardless of the year surveyed. The values obtained in this study are somewhat larger than these values in McGarry (2016) only when recipients are relatively young, decrease with recipients' age, and eventually become lower than the values in the U.S. [10]

4.2. The frequency and timing of inter vivos gift receipts

This section examines the frequency and timing of inter vivos gift receipts. Discovering whether gifts are given more or less annually or, alternatively, are given only rarely can potentially provide important information from which we may make conjectures about the motives underlying such gifts. For instance, if respondents receive gifts more or less annually, this provides reason to think that the motive is to reduce inheritance taxes; conversely, if respondents receive gifts only rarely, other motives (exchange or altruistic motives, including the desire to ease liquidity constraints) are more likely. For the analysis here, inter vivos gifts include all kinds of the abovementioned assistance from parents. Since questions about some types of assistance have been included in the survey only since 1994, the analysis here regarding gift receipts focuses on the 22-year period from 1994 to 2015.

To examine the frequency of inter vivos transfers, Figure 1 shows a histogram of the number of years in which respondents (or their spouses) received a gift over the 22-year period. Of the 1,500 respondents included in the initial survey, the 676 respondents that did not drop out during the observation period (1993 to 2015) were used for this analysis. Those who never received a gift from their parents during the 22-year period make up the largest share (33.7 percent), while those who received a gift in fewer than three of the 22 years (including those that never received a gift) total

[10] Since HRS only looks at the inter vivos gifts (financial assistance) of US$500 or more, the share of children who received gifts from their parents in the preceding year should become higher if it includes gifts of smaller amounts. In other words, the actual difference in the share between Japan and the U.S. may be more substantial.

Table 5. Share of households that received gifts in the two preceding years

(a). All households

	Receipt in year *t*-1		
Receipt in year *t*	Did not receive	Received	Total
Did not receive	23,575	2,562	26,137
	(71.3%)	(7.7%)	(79.1%)
Received	2,230	4,692	6,922
	(6.7%)	(14.2%)	(20.9%)
Total	25,805	7,254	33,059
	(78.1%)	(21.9%)	(100.0%)

(b). Households without co-resident parents

	Receipt in year *t*-1		
Receipt in year *t*	Did not receive	Received	Total
Did not receive	15,244	1,253	16,497
	(82.7%)	(6.8%)	(89.5%)
Received	841	1,092	1,933
	(4.6%)	(5.9%)	(10.5%)
Total	16,085	2,345	18,430
	(87.3%)	(12.7%)	(100.0%)

66.9 percent. Since it is possible that some of the "gifts" received may include money received from parents toward their own living expenses in the case of co-resident parents, the frequency of actual gift receipts from parents is probably even lower if these monetary exchanges are excluded. Therefore, it could be said that, for many people, the receipt of inter vivos gifts from their parents is a very rare occurrence.

Next, Table 5 shows the number of observations and the share of respondents (including their spouses) that received gifts for two years in a row, with panel (a) presenting the results for all respondents and panel (b) the results for respondents without co-resident parents. Table 5(a) for all respondents suggests that the share that received gifts in two consecutive years is only 14.2 percent. If respondents with co-resident parents in years *t* and *t-1* are excluded – i.e., hence focusing on respondents without co-resident parents only –, the share of respondents (including their spouses) that received gifts for two years in a row decreases to 5.9 percent. Since these results suggest that gift receipts (especially among households without a co-resident parent) are rare, it seems that there are few parents that make gifts on a more or less regular basis to save inheritance tax.

Next, to look at the timing of gifts from parents to children, the age of respondents at the time they (or their spouse) received a gift from their parents is examined. If a clear pattern emerges, this might help to narrow down parents' motives for giving gifts. For instance, in the case of the exchange motive, where parents give gifts to ensure that children take care of them in their old age, they should wait as long as possible in order to elicit the greatest effort – otherwise, children might not look after their parents in old age if gifts are given too early. [11] On the other hand, if parents are altruistic and give gifts for the purpose of easing income disparities among their children, one would

[11] In fact, in the case of intergenerational asset transfers based on the strategic motive, it is generally thought that the optimal strategy is to make such transfers through a bequest to maximize children's efforts. However, it could also make sense for parents to partly "pay" for such efforts in advance, so that children believe that they will receive assets in return for looking after their parents in old age (see, e.g., Norton and Van Houtven, 2006, p.161).

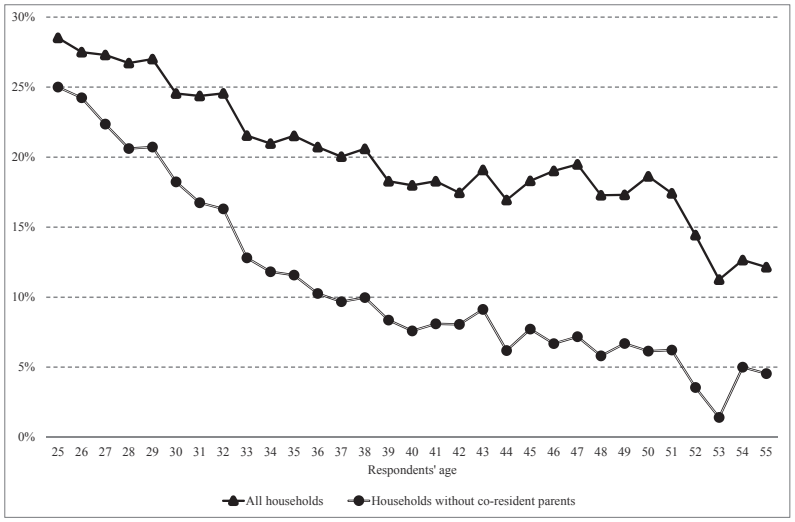

Figure 2. Share of households that received an inter vivos gift in the preceding year by age

expect that gifts are not given when offspring are relatively young but rather when they are older and disparities have become clear. Meanwhile, if the purpose of gifts is to relieve liquidity constraints, one would expect that recipients would be younger people with relatively low incomes that make it difficult to pay for wedding expenses or buy a home, and so on.

Thus, to examine the pattern in recipients' age, Figure 2 shows the percentage of households (respondents or their spouses) that received a gift (vertical axis) by respondents' age group (horizontal axis). The figure shows the percentage calculated for all households and for households without co-resident parents. In both cases, the share is relatively high in young households and then decreases with age until households in which respondents were in their 40s, when the share starts to move sideways. This pattern likely reflects the idea that the share of households that receive gifts to help with wedding expenses and/or buying a home decreases with age until around the age of 40, while the share of households receiving gifts for other purposes remains more or less unchanged. [12] The results therefore suggest that parents give gifts mainly for the purpose of easing liquidity constraints faced by children who need to pay wedding expenses or buy a home. When parents do so, they can avoid taxes if the gifts do not exceed a certain threshold and/or gifts are for specific purposes, such as for wedding expenses, educational expenses, and so on. This kind of tax advantage helps parents make intergenerational transfers that involve smaller tax payments while their children are still young.

[12] To examine this issue in more detail, the author examined separately the share of households by age group that received gifts for each of the three types of gifts shown in Table 2 – that is, gifts to help with buying a home, to help with wedding expenses, and to help with living expenses –. When doing so, gifts for help with living expenses were divided into help with housing loan repayments, rent, living expenses, expenses for children, and others, and the share by age group for each of these was calculated. The results show that the share of households that received gifts to help with housing loan repayments and rent decreased slightly among those in their 40s, the share that received gifts to help with buying a home and help with expenses for children remained more or less unchanged, and the share that received help with wedding expenses and gifts to help with other items (i.e., housing loan repayments, rent, living expenses, and others) decreased. Taken together, the patterns for the different gift categories result in the flattening of the share, seen in the figure, for households in which respondents are in their 40s.

5. Regression analysis

This section presents the results of the regression analysis. Specifically, Section 5.1 describes the econometric approach used to examine the determinants of the receipt of inter vivos gifts. Section 5.2 and 5.3 explain the results of the regression analysis, which attempts to elucidate the parental motive for inter vivos gifts. Section 5.4 examines whether parental transfers for home purchase are associated with the child(ren)'s subsequent provision of in-kind and/or financial help to their elderly parents. The purpose of this analysis is to examine whether these transfers are caused, at least partly, by a parental exchange motive.

5.1. Econometric approach

This paper examines the link between life events involving major expenditures and respondents' characteristics, on the one hand, and the probability of receiving inter vivos gifts and the amount of received, on the other, using regression analysis. To do so, I estimate the following equation:

$$Gifts_{it} = \alpha + LifeEvents'_{it}\beta + X'_{it}\gamma + year_t + u_i \quad (1)$$

where i indicates a respondent couple or a respondent (or her husband). $Gifts_{it}$ indicates the probability of receiving gifts or the size of transfer receipts. $LifeEvents_{it}$ and X_{it} represents a vector of dummies for life events in the preceding year and that of respondent (or respondent couple) i's characteristics, respectively. u_i is an error term that is assumed to be independently and normally distributed. I analyze the determinants of the probability of receiving gifts by specifying the equation (1) as a Linear Probability Model. On the other hand, when the dependent variable is the size of transfer receipts, which is bounded below by 0, I estimate the equation with Tobit and other panel regression models (i.e., pooled OLS and random and fixed effect models). The sample is limited to participants whose parent(s) is/are alive at the survey date in the regression analyses.

Possible answers in the survey regarding life events in the preceding year include the following: gave birth, had a serious illness requiring surgery or long-term care, had mental problems such as depression, had "consumer trouble" (falling victim to loan- and credit card-related scams, phishing attacks, etc.), was involved in an accident or disaster, nothing out of the ordinary happened, got married, and bought a home. [13] A dummy is constructed for each of these and used as an explanatory variable. It should be noted that "bought a home" implies that the home ownership status changed from rented housing to owner-occupied housing, so this variable does not include respondents that already owned a home and bought a new one.

Variables for respondents' characteristics include their age, sibling structure, educational attainment, marital status, number of children, a dummy variable for households without co-resident parents, dummies for their employment status, household income (in logarithms), and household financial assets. [14] The coefficient on respondents' age is expected to be negative if the older respondents become the less likely it is that they will receive gifts from parent(s) as seen in Figure 2.

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[13] The JPSC contains a question that asks, "Have you experienced the following events in the preceding year?" There are about 15 possible answers of this question, including "had a serious illness requiring surgery or long-term care," "had mental problems such as depression," "had consumer trouble," "was involved in an accident or disaster," etc. The choice of "nothing out of the ordinary happened" is also included in the possible answers to this question. On the other hand, the dummies for "gave birth," "got married" and "bought a home" are constructed from other questions in the JPSC.

[14] Because a large number of households had zero household financial assets, the level is used rather than the log.

To represent the sibling structure, I use the following three variables: (1) a dummy variable that takes one if the respondent (her spouse) is not an only child, (2) a dummy variable that takes one if the respondent (or her spouse) has a sibling/siblings of the other sex, and (3) a dummy variable that takes one if the respondent (or her spouse) is the first-born daughter (or son). To gauge the gender effect relative to respondents with siblings of the same sex only, I intersect the first dummy variable with the second one (referred to as "gender dummy" below). Since all the respondents (her spouses) in our survey are female (male), the coefficient of this intersected variable can be interpreted as the gender effect. Similarly, the intersection term of the first dummy variable and the third one also indicates the first-born daughter (son) effect. The coefficient on the gender dummy is expected to be negative if women are treated unfavorably. The coefficient on the first-born dummy (intersected with the dummy for having one or more siblings) is also expected to be positive if, for some reason, gifts are distributed disproportionately to the first-born daughter (son).

The coefficient on the dummies for educational attainment is expected to be negative if educational investment is a sort of prepayment of inter vivos gifts and they are mutually substitutable. On the other hand, if the educational attainment represents the amount of a respondent's permanent income and parents are transferring their wealth altruistically, I also expect the coefficient on those dummies to be negative, since those who are better educated are likely to earn more over their lifetimes.

To consider the economic needs related to household structure, I add the dummy variable for marital status, number of children, and the dummy variable for households without co-resident parents. If parents want their family line to be maintained, they would transfer more wealth to the child(ren) who is/are married and have many children than those who are single and/or do not have any children. On the other hand, altruistic parents would try to ease liquidity constraints faced by those with many children to help with child-rearing and education expenses. Thus, I expect the coefficient on the marital status dummy and the number of children to be positive. I add the dummy variable for households without co-resident parents to control for a potential difference in the probability of receiving gifts and the amounts received between households with and without co-resident parents, as shown in Figure 2.

I also control for the respondents' financial strength in order to elucidate the role of parental altruism. If parental altruism matters for an allocation of transfers among offspring, gifts would be disproportionately distributed toward economically disadvantaged children. To represent respondents' employment status, a dummy for regular employees and one for non-regular employees are used, meaning that those not in employment are the reference group. Household income is respondents' annual income or the combined income of the respondent and her husband if the respondent is married, excluding other income (remittances and spending money from parents, child support, etc.). The reason for excluding other income is that it may include inter vivos gifts from parents. Household financial assets are financial assets owned by respondents, spouses, and their children, and do not include financial assets owned by co-resident parents.

5.2. Determinants of the probability of receiving gifts

This subsection presents regression analyses to examine the link between life events and gift receipts as well as the kind of respondent characteristics that make the receipt of inter vivos gifts more likely. I start with a specification whose dependent variable is the dummy variable that indicates whether a respondent (or her spouse) received an inter vivos gift in the preceding year (i.e., the variable whose mean value is shown in Table 4). The variables related to sibling structure are not present in this specification, since the dependent variable does not focus only on a gift from the respondent's parents or a gift from her husband's parents, thus making it difficult to estimate the effect of the

Table 6. Determinants of inter vivos gift receipts

Dependent variable	Dummy for receipt of inter vivos gift in the preceding year		
	(a)	(b)	(c)
Estimation method	OLS	Random effect	Fixed effect
Independent variables	Coeff.	Coeff.	Coeff.
Life event in the preceding year			
Gave birth	0.034 ***	0.034 ***	0.036 ***
	(0.011)	(0.010)	(0.010)
Had a serious illness that required surgery or long-term medical treatment	0.035 **	0.031 *	0.032 *
	(0.016)	(0.016)	(0.017)
Had mental health problems such as depression	0.071 ***	0.049 ***	0.044 ***
	(0.017)	(0.016)	(0.017)
Had consumer problems	0.096 ***	0.065 **	0.061 **
	(0.035)	(0.030)	(0.030)
Was involved in an accident or disaster	0.023 *	0.008	0.004
	(0.014)	(0.012)	(0.012)
Nothing out of the ordinary happened	-0.014 ***	0.001	0.004
	(0.005)	(0.004)	(0.004)
Got married	0.455 ***	0.450 ***	0.446 ***
	(0.020)	(0.021)	(0.022)
Bought a home (renter → homeowner)	0.142 ***	0.157 ***	0.164 ***
	(0.016)	(0.016)	(0.016)
Respondent's characteristics			
Age	-0.007 ***	-0.008 ***	-0.004 ***
	(0.000)	(0.001)	(0.001)
Educational attainment (reference group: junior high school)			
High school, junior college, technical college	0.063 ***	0.075 ***	-
	(0.010)	(0.021)	-
University	0.100 ***	0.111 ***	-
	(0.012)	(0.024)	-
Married	0.203 ***	0.176 ***	0.159 ***
	(0.008)	(0.015)	(0.019)
No. of children	0.029 ***	0.018 ***	0.009
	(0.002)	(0.005)	(0.007)
Household without co-resident parents	-0.275 ***	-0.199 ***	-0.153 ***
	(0.005)	(0.012)	(0.015)
Employment status (reference group: not in employment)			
Regular employee	-0.037 ***	-0.050 ***	-0.050 ***
	(0.006)	(0.009)	(0.010)
Non-regular employee	-0.002	-0.023 ***	-0.024 ***
	(0.006)	(0.007)	(0.008)
Household income (log)	-0.072 ***	-0.062 ***	-0.052 ***
	(0.005)	(0.007)	(0.009)
Household financial assets	0.000004	-0.000009 *	-0.000013 **
	(0.000003)	(0.000005)	(0.000006)
R^2: within	-	0.085	0.087
between	-	0.207	0.129
overall	0.166	0.156	0.120
Model selection test		Breusch-Pagan	Hausman
		22210.35 ***	245.82 ***
No. of observations	31,237	31,237	31,237

Notes: Figures in parentheses are heteroskedasticity-robust standard errors. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively. Coefficients on regional and year dummies are not shown to conserve space.

sibling structure clearly. The estimation results are shown in Table 6. Based on the results of the Breusch-Pagan and Hausman tests for model selection, the fixed effect model is selected, and thus the interpretation of the coefficient estimates here is based on the results shown in column (c). [15] Starting with the dummy variables representing life events in the preceding year, all dummies except for "was involved in an accident or disaster" and "nothing out of the ordinary happened" have significant coefficients. Especially when there is a wedding or a purchase of a new home, the probability of receiving a gift is substantially higher. In addition, respondents were also more likely to receive inter vivos transfers if they had health problems, including depression or childbirth. These findings suggest that the purpose of such gifts is to ease liquidity constraints, as also discussed in Section 4.2.

Turning to respondents' characteristics, the probability of receiving gifts tends to decrease with age. This is consistent with the pattern in Figure 2 indicating that the share of households receiving gifts declines with age. While married respondents are likely to receive inter vivos gifts, no such pattern is observed for those in the data who have many children when fixed effects are controlled for. Meanwhile, households where parents were not co-resident were significantly less likely to receive gifts than those with co-resident parents. This finding likely reflects the following two effects. The first is that, in the case of households with co-resident parents, if parents hand over money to cover their living expenses to the child, this is considered in the data as a gift. The second is the effect that households with co-resident parents receive gifts from parents in return for providing care to parents or allowing them to cohabit. However, if parents are transferring their assets strategically, they should try to delay the transfers as much as possible (e.g., until their own death) to draw maximum care efforts from the offspring. Therefore, the first effect seems to dominate the second effect.

Looking at the coefficients on the variables regarding the respondents' financial strength, the probability of receiving gifts was significantly lower for those who were working than for those who were not working, and among those who were working it was significantly lower for those in regular than those in non-regular employment. Next, higher household income (excluding remittances and spending money from parents) was associated with a significantly lower probability of receiving gifts from parents. Finally, respondents with abundant financial assets were less likely to receive gifts from parents. These results are consistent with the expectation from the altruism model. Moreover, since the fixed effect model estimates coefficients exploiting the variation within individuals (around the individual mean of those variables), the negative coefficients signify that parents decide whether or not to give gifts according to short-term fluctuations in their children's financial strength.

Table 7 (Table 8) reports the estimation results for the specification whose dependent variable is the dummy that indicates whether a respondent (or her spouse) received assistance with living expenses in the preceding year from the respondent's (or her spouse's) parents. When employing this specification, I add the variables regarding respondents' (or spouses') sibling structure to the vector of explanatory variables. Looking at the results for the assistance from respondents' parents, the coefficient of the gender dummy is significantly negative, implying that women are treated unfavorably when gifts are allocated among siblings. [16] On the other hand, as for gifts from the

[15] While the dummies for educational attainment are dropped in the fixed effect model, contrary to what one might expect, they are estimated to be significantly positive by the OLS and random effect models. This result may suggest that the unobserved parents' affluence included in the error term is positively correlated with the respondent's educational attainment.

[16] Since the sibling structure is time-invariant and, therefore, dropped from the fixed effect model, I focus on the results from the random effect model when interpreting the coefficients on the sibling structure variables.

Table 7. Determinants of the receipts of assistance with living expenses from respondents' parents

Dependent variable	Dummy for receipt of monthly assistance with living expenses and the like in the preceding year		
	(a)	(b)	(c)
Estimation method	OLS	Random effect	Fixed effect
Independent variables	Coeff.	Coeff.	Coeff.
Life event in the preceding year			
Gave birth	0.006	0.004	0.005
	(0.009)	(0.007)	(0.008)
Had a serious illness that required surgery or long-term medical treatment	0.003	0.007	0.010
	(0.013)	(0.013)	(0.013)
Had mental health problems such as depression	0.043 ***	0.025 *	0.019
	(0.015)	(0.014)	(0.014)
Had consumer problems	0.096 ***	0.057 **	0.052 *
	(0.032)	(0.026)	(0.027)
Was involved in an accident or disaster	0.012	-0.002	-0.003
	(0.012)	(0.010)	(0.010)
Nothing out of the ordinary happened	-0.013 ***	-0.004	-0.002
	(0.004)	(0.003)	(0.003)
Got married	-0.025 **	-0.040 ***	-0.045 ***
	(0.011)	(0.012)	(0.013)
Bought a home (renter → homeowner)	0.005	0.009	0.013
	(0.011)	(0.010)	(0.010)
Respondent's characteristics			
Age	-0.006 ***	-0.009 ***	-0.010
	(0.000)	(0.001)	(0.007)
Sibling structure			
Those with sibling(s)	-0.068 ***	-0.079 ***	-
	(0.009)	(0.020)	-
Those with sibling(s) × Those with sibling(s) of the opposite sex	-0.034 ***	-0.021 **	-
	(0.004)	(0.009)	-
Those with sibling(s) × The first daughter	0.005	0.004	-
	(0.004)	(0.010)	-
Educational attainment (reference group: junior high school)			
High school, junior college, technical college	0.044 ***	0.048 ***	-
	(0.008)	(0.017)	-
University	0.058 ***	0.066 ***	-
	(0.009)	(0.020)	-
Married	0.039 ***	0.039 ***	0.036 **
	(0.007)	(0.013)	(0.015)
No. of children	0.012 ***	0.006	0.007
	(0.002)	(0.004)	(0.005)
Household without co-resident parents	-0.113 ***	-0.082 ***	-0.061 ***
	(0.004)	(0.009)	(0.011)
Employment status (reference group: not in employment)			
Regular employee	-0.022 ***	-0.031 ***	-0.030 ***
	(0.005)	(0.007)	(0.008)
Non-regular employee	0.002	-0.005	-0.004
	(0.005)	(0.006)	(0.006)
Household income (log)	-0.053 ***	-0.043 ***	-0.036 ***
	(0.004)	(0.006)	(0.007)
Household financial assets	-0.000002	-0.000006	-0.000007
	(0.000002)	(0.000004)	(0.000004)
R^2: within	-	0.020	0.021
between	-	0.164	0.114
overall	0.084	0.075	0.049
Model selection test		Breusch-Pagan	Hausman
		26678.95 ***	134.38 ***
No. of observations	31,180	31,180	31,180

Notes: Figures in parentheses are heteroskedasticity-robust standard errors. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively. Coefficients on regional and year dummies are not shown to conserve space.

Table 8. Determinants of the receipts of assistance with living expenses from spouses' parents

Dependent variable	Dummy for receipt of monthly assistance with living expenses and the like in the preceding year		
	(a)	(b)	(c)
Estimation method	OLS	Random effect	Fixed effect
Independent variables	Coeff.	Coeff.	Coeff.
Life event in the preceding year			
Gave birth	0.011	0.013	0.014 *
	(0.009)	(0.008)	(0.008)
Had a serious illness that required surgery or long-term medical treatment	0.054 ***	0.032 **	0.030 *
	(0.020)	(0.016)	(0.016)
Had mental health problems such as depression	0.058 ***	0.030	0.025
	(0.022)	(0.021)	(0.022)
Had consumer problems	0.017	0.019	0.017
	(0.036)	(0.029)	(0.030)
Was involved in an accident or disaster	0.017	0.013	0.010
	(0.016)	(0.012)	(0.012)
Nothing out of the ordinary happened	-0.016 ***	-0.000	0.002
	(0.005)	(0.004)	(0.004)
Got married	-0.007	-0.006	-0.008
	(0.012)	(0.011)	(0.012)
Bought a home (renter → homeowner)	-0.008	0.004	0.006
	(0.012)	(0.010)	(0.010)
Spouse's characteristics			
Age	-0.002 ***	-0.003 ***	-0.015 *
	(0.000)	(0.001)	(0.008)
Sibling structure			
Those with sibling(s)	-0.160 ***	-0.112 ***	-
	(0.011)	(0.024)	-
Those with sibling(s) × Those with sibling(s) of the opposite sex	-0.006	0.001	-
	(0.005)	(0.011)	-
Those with sibling(s) × The first son	0.060 ***	0.062 ***	-
	(0.005)	(0.011)	-
Educational attainment (reference group: junior high school)			
High school, junior college, technical college	0.028 ***	0.039 **	-
	(0.008)	(0.018)	-
University	0.063 ***	0.061 ***	-
	(0.009)	(0.019)	-
No. of children	0.016 ***	0.011 **	0.002
	(0.002)	(0.004)	(0.006)
Household without co-resident parents	-0.253 ***	-0.205 ***	-0.172 ***
	(0.006)	(0.016)	(0.022)
Employment status (reference group: not in employment)			
Regular employee	-0.026 **	-0.022 *	-0.020
	(0.010)	(0.012)	(0.013)
Non-regular employee	-0.007	-0.010	-0.005
	(0.015)	(0.016)	(0.017)
Household income (log)	-0.088 ***	-0.059 ***	-0.046 ***
	(0.006)	(0.009)	(0.010)
Household financial assets	0.000010 ***	0.000000	-0.000002
	(0.000002)	(0.000004)	(0.000005)
R^2: within	-	0.045	0.047
between	-	0.226	0.045
overall	0.183	0.178	0.054
Model selection test		Breusch-Pagan	Hausman
		25946.12 ***	125.16 ***
No. of observations	21,285	21,285	21,285

Notes: Figures in parentheses are heteroskedasticity-robust standard errors. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively. Coefficients on regional and year dummies are not shown to conserve space.

spouse's parents, in Table 8, while the estimated coefficient of the gender dummy is not significantly different from zero, that for the first son dummy is significantly positive, implying that the first son is more likely to receive gifts from their parents than other siblings. There are at least two possible explanations for this result: (1) parents try to exchange gifts for future in-kind and financial transfers from their offspring, and (2) parents try to offset the costs borne by those who take over the family line (e.g., holding memorial services, maintaining the family grave, etc.). Meanwhile, several coefficients of the dummy variables for life events and other respondent (spouse) characteristics do not have statistical significance. Since assistance with living expenses from parents does not consider help from parents with the purchase of a home as well as wedding expenses, the coefficients of "got married" and "bought a home" may not be significantly positive. [17]

5.3 Determinants of the gift amount received

This subsection elucidates the determinants of the amounts of gifts by the same analytical framework as Section 5.2, except that the dependent variable is not a dummy variable, but a continuous one. Although the amount is available for assistance with living expenses and help with wedding expenses, the focus here is on the former type of gifts. [18] The estimation results for the amount of assistance from respondents' parents are shown in Table 9. As far as can be judged from the result of the fixed effect model, the amount of assistance significantly decreases in the year where nothing out of the ordinary happened and the respondent got married. Turning to respondent characteristics, the same variables are significant, as in the case of Table 7, except that the marital status dummy is insignificant. Table 10 reports the estimation results for the amount of assistance from spouses' parents. All dummies for life events have insignificant coefficients, suggesting that spouses' parents do not necessarily alter the amount of assistance with living expenses so as to immediately compensate for positive shocks to expenditure (or negative shocks to income) associated with various life course events. On the other hand, the effects of age, the co-resident dummy and the household income are negatively significant. This finding is similar to (i.e., not qualitatively different from) the results discovered in Tables 6 to 8. Taken together, not only the probability of receiving gifts but also their amounts seem to vary consistently with the parental motive to alleviate liquidity constraints of children.

5.4 Past assistance with buying a home and subsequent provision of in-kind and financial help

The estimation results thus far appear to be more consistent with parental altruism than some kind of exchange or self-interest. However, the exchange motive still cannot be completely rejected. For example, inter vivos gifts from parents may be closely tied with subsequent provision of informal care from their offspring. In fact, Ciani and Deiana (2018) point out that upstream and downstream intergenerational transfers occur many years apart. To confirm this possibility, whether past transfers from parents to children leads to subsequent in-kind and/or financial help from children to their elderly parents is examined.

I use the following three dummy variables as a dependent variable: (1) the respondent couple currently provide informal care for a/their parent(s) or will provide it at some point in the future, (2) the respondent couple currently live with a parent(s) or will live with them at some point in the

[17] While the coefficient on "got married" is significantly *positive* in Table 6, it is significantly *negative* in Table 7. This is probably because respondents' parents are likely to give a large amount of help with wedding expenses to respondents in the year of marriage, which may therefore crowd out other types of gifts.

[18] Since information about the amount of assistance with living expenses is available only after the 6th survey, the number of observations decreases slightly compared to those of Tables 7 and 8.

Table 9. Determinants of the amount of assistance with living expenses from respondents' parents

Dependent variable	Amount of monthly assistance with living expenses and the like in the preceding year			
	(a)	(b)	(c)	(d)
Estimation method	Tobit	OLS	Random effect	Fixed effect
Independent variables	Marg. eff.	Coeff.	Coeff.	Coeff.
Life event in the preceding year				
Gave birth	0.044 *	0.040	0.030	0.034
	(0.026)	(0.035)	(0.028)	(0.029)
Had a serious illness that required surgery or long-term medical treatment	-0.014	-0.051	-0.037	-0.030
	(0.034)	(0.052)	(0.047)	(0.048)
Had mental health problems such as depression	0.080 **	0.120 *	0.040	0.001
	(0.036)	(0.063)	(0.049)	(0.049)
Had consumer problems	0.246 **	0.345 **	0.195	0.167
	(0.105)	(0.162)	(0.137)	(0.135)
Was involved in an accident or disaster	0.067 **	0.097 *	0.027	0.017
	(0.033)	(0.050)	(0.042)	(0.043)
Nothing out of the ordinary happened	-0.036 ***	-0.047 ***	-0.026 **	-0.022 *
	(0.011)	(0.016)	(0.013)	(0.013)
Got married	-0.037	-0.033	-0.068 *	-0.081 *
	(0.035)	(0.041)	(0.041)	(0.043)
Bought a home (renter → homeowner)	0.007	0.024	0.050	0.065
	(0.030)	(0.043)	(0.040)	(0.040)
Respondent's characteristics				
Age	-0.012 ***	-0.008 ***	-0.015 ***	-0.024
	(0.001)	(0.001)	(0.003)	(0.027)
Sibling structure				
Those with sibling(s)	-0.165 ***	-0.234 ***	-0.325 ***	-
	(0.028)	(0.041)	(0.097)	-
Those with sibling(s) × Those with sibling(s) of the opposite sex	-0.099 ***	-0.166 ***	-0.136 ***	-
	(0.012)	(0.017)	(0.041)	-
Those with sibling(s) × The first daughter	0.015	0.037 **	0.054	-
	(0.012)	(0.016)	(0.038)	-
Educational attainment (reference group: junior high school)				
High school, junior college, technical college	0.135 ***	0.133 ***	0.132 **	-
	(0.021)	(0.027)	(0.060)	-
University	0.241 ***	0.156 ***	0.183 **	-
	(0.051)	(0.033)	(0.072)	-
Married	0.050 ***	0.045 *	0.057	0.068
	(0.017)	(0.027)	(0.049)	(0.058)
No. of children	0.033 ***	0.033 ***	0.015	0.012
	(0.006)	(0.008)	(0.014)	(0.019)
Household without co-resident parents	-0.340 ***	-0.464 ***	-0.363 ***	-0.289 ***
	(0.016)	(0.019)	(0.039)	(0.046)
Employment status (reference group: not in employment)				
Regular employee	-0.045 ***	-0.038 *	-0.087 ***	-0.087 ***
	(0.014)	(0.022)	(0.027)	(0.029)
Non-regular employee	0.004	0.015	-0.030	-0.030
	(0.013)	(0.018)	(0.024)	(0.025)
Household income (log)	-0.095 ***	-0.106 ***	-0.113 ***	-0.101 ***
	(0.009)	(0.018)	(0.029)	(0.033)
Household financial assets	-0.00003 ***	-0.00002 ***	-0.00002	-0.00002
	(0.000010)	(0.000007)	(0.000012)	(0.000014)
(Pseudo) R^2: within	-	-	0.014	0.015
between	-	-	0.112	0.066
overall	0.073	0.061	0.054	0.026
Model selection test			Breusch-Pagan	Hausman
			24612.21 ***	101.82 ***
No. of observations	26,541	26,541	26,541	26,541

Notes: Figures in parentheses are standard errors for Column (a) and heteroskedasticity-robust standard errors for Columns (b), (c) and (d). ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively. Coefficients on regional and year dummies are not shown to conserve space. Marginal effects are calculated as $\beta_k \times \Phi(X\beta/\sigma)$ at the mean of covariates.

Table 10. Determinants of the amount of assistance with living expenses from spouses' parents

Dependent variable	Amount of monthly assistance with living expenses and the like in the preceding year			
	(a)	(b)	(c)	(d)
Estimation method	Tobit	OLS	Random effect	Fixed effect
Independent variables	Marg. eff.	Coeff.	Coeff.	Coeff.
Life event in the preceding year				
Gave birth	0.042 *	0.000	0.018	0.023
	(0.023)	(0.036)	(0.029)	(0.030)
Had a serious illness that required surgery or long-term medical treatment	0.142 **	0.186 **	0.115	0.106
	(0.062)	(0.092)	(0.076)	(0.076)
Had mental health problems such as depression	0.032	0.049	-0.003	-0.009
	(0.048)	(0.085)	(0.080)	(0.083)
Had consumer problems	0.047	0.040	-0.095	-0.113
	(0.081)	(0.156)	(0.069)	(0.071)
Was involved in an accident or disaster	0.020	0.054	0.047	0.039
	(0.035)	(0.073)	(0.049)	(0.049)
Nothing out of the ordinary happened	-0.031 ***	-0.049 **	-0.004	0.003
	(0.012)	(0.020)	(0.015)	(0.015)
Got married	-0.036	-0.038	-0.026	-0.037
	(0.032)	(0.041)	(0.043)	(0.047)
Bought a home (renter → homeowner)	-0.024	-0.033	-0.007	0.007
	(0.027)	(0.046)	(0.038)	(0.038)
Spouse's characteristics				
Age	-0.006 ***	-0.005 ***	-0.005 **	-0.051 **
	(0.001)	(0.001)	(0.003)	(0.022)
Sibling structure				
Those with sibling(s)	-0.358 ***	-0.353 ***	-0.214 **	-
	(0.052)	(0.046)	(0.092)	-
Those with sibling(s) × Those with sibling(s) of the opposite sex	-0.013	-0.007	0.036	-
	(0.012)	(0.020)	(0.043)	-
Those with sibling(s) × The first son	0.108 ***	0.159 ***	0.148 ***	-
	(0.012)	(0.019)	(0.045)	-
Educational attainment (reference group: junior high school)				
High school, junior college, technical college	-0.008	-0.047	0.109	-
	(0.020)	(0.039)	(0.079)	-
University	0.065 ***	0.082 *	0.163 *	-
	(0.024)	(0.042)	(0.085)	-
No. of children	0.038 ***	0.055 ***	0.055 ***	0.033
	(0.006)	(0.009)	(0.017)	(0.023)
Household without co-resident parents	-0.699 ***	-0.830 ***	-0.678 ***	-0.563 ***
	(0.028)	(0.028)	(0.071)	(0.095)
Employment status (reference group: not in employment)				
Regular employee	-0.040 *	-0.074 *	-0.073	-0.056
	(0.024)	(0.042)	(0.050)	(0.054)
Non-regular employee	-0.023	-0.065	-0.050	-0.027
	(0.027)	(0.060)	(0.056)	(0.058)
Household income (log)	-0.157 ***	-0.242 ***	-0.159 ***	-0.123 ***
	(0.013)	(0.026)	(0.038)	(0.043)
Household financial assets	0.00001	0.00002 *	-0.00001	-0.00002
	(0.000010)	(0.000009)	(0.000017)	(0.000021)
(Pseudo) R^2: within	-	-	0.027	0.028
between	-	-	0.158	0.024
overall	0.118	0.118	0.112	0.027
Model selection test			Breusch-Pagan	Hausman
			23004.97 ***	90.11 ***
No. of observations	17,959	17,959	17,959	17,959

Notes: Figures in parentheses are standard errors for Column (a) and heteroskedasticity-robust standard errors for Columns (b), (c) and (d). ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively. Coefficients on regional and year dummies are not shown to conserve space. Marginal effects are calculated as $\beta_k \times \Phi(X\beta/\sigma)$ at the mean of covariates.

Table 11. Relation between assistance with buying a home and subsequent provision of in-kind and financial help

Estimation method	(a)	(b)	(c)	(d)	(e)	(f)
	Fixed effect					
Dependent variable	Informal care provision for respondent's parents	Co-resident with respondent's parents	Financial assistance for respondent's parents	Informal care provision for spouse's parents	Co-resident with spouse's parents	Financial assistance for spouse's parents
Independent variables	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Assistance from respondent's parents when buying a home	0.001	-0.062	-0.023	-	-	-
	(0.036)	(0.038)	(0.035)	-	-	-
Assistance from spouse's parents when buying a home	-	-	-	-0.023	-0.012	-0.040
	-	-	-	(0.036)	(0.027)	(0.026)
R^2: within	0.016	0.277	0.037	0.062	0.049	0.026
between	0.048	0.525	0.174	0.076	0.131	0.036
overall	0.039	0.428	0.122	0.057	0.126	0.026
No. of observations	20,758	19,160	20,757	20,281	18,697	20,282

Notes: Figures in parentheses are heteroskedasticity-robust standard errors. Coefficients on regional and year dummies are not shown to conserve space.

future, and (3) the respondent couple currently give financial assistance to a/their parent(s) or will give it at some point in the future. The JPSC allows us to define these dependent variables separately for respondents' and their spouses' parents. As for the explanatory variable, focus is placed on a past experience of receiving financial assistance from parents when buying a home for the following reasons. First, the amount of assistance with buying a home is large enough to be thought of as an intertemporal exchange from parents for subsequent help from children. Although the exact amount is not available from the JPSC, Yukutake et al. (2015) report that of households which received assistance when buying a home the mean value of the assistance reached as high as 10 million yen in Japan. Second, a large fraction of respondent couples receive assistance when buying a home. As shown in Table 2, roughly 10 to 20 percent of couples (among those who purchased a home in the preceding year) received this assistance. Third, it is possible to distinguish between assistance for home purchase from respondents' parents and from their spouses' parents and it is therefore possible to estimate the effect of the assistance on the subsequent in-kind and/or financial help separately for each pair of parents.

Given that the transfer from parents is associated with exchange-related motives, we may expect a positive relation between parental assistance for home purchase and subsequent in-kind and/or financial help from the children. Table 11 reports the coefficient of a dummy variable which takes one if a respondent (or her spouse) received assistance for home purchase from the respondent's parents (or her spouse's parents) in the past. While columns (a) to (c) show the relation between the respondent's receipt of help with home purchase and her in-kind or financial assistance for her parents, columns (d) to (f) show the relation between the spouse's receipt of help with home purchase and his in-kind or financial assistance for his parents. Contrary to the prediction from a model of the exchange motive, no coefficients are statistically different from zero, suggesting that parental assistance with buying a home does not significantly induce the subsequent provision of care from children. Even when focusing on the sample of the first sons among respondents' spouses (i.e., husbands), the estimation results show hardly any change (results not shown to conserve space). This finding implies that the reason why parents are likely to give gifts disproportionately to their first son is not to exchange this for his subsequent in-kind and financial transfers, but to compensate for the costs borne by the first son to maintain the family line. Thus, it does not seem that parents

give gifts to ensure that children take care of them in old age. [19],[20]

6. Conclusion

Using microdata from the Japanese Panel Survey of Consumers provided by the Panel Data Research Center at Keio University, this study attempted to elucidate patterns in inter vivos gift receipts in Japan as well as parents' motives for giving such gifts. Concretely, the share of respondents that received inter vivos gifts in the preceding year, the frequency and timing of gift receipts over the 22-year observation period, and what characteristics affected the likelihood of receiving gifts and the size of transfer receipts were examined.

The results can be summarized as follows. To begin with, it was found that the share of respondents reporting that they (or their spouse) received gifts in any given year declines from 25 to 13 percent with age for all households. Moreover, respondents (or their spouses) tended to receive inter vivos gifts from their parents when they were young and when they experienced major life events involving large expenditures such as buying a home or getting married. Furthermore, the more unstable the respondents' employment and/or the lower their financial strength (i.e., income and assets) was, the more likely they were to receive inter vivos gifts. Therefore, the results suggest that one of the parents' motives for making inter vivos gifts was to ease liquidity constraints when the balance between a child's income and expenditure broke down.

Finally, it is interesting to consider the policy implications of the results obtained in this study. The analysis in this study found that parents make inter vivos gifts to help with buying a home, getting married, or raising children. Therefore, the fact that tax exemptions for inter vivos gifts which have been implemented in recent years are limited to gifts related to education, housing, marriage, and raising children is well aligned with the intentions of those making inter vivos gifts. However, the issue is whether such gifts spur consumption and asset formation: While gifts given to ease liquidity constraints are likely to spur consumption, they are unlikely to aid asset formation, except in the case of gifts to help home purchase. Moreover, since parents helping with expenses related to getting married (in the form of gifts) have always been tax exempt, and gifts for other uses (buying a home or raising children) are already tax exempt up to ¥1,100,000 (per year), the social significance of establishing a new major framework of tax exemptions for inter vivos gifts is not clear. Instead, it is possible that any advantages might be outweighed by the disadvantages, such as growing inequality in education as a result of the rich making large inter vivos gifts for educational purposes (to save taxes) or a decline in tax revenues due to an increase in generation-skipping asset transfers from grandparents to grandchildren. This means that more detailed analyses are required to compare the social benefits and disadvantages of policies to encourage inter vivos gifts through tax reductions.

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[19] If parents tend to give gifts to children who are likely to take care of them in old age, the variable regarding gifts to help with home purchase would be endogenous. Since this works to make it easier to find a positive coefficient on the dummy variable for the help with home purchase, the fact that the coefficient is insignificant even with this bias suggests that the actual (not biased) coefficient would be smaller.

[20] Respondents of the JPSC are relatively young and may have not yet started providing informal care/financial assistance and may not (yet) be living with their parent(s). Johar et al. (2015) showed by using Japanese data that parent-children co-residence tends to start after one of the parents has lost his or her spouse. Therefore, if more data are accumulated over time, it will be possible to find a relationship in which the receipt of gifts encourages the child(ren) to provide care/assistance and live with the parent(s) subsequently. In fact, Yamada (2006) indicated that past experience of receiving a gift (or inheritance) from parents has a negative impact on distance between the child's residence and that of the parents and has a positive impact on the frequency of contact between the child and his or her parents.

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References

Arrondel, Luc, André Masson, and Pierre Pestieau. (1997) "Bequest and Inheritance: Empirical Issues and France-U.S. Comparison," in Guido Erreygers and Toon Vandevelde, eds., *Is Inheritance Legitimate? Ethical and Economic Aspects of Wealth Transfers*, Heidelberg: Springer, pp. 89-125.

Behrman, Jere R., and Mark R. Rosenzweig. (2004) "Parental Allocations to Children: New Evidence on Bequest Differences among Siblings," *Review of Economics and Statistics*, Vol. 86, No. 2, pp. 637-640.

Ciani, Emanuele, and Claudio Deiana. (2018) "No Free Lunch, Buddy: Past Housing Transfers and Informal Care Later in Life," *Review of Economics of the Household*, Vol. 16, No. 4, pp. 971-1101.

Dunn, Thomas A., and John W. Phillips. (1997) "The Timing and Division of Parental Transfers to Children," *Economics Letters*, Vol. 54, No. 2, pp. 135-137.

Groneck, Max. (2017) "Bequests and Informal Long-Term Care: Evidence from HRS Exit Interviews," *Journal of Human Resources*, Vol. 52, No. 2, pp. 531-572.

Hamaaki, Junya. (2018) "Intergenerational Asset Transfers and Family Caregiving [Sedai-kan shisan iten to kazoku kaigo]," *Quarterly of Personal Finance [Kikan Kojin Kinyu]*, Spring 2018, pp. 66-79 (in Japanese).

Hamaaki, Junya. (2020) "Determinants of Inter Vivos Gifts from Parents to their Child(ren): Evidence from Japanese Panel Data [Nihon ni okeru oyako-kan zoyo no kettei yoin]," in Institute of Comparative Economic Studies, Hosei University and Junya Hamaaki, eds., *Intergenerational Transfers and Family in an Aging Society with Low Birth Rate [Shoshi kourei shakai ni okeru sedai-kan shisan iten to kazoku]*, Nippon Hyoron Sha Co., Ltd., pp. 45-69. (in Japanese).

Hamaaki, Junya, Masahiro Hori, and Keiko Murata. (2019) "The Intra-family Division of Bequests and Bequest Motives: Empirical Evidence from a Survey on Japanese Households," *Journal of Population Economics*, Vol. 32, No. 1, pp. 309-346.

Henretta, John C., Martha S. Hill, Wei Li, Beth J. Soldo, and Douglas A. Wolf. (1997) "Selection of Children to Provide Care: The Effect of Earlier Parental Transfers," *Journals of Gerontology* Series B, Vol. 52B, pp. 110-119.

Hochguertel, Stefan, and Henry Ohlsson. (2009) "Compensatory Inter Vivos Gifts," *Journal of Applied Econometrics*, Vol. 24, No. 6, pp. 993-1023.

Horioka, Charles Yuji. (2002) "Are the Japanese Selfish, Altruistic or Dynastic?" *Japanese Economic Review*, Vol. 53, No. 1, pp. 26-54.

Horioka, Charles Yuji. (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*, Vol. 12, No. 3, pp. 411-437.

Idee, Takako. (2006) "Gifts for Home Purchases and the Tax System [Jutaku shutoku ni okeru zoyo to zeisei]," *Japanese Journal of Research on Household Economics [Kikan kakei keizai kenkyu]*, Vol. 69, pp. 21-27.

Jiménez-Martín, Sergi, and Cristina Vilaplana Prieto. (2015) "Informal Care Motivations and Intergenerational Transfers in European Countries," *Health Economics*, Vol. 24, No. S1, pp. 89-103.

Light, Audrey, and Kathleen McGarry. (2004) "Why Parents Play Favorites: Explanations for Unequal Bequests," *American Economic Review,* Vol. 94, No. 5, pp. 1669-1681.

McGarry, Kathleen. (1999) "Inter Vivos Transfers and Intended Bequests," *Journal of Public Economics*, Vol. 73, No. 3, pp. 321-351.

McGarry, Kathleen. (2000) "Behavioral Responses to the Estate Tax: Inter Vivos Giving," *National Tax Journal*, Vol. 53, No. 4, pp. 913-932.

McGarry, Kathleen. (2016) "Dynamic Aspects of Family Transfers," *Journal of Public Economics*, Vol. 137, pp. 1-13.

McGarry, Kathleen, and Robert F. Schoeni. (1995) "Transfer Behavior in the Health and Retirement Study: Measurement and the Redistribution of Resources within the Family," *Journal of Human Resources*, Vol. 30, Special Issue on the Health and Retirement Study: Data Quality and Early Results pp. S184-S226.

McGarry, Kathleen, and Robert F. Schoeni. (1997) "Transfer Behavior Within the Family: Results from the Asset and Health Dynamics Study," *Journals of Gerontology* Series B, Vol. 52B, pp. 82-92.

Johar, Meliyanni, Shiko Maruyama, Sayaka Nakamura. (2015) "Reciprocity in the Formation of Intergenerational Coresidence," *Journal of Family and Economic Issues*, Vol. 36, pp. 192-209.

Menchik, Paul L. (1980) "Primogeniture, Equal Sharing, and the U.S. Distribution of Wealth," *Quarterly Journal of Economics*, Vol. 94, No. 2, pp. 299-316.

Menchik, Paul L. (1988) "Unequal Estate Division: Is it Altruism, Reverse Altruism, or Simply Noise?" in Denis Kessler and Andre Masson, eds., *Modeling the Accumulation and Distribution of Wealth*, Oxford: Clarendon Press, pp. 105-116.

Nivakoski, Sanna. (2019) "Does the Exchange Motive Influence Intergenerational Transfers? Evidence from Ireland," *Review of the Economics of the Household*, Vol. 17, No. 3, pp. 1049-1079.

Norton, Edward C., and Courtney Harold Van Houtven. (2006) "Inter-vivos Transfers and Exchange," *Southern Economic Journal*, Vol. 73, No. 1, pp. 157-172.

Norton, Edward C., Lauren H. Nicholas, and Sean Sheng-Hsiu Huang. (2013) "Informal Care and Inter-vivos Transfers: Results from the National Longitudinal Survey of Mature Women," *BE Journal of Economic Analysis & Policy*, Vol. 14, No. 2, pp. 1-24.

Ohlsson, Henry. (2007) "The Equal Division Puzzle – Empirical Evidence on Intergenerational Transfers in Sweden," Uppsala University, Working Paper 2007:10.

Olivera, Javier. (2017) "The Division of Inter-vivos Parental Transfers in Europe," *Journal of the Economics of Ageing*, Vol. 9, pp. 41-51.

Wilhelm, Mark O. (1996) "Bequest Behavior and the Effect of Heirs' Earnings: Testing the Altruistic Model of Bequests," *American Economic Review*, Vol. 86, No. 4, pp. 874-892.

Yamada, Ken. (2006) Intra-family Transfers in Japan: Intergenerational Co-residence, Distance, and Contact. *Applied Economics*, Vol. 38, pp. 1839-1861.

Yukutake, Norifumi, Shinichiro Iwata, and Takako Idee. (2015) "Strategic Interaction between Inter Vivos Gifts and Housing Acquisition," *Journal of Japanese and International Economies*, Vol. 35, pp. 62-77.

Zhou, Yanfei. (2006) "The Situation and Motivations of Inter Vivos Transfers in Japan [Seizen zoyo no jittai to doki]," *Journal of Personal Finance and Economics [Seikatsu Keizaigaku Kenkyu]*, Vol. 22-23, pp. 123-35 (in Japanese).

Zhou, Yanfei. (2007) "The Impact of Financial Aid of Parents on the House Purchase Behavior of Children [Oya karano jyutaku sikinenjo to ko no jyutaku shutoku kodo]," *Quarterly Journal of Housing and Land Economics [Kikan Jyutaku Tochi Keizai]*, Autumn 2007, pp. 29-37 (in Japanese).

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Impact of Inter-Generational Transfer through Tax and Social Security Systems on Income Inequality in Japan

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Abstract

In this study, microdata from the *Comprehensive Survey of Living Conditions* (CSLC) is used to investigate how inter-generational transfer through tax and social security systems affects income inequality in Japan. To provide accurate income inequality measures, sampling weights are created using microdata from the *Population Census*. To shed light on income inequality from a broad perspective, four inequality measures are provided based on three definitions of income. It was found that income inequality measures tend to be high when adjusted with our sampling weights. Additionally, it was also found that tax and social security systems not only lower the level of income inequality but also slow the pace of the increase.

Keywords: income distribution, inequality, sampling weight adjustment

JEL Classification Codes: **D31, N35, C83**

1. Introduction

Growing attention is being paid recently to the increase in income and wealth inequality, particularly after Piketty (2014) was published. Along with the global trend pointed out by Piketty (2014), previous studies, such as Tachibanaki (1998), report that inequality has also been rising in Japan.

Tachibanaki (1998) insisted that the level of income inequality in Japan is relatively high among the OECD countries. While it was surprising to note that income inequality in Japan is as high as that of the US, Ohtake (2005) pointed out that the income inequality measures reported by Tachibanaki (1998) were not comparable with those reported by the OECD. Ohtake (2005) found that, if income inequality measures are calculated on the basis of redistributed income, income inequality in Japan is close to the average of the OECD countries. Moreover, Ohtake (2005) pointed that the increase in income inequality in Japan was due to population aging. Tachibanaki (2006) and Oshio (2010), on the other hand, found that an increase in income inequality was observed even within a particular age group, and economists have not yet reached a consensus on the margin by which the increase in income inequality is attributable to population aging.

The main issue in the so-called Tachibanaki-Ohtake dispute is two-fold: First, it is necessary to exercise care over the definition of income used to calculate the income inequality measures. The second point is that income inequality differs across different age groups, and thus changes in the composition of age groups can lead to an increase in income inequality, even if inequality is

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unchanged within an age group. These two points are closely linked to the redistributive mechanisms of tax and social security systems in the sense that the difference in income inequality measures calculated based on different definitions of income is largely due to tax and social security systems, and tax and social security systems play an important role in mitigating the within- and across-age-group income inequality.

The focus of this study is on the inter-generational redistributive mechanisms of tax and social security systems. Microdata from the *Comprehensive Survey of Living Conditions* (CSLC) is used to investigate how income inequality is affected by inter-generational transfer through the tax and social security systems.

2. Sampling Bias and Weighting Adjustment

2.1. Measurement of Income Inequality

It is well-known that there have been dramatic changes in household composition in Japan, due in part to population aging, the nuclearization of households, and the increase in dual-income households. Previous studies, such as Ohtake (2005) or Kitao and Yamada (2019), pointed out that such changes in the composition of households have substantial effects on the levels and trends of inequality measures. It is therefore important to pay attention to such changes in the composition of households when the effect of tax and social security systems is analyzed.

The problem is that the composition of households in the sample does not necessarily reflect that of the population. If the probability of households to be included in the sample is identical for all the households, the sample distribution would reflect the population distribution. In reality, however, the sample inclusion probability differs considerably across households. For example, a household headed by a young single male is less likely to respond to a survey than a household with a married older household head. Moreover, some surveys intentionally over-sample particular households to shed light on disadvantaged households, for instance. Consequently, the sample distribution deviates from the population distribution, and sampling bias arises.

How then can accurate measures of income inequality be obtained using the sample data? Most public surveys provide sampling weights to correct for the bias. [1] However, even if a weighting adjustment using the officially-provided weights is applied, a sampling bias still remains. To show to what extent sample distribution deviates from the population distribution and by what margin weight adjustment corrects for the bias, the shares of each age category and each household type in the CSLC are shown in Figure 1. As can be seen from the figure, the share of each age category and household category deviate from those calculated from the *Population Census*. In particular, households with a younger head and single households are underrepresented.

Why does the sample distribution not conform to the population distribution even if the weighting adjustment is applied? The reason is that the officially provided weights accompanying the CSLC data correct only for regional disproportionality. Moreover, the sample distribution can deviate from the population distribution even if other household characteristics are taken into account in the process of sampling and creating the provided weights, because researchers sometimes drop non-negligible numbers of observations in the process of data cleaning. Thus, to make sample distribution conform to the population distribution, researchers should ideally create their own original sampling weights.

As mentioned above, this study mainly focuses on the role of inter-generational transfer through tax and social security systems. To do so, it is important to have the sample distribution faithfully

[1] A detailed explanation of sampling weights and how they are used is provided in the following section.

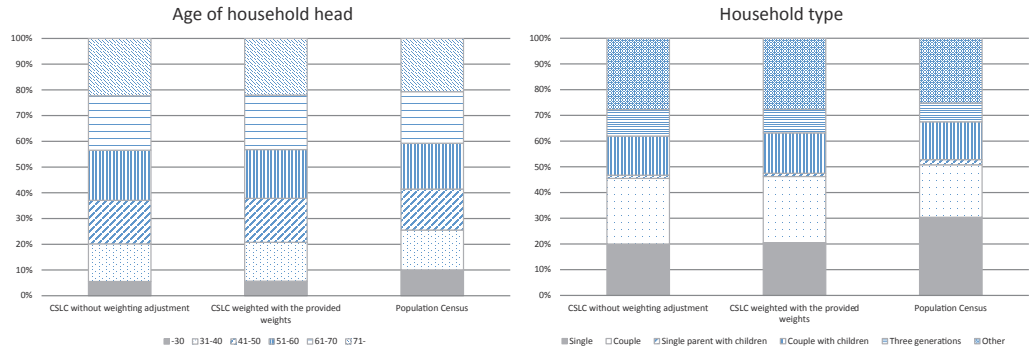

Figure 1: Household share by age category and household type

reflect the population distribution. Otherwise, the proportion of beneficiaries in the sample may be different from that in the population, and the contribution of the tax and social security systems may be under- or over-estimated. This study thus placed emphasis on the weighting adjustment. Original sampling weights were created using microdata from the *Population Census* to provide accurate income inequality measures.

2.2. Weighting adjustment

Weighting adjustment is not a common focus of economic analysis, especially in regression analysis. This is perhaps because economists are interested in relationships between variables and tend to implicitly assume that the parameters relating variables are identical across individuals. Regarding analyses on inequality, however, weighting adjustment is important because inequality measures such as Gini coefficients quantify how many rich or poor people exist and how rich or poor they are. If the sample distribution deviates from the population and rich or poor people are over- or under-represented, income inequality is also likely to be over- or under-estimated.

As mentioned above, it is common for public survey data in Japan to have accompanying sampling weights. The problem is, however, that the weights are created in different ways across different surveys, which can make a huge difference in income inequality measures calculated using different datasets. For example, it is well-known that the value of Gini coefficients calculated using the CSLC data are higher than those calculated using the *National Survey on Family Income and Expenditure* (NSFIE). Moreover, some respondents provide inconsistent responses to survey questions; there are respondents who report that they are working, but earnings are not reported or vice versa, for instance. Such observations have been dropped when analyzing the data. As a result, the sample distribution differs from the raw data and will not conform to the population even if an adjustment using the provided sampling weights is applied. For these reasons, original sampling weights were created as a part of this research.

The most intuitive way of performing weighting adjustment is so-called "cell weighting." The basic idea of cell weighting is that households are sorted into weighting cells defined on the basis of household characteristics, households in each cell being assigned an identical weight. For example, the weighting cell can be defined by household type and households sorted into two cells: single and two-or-more-person households. Suppose we are interested in the (population) mean of income, but the sample is biased in a manner that single households are underrepresented in the sample. The problem, in this case, is that the simple average of income $\bar{y} \equiv \frac{1}{n}\sum_{i=1}^{n} y_i$ is a biased estimator of the mean if the levels of income differ between single and two-or-more-person households. We then define the sampling weight w_i to observation i and calculate $\tilde{y} = \sum_{i=1}^{n} w_i y_i / \sum_{i=1}^{n} w_i$ to obtain

an unbiased estimator of the mean of income. In this case, the value of w_i is identical for the households belonging to the same weighting cell (single or two-or-more-person), and the weight assigned to single households is heavier than that assigned to two-or-more-person households.

Let s_j be the share of the households belonging to cell *j* in the population and $\overline{s}_j$ be that in the CSLC. The sampling weight w_j assigned to households belonging to cell *j* is proportional to the ratio of the share of household group *j* in the *Population Census* to that in the CSLC, that is, $w_j \propto s_j / \overline{s}_j$.

An implicit assumption underlying this cell weighting method is that households within each cell are sufficiently homogeneous that households in the sample can be regarded as representative of all households belonging to the weighting cell. This assumption is perhaps not valid in the previous example (of defining the cell by household type). Suppose that the under-sampling of single households in the previous example is due to the low response probability of single households with a younger, working household head. The weighted average $\widetilde{y} = \sum_{i=1}^{n} w_i y_i / \sum_{i=1}^{n} w_i$ is no longer an unbiased estimator of the mean, and the sample distribution within the cell to which single households belong differs from the population distribution. In general, the level of income of households with an older, retired head is lower than that of households with a younger, working head. Thus, the mean income is likely to be under-estimated. How can this problem be dealt with? A straightforward way to solve this problem is to employ an additional variable, the age of the household head, to define the weighting cells. That is, households are sorted into four household groups: single households with a head younger than age 60, single households with a single head age 60 or older, two-or-more-person households with a head younger than age 60, and two-or-more-person households with a head aged 60 or older. Let us call such a group a "cell." The variables used to define cells are called auxiliary variables.

To make the households within a cell more homogeneous, more auxiliary variables should be employed. In the previous example, an auxiliary variable, housing status (renters or homeowners), for instance, can be added and eight cells defined. By doing so, the households within each cell become more similar, and the weighted average is expected to be close to the population mean. The problem with using too many auxiliary variables is, however, that there emerge cells with few or no households. For example, if the sample size is 10,000 and the share of single homeowner households with a young head is 0.5%, we would expect to see 50 households in this cell. Since households with a younger head are less likely to respond, the number of households in this cell may be much smaller than 50 households. If there are cells with no observations, the cell would have to be "collapsed" by merging it with neighboring cells. Even if there is no cell containing no observations, cells with few observations can also cause problems. Suppose that there is only one household in a cell. In this case, the weight assigned to this household is likely to be much larger than that assigned to the households in other cells. If the variability of the weight is too large, the variance in the statistics, including income inequality measures, tends to be large.

Weighting adjustment is necessary to obtain accurate income inequality measures, but often increases the variance in income inequality measures. Thus, there exists a tradeoff between precision and variability, and it is necessary to decide on the extent of variance inflation. Previous studies, such as Kish (1992), proposed a variance inflation factor F:

$$F = 1 + CV(w_i)^2$$

where $CV(w_i)^2$ is the coefficient of variation of sampling weight w_i. Five auxiliary variables are employed to define the weighting cells, and the cells are collapsed to maintain the value of F below than that of the provided weights. The auxiliary variables used are the following: i) age of the household head (younger than 40, 40 to 59, 60 or older), ii) household type (single male, single female, a couple, a parent and children, a couple with children, three generations, other), iii) number

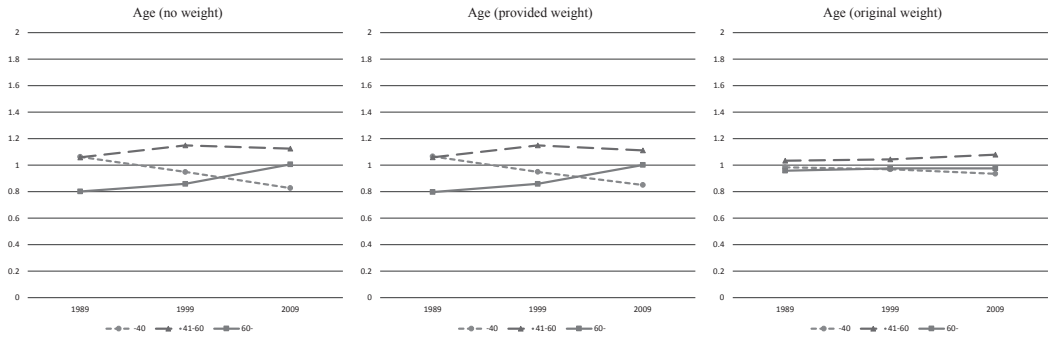

Figure 2-a: Sample disproportionality by weight (age category)

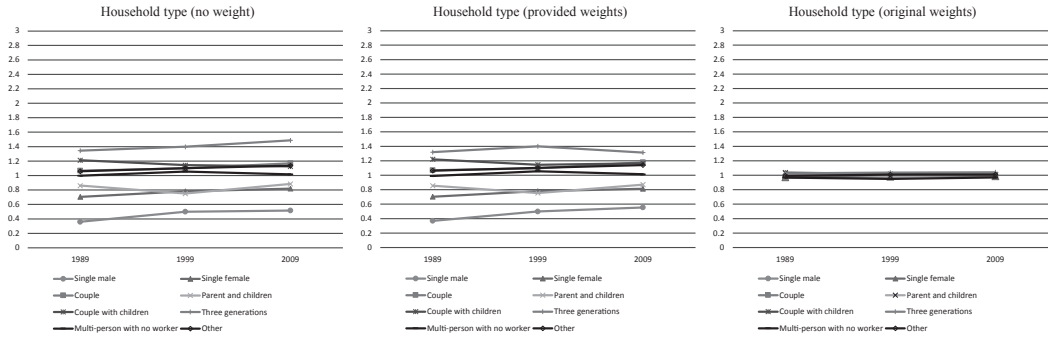

Figure 2-b: Sample disproportionality by weight (household type)

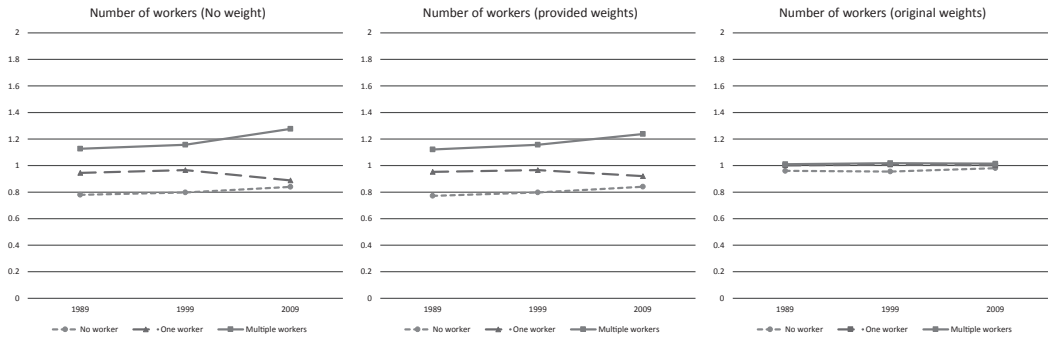

Figure 2-c: Sample disproportionality by weight (number of workers)

of workers (no worker, one worker, two or more workers), iv) area of residence (designated cities, Tokyo special wards, and other cities in five areas (Hokkaido and Tohoku, Kanto, Chubu, Kinki, and Chugoku + Shikoku + Kyushu)), v) homeownership (renter, small homeowner, large homeowner). Thus, there are $3 \times 7 \times 3 \times 7 \times 3 = 1{,}323$ cells in total. However, there exist numerous cells with no observation as well as those that are assigned too heavy a weight. These cells are collapsed in the following manner. First, the no-observation cells are merged with cells in the neighboring area of residence. If there still remain no-observation cells, they are merged with cells in the neighboring age category. The sampling weights are then created, following which F is calculated. If the variance inflation factor F is larger than that of the provided weights, the cell-collapsing procedure is applied

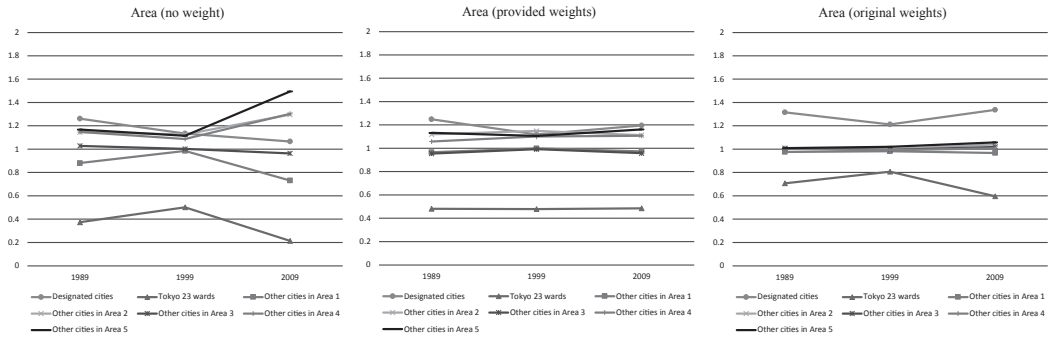

Figure 2-d: Sample disproportionality by weight (area of residence)

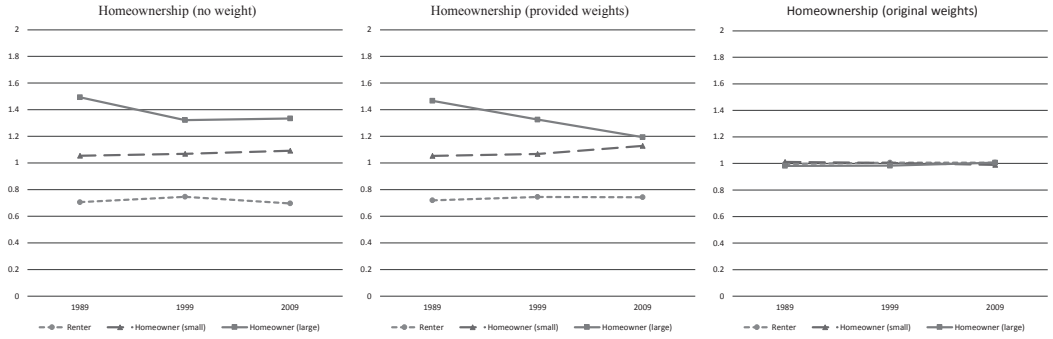

Figure 2-e: Sample disproportionality by weight (homeownership)

to the cell to which the largest weight is assigned. This procedure is repeated until the value of *F* falls below that of the provided weights.

Figures 2-a to 2-e show the ratio of the share of each category in the CSLC to that in the *Population Census*. If the ratio is larger than 1, households belonging to that category are overrepresented, and vice versa. As can be seen in the figures, adjustment with our original weights generally corrects for the sampling bias. Due to the cells being collapsed with those in the neighboring age or area categories, sampling bias remains for age of the household head and area of residence. Although adjustment with our original weights is not perfect, our original weights perform much better than the provided weights, except for the area of residence.

3. Measurement of income inequality

3.1. Definitions of income

As mentioned above, income inequality measures are sensitive to the definition of income. Since this study focuses on the redistributive mechanisms of the tax and social security systems on income inequality, income inequality measures are calculated based on three definitions: i) initial income defined as pre-tax income including neither pension income nor social security benefits, ii) pre-tax income defined as i) plus pension income and social security benefits, and iii) disposable income defined as ii) minus tax and social security payments.

Moreover, previous studies have shown that income inequality measures depend on whether or not they have been equivalized. As households are rapidly nuclearizing in Japan, it is important to

calculate income inequality measures on equivalized income. For example, let us consider a household composed of a household head, the household head's spouse, and the parents of the household head. If the household head and the spouse earn 4 million yen and the household head's parents earn 2 million yen, this household is regarded as one household earning 6 million yen. Suppose that the household head decides to live separately from his or her parents. The household would then be split into two households, one earning 4 million yen and the other earning 2 million yen. This can affect the income inequality measure for household income, while income inequality measures on equivalized income do not change. This is why it is necessary to calculate income inequality measures based on equivalized income when households are nuclearizing.

3.2. Income inequality measures

There are many types of income inequality measures. Since each of them has its own advantages, it is difficult to decide on which measures to use. Here, the most common measures are taken up to shed light on income inequality in Japan from various perspectives. The income inequality measures employed are the following:

i) The Gini coefficient G is defined as

$$G = \frac{1}{2n^2\overline{y}}\sum_{i=1}^{n}\sum_{j=1}^{n}|y_i - y_j|,$$

where y_i denotes the income of individual i, $\overline{y}$ denotes the mean of income, and n is the number of observations.

ii) The relative poverty rate is defined as the share of households whose income falls below half the median income.

iii) The mean log deviation (MLD) is defined as

$$\mathrm{MLD} = \frac{1}{n}\sum_{i=1}^{n}\log\left(\frac{\overline{y}}{y_i}\right).$$

iv) The log variance (LV) is defined as

$$\mathrm{LV} = \frac{1}{n}\sum_{i=1}^{n}(\log y_1 - \overline{\log y}).$$

Since this study placed emphasis on the margin of income by which inequality decreases due to the redistributive mechanisms of the tax and social security systems, details of these income inequality measures are not referred to here.

4. Data

The microdata from the CSLC is used to provide the income inequality measures. To obtain more accurate measures, the sampling weights created from the *Population Census* were used.

4.1. Population Census

The *Population Census* is an exhaustive survey which essentially covers all households in Japan. We can therefore regard the household distribution in the *Population Census* as being the true distribution of households in Japan. Unfortunately, the *Population Census* does not contain information on household income, and therefore income inequality measures cannot be calculated using *Population Census* data. The *Population Census*, however, does contain some important variables related to family characteristics that are also available in the CSLC data. Those variables are therefore used to define weighting cells for the *Population Census* and CSLC data. The sampling weights that make the distribution of CSLC sample conform to the true population distribution were created by using the share of each weighting cell in the *Population Census* as the true population distribution.

Table 1. Summary statistics: *Population Census*

	1990	2000	2010
Number of households	40,272,911	46,191,722	49,723,524
Average age of household head	48.3	51.1	54.2
Share of households with a head aged 60 or older	23.4%	31.3%	40.4%
Share of single households	22.8%	27.3%	30.4%
Share of households with two or more workers	43.1%	37.2%	32.5%
Share of homeowner households	59.5%	60.2%	62.8%

Table 2. Summary statistics: CSLC

	1989	1999	2010
Number of households	35,900	28,307	23,766
Average household pre-tax income	600.4	653.9	550.2
Standard Deviation of household pre-tax income	484.4	562.8	463.7
Average age of household head	47.8	50.7	55.8

Since it is necessary to select the households according to the sample selection criteria applied to the CSLC, microdata from the *Population Census* is used to enable the same sample selection criteria to be applied before calculating the share of population groups. Moreover, as the categories of socio-economic characteristics are defined in the same manner as they are in the CSLC, responding households in the CSLC in each population group can be regarded as representing all of the other households in that cell.

Table 1 presents summary statistics of the *Population Census*. It shows that sampling is disproportional. For example, single households are likely to be under-sampled while homeowners tend to be over-sampled.

4.2. Comprehensive Survey of Living Conditions (CSLC)

The CSLC, conducted by the Ministry of Health, Labour and Welfare, is a representative national survey in Japan. The CSLC is an annual cross-sectional survey, a large-scale survey being conducted only once every three years. The data used here is taken from the large-scale surveys conducted in 1989, 1998, and 2010 to overview the transition of income inequality through the 1990s and the 2000s. The sample size of the large-scale survey is extremely large, but the income questionnaire is distributed only to a subsample: The sample size of the 2010 income data is 26,115 (households). Summary statistics of the CSLC data are provided in Table 2.

A distinguishing feature of the CSLC is that the survey interviewers are people who work at public health and welfare offices or public health centers. The advantage of this feature is that the CSLC sample covers more non-standard households, such as poor single households receiving social welfare, than other government surveys. Hashimoto (2011) pointed, however, that the survey interviewers do not undergo official training for asking survey questions. Thus, there may be some problems such as disproportional response rates across population groups. Another problem associated with the sampling of the CSLC is that, unlike other government surveys, such as the NSFIE, the CSLC do not supplement the non-respondents. Therefore, even if the response rate of households with a young single male is lower than for other households, for example, MHLW does not survey additional households with a young single male. Since the sampling weights provided by MHLW correct only for geographical disproportionality, the response rates may depend on household

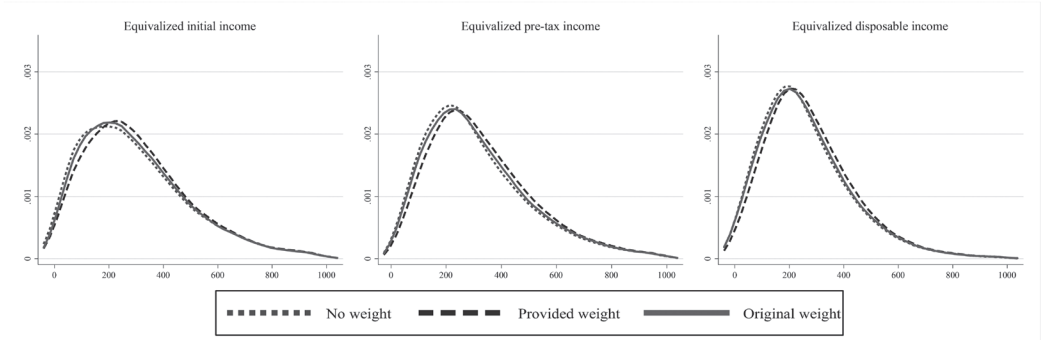

Figure 3: Kernel density by weight (CSLC)

characteristics.

5. Results

5.1. Kernel density of income distribution

To see how income distribution changes with weighting adjustments, let us examine kernel density with and without weighting adjustments. Figure 3 shows the kernel densities produced from the 2010 CSLC data. As can be seen from the figure, the income distribution does not change dramatically. This is perhaps because the CSLC is successful in covering relatively poor households. As Hori, Maeda, and Suga (2020b) pointed out, the income distribution in the NSFIE changes dramatically when weighting adjustment is applied. Thus, the gaps in income inequality measures calculated from the CSLC and the NSFIE are perhaps due to poorer households being underrepresented in the NSFIE.

Weighting adjustment with our original sampling weights bring the share of households belonging to each weighting cell in the CSLC and NSFIE into correspondence with that in the *Population Census*. Thus, adjustment with our sampling weights fills the gap between the income distributions in the CSLC and the NSFIE that can be explained by the auxiliary variables, and it is therefore expected that the income distributions will become similar. To verify this hypothesis, the kernel density was drawn using microdata from the CSLC and the NSFIE. [2] Figure 4-a shows the kernel densities without weighting adjustment obtained from the CSLC and NSFIE data, while Figure 4-b and 4-c present the kernel densities adjusted with the provided weights and our original weights, respectively. What can be seen from Figure 4-a is that the income distribution in the CSLC is more left-skewed than that in the NSFIE. This is perhaps because poorer households are underrepresented in the NSFIE. As can be seen from Figure 4-b, the gap between the income distributions remain even if an adjustment with the provided weights is applied. Finally, Figure 4-c shows that the gap narrows when adjusted with our original sampling weights. It is true that the gap remains for initial income and pre-tax income, but almost disappears for disposable income. Thus, the gap in income distribution between the two surveys can be explained to a considerable extent by the differences in the auxiliary variables (age of household head, household types, number of workers, area of residence, and homeownership rates).

[2] The kernel density used here is that presented in Hori, Maeda, and Suga (2020b).

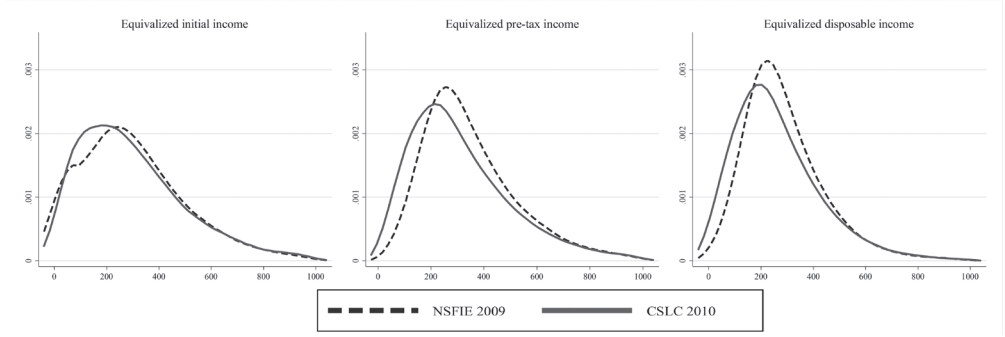

Figure4-a: Kernel density of income distribution by data (no weight)

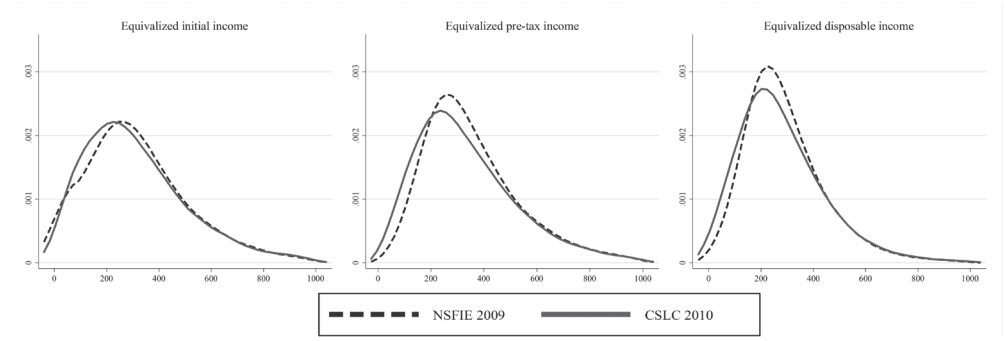

Figure4-b: Kernel density of income distribution by data (adjusted with provided weights)

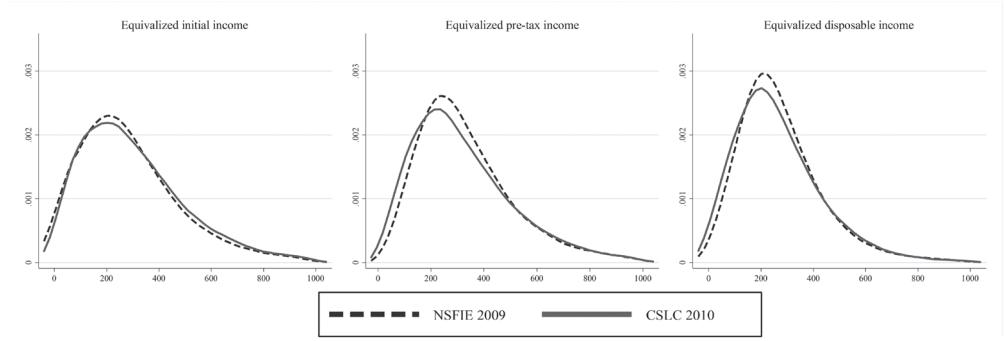

Figure4-c: Kernel density of income distribution by data (adjusted with our original weights)

5.2. Income inequality measures

Figures 5-a to 5-d show income inequality measures with and without weighting adjustment. Only income inequality measures calculated from the CSLC data are presented, since it was confirmed that income distributions are sufficiently close after adjustment with our original weights. It was found that income inequality measures calculated from the CSLC data are not as sensitive as those calculated from the NSFIE data. This is perhaps because the CSLC is more successful in sampling poorer households.

As mentioned above, previous studies revealed that there are huge gaps between income inequality measures calculated from the CSLC and the NSFIE. It was expected that this gap would

Figure5-a: Gini coefficients by weight (CSLC)

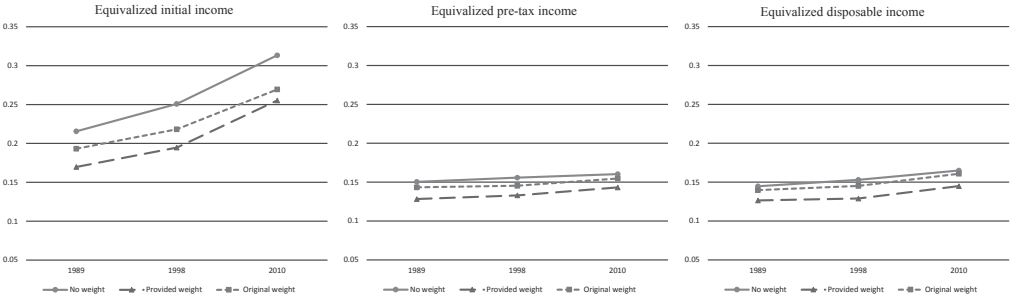

Figure5-b: Relative poverty rate by weight (CSLC)

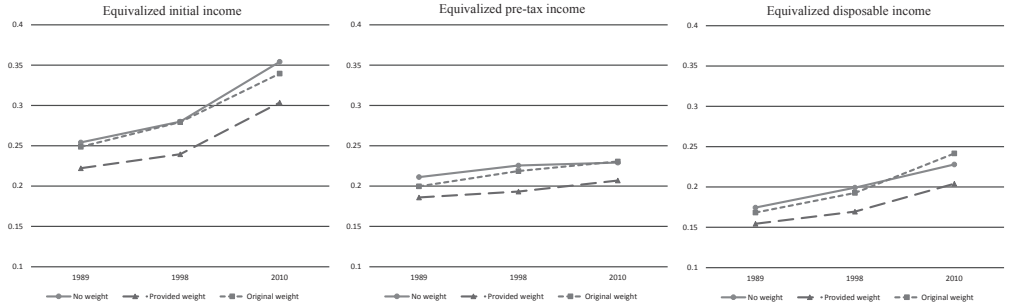

Figure 5-c: MLD by weight (CSLC)

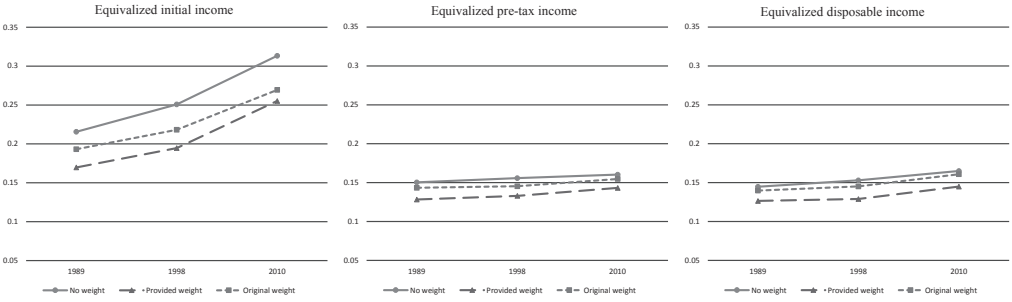

Figure 5-d: LV by weight (CSLC)

be narrowed when adjusted with our original sampling weights. To verify this hypothesis, the Gini coefficient from the 2010 CSLC and the 2009 NSFIE data were calculated with and without weighting adjustment. Without weighting adjustment, the Gini coefficient calculated from the 2010 CSLC data is 0.333 and that calculated from the 2009 NSFIE is 0.302. When adjusted with our original weights, the Gini coefficient calculated from the 2010 CSLC data is 0.341 and that calculated from the 2009 NSFIE is 0.329. Thus, weighting adjustment approximately halved the gap.

As can be seen from Figure 5-a to 5-d, income inequality measures calculated on initial income are considerably higher than those calculated from disposable income. This indicates that redistributive mechanisms of tax and social security systems played an important role in lowering income inequality. Moreover, the pace of increase in income inequality is also lower for the income inequality measures calculated on disposable income. Thus, the inter-generational distributive mechanisms of tax and social security systems not only lower the level but also the speed of increase in the income inequality measures.

5.4. The cause of the increase in income inequality

Let us consider how the contribution of the changes in the composition of households to the increase in income inequality can be measured by using sampling weights. As mentioned, our original

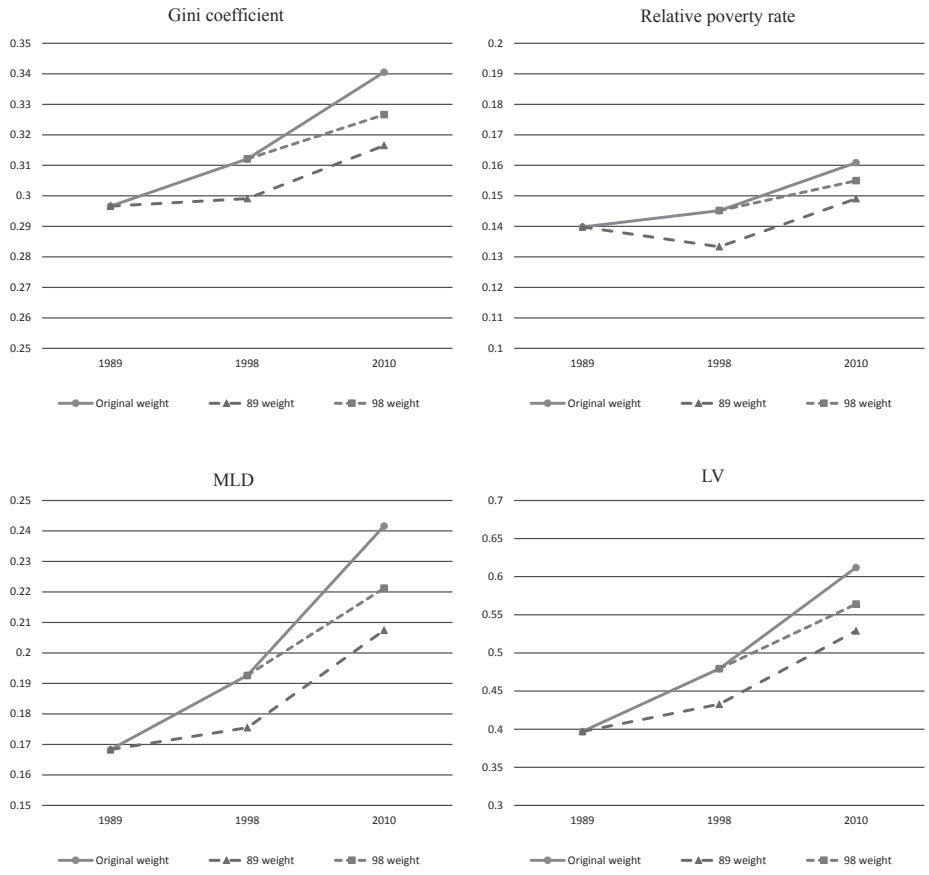

Figure 6: Income inequality measures with fixed share of weighting cells (CSLC)

sampling weights were created by calculating the ratio of the share of households belonging to weighting cell *j* in the *Population Census* to that in the CSLC. Let s_{jt} be the share of households belonging to cell j at year t in the *Population Census* and $\overline{s}_{jt}$ be that in the CSLC. How much income inequality increased can estimated by holding the composition of households at the levels of certain years by using the weights $s_{j1989}/\overline{s}_{j1999}$, $s_{j1989}/\overline{s}_{j2009}$, and $s_{j1999}/\overline{s}_{j2009}$.

Figure 6 shows the income inequality measures adjusted by the weights holding the composition of households at 1989 and 1999 levels. The dashed lines represent income inequality measures holding the household composition at the 1989 level, while the dotted lines represent income inequality measures holding the household composition at the 1999 level. As can be seen from the dashed lines, the greater part of the increase in income inequality during the 1990s can be explained by changes in the composition of households. Thus, as previous studies, such as Ohtake (2005), pointed out, the increase in income inequality during the 1990s can be accounted for by the changes in the composition of households resulting, for example, from population aging, nuclearization of households, or increase in dual-income households. For the 2000s, on the other hand, the changes in the composition of households accounts for at most half of the changes in income inequality measures. Thus, it is necessary to consider factors other than the changes in household composition, such as the collapse of traditional employment systems.

6. Conclusion

The role of inter-generational redistributive mechanisms in income inequality is investigated in this study. Using the microdata from the CSLC, several income inequality measures are provided for different definitions of income to show the margin by which income inequality measures change due to the tax and social security systems. To provide accurate measures, sampling weights were created using microdata from the *Population Census*.

It was found that adjustment with our original sampling weights narrows the gap between the income inequality measures calculated from the CSLC and the NSFIE data. Thus, the income inequality measures obtained are thought to be more accurate than those provided by previous studies using the provided sampling weights. It was also found that the income inequality measures based on equivalized initial income were considerably larger than those based on equivalized disposable income. Moreover, the rate of increase in the income inequality measures based on equivalized initial income was substantially higher than that based on equivalized disposable income. Thus, it can be concluded that the inter-generational redistributive mechanisms of the tax and social security systems not only lower the level but also mitigate the upward trend of income inequality.

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References

Suga, F. (2020). Zei-Shakaihoshou Seido niyoru Sedaikan Shotoku Saibunpai ga Kakusa ni Ataeru Eikyou (The Effect of Inter-Generational Redistribution through Tax and Social Security Systems on Inequality). in Junya Hamaaki (eds.), *Shoushi Koureika Shakai niokeru Sedaikan Iten to Kazoku*, Tokyo, Japan: Nihon Hyouron Sha, pp. 73-96.

Hashimoto, H. (2011). Kongo no Kokumin Seikatsu Kisochousa no Arikata ni tsuite no Ichikousatsu (A Study on the Nature of Future Basic Surveys of Japanese People's Livelihoods). Kousei no Shihyou, 58(4), 33-39 (in Japanese).

Hori, M., Maeda, S., & Suga, F. (2020a). Income Inequality in Japan: An Analysis using the CSLC dataset. mimeo

Hori, M., Maeda, S., & Suga, F. (2020b). In Search of Accurate Measures of Income Inequality across Japanese Households. mimeo

Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics*, 19(2), 81.

Kish, L. (1992). Weighting for unequal Pi. *Journal of Official Statistics*, 8(2), 183.

Kitao S. and Yamada T. (2019). Dimensions of Inequality in Japan: Distributions of Earnings, Income and Wealth between 1984 and 2014. RIETI Discussion Paper Series (2019-034).

Lise, J., Sudo, N., Suzuki, M., Yamada, K., & Yamada, T. (2014). Wage, income and consumption inequality in Japan, 1981–2008: From boom to lost decades. *Review of Economic Dynamics*, 17 (4), 582-612.

Ohtake, F. (2005). Nihon no Fubyoudou (Inequality in Japan). Nihon Keizai Shinbunsha, Tokyo (in Japanese).

Piketty, T. (2014). *Capital in the Twenty-First Century*, Cambridge Massachusetts: Belknap Press

Sano, S., Tada, S. & Yamamoto, M. (2015). Setai Chousa no Houhou to Chousa Setai no Seishitsu –Setai Kousei, Nenrei, Gakureki ni kansuru Hikaku– (Methods of Household Survey and the Characteristics of Households – Comparison of Family Composition, Age, and Educational Attainment), Financial Review, (122), 4-24 (in Japanese).

Tachibanaki, T. (1998). Nihon no Keizai Kakusa: Shotoku to Shisan kara Kangaeru (Economic Inequality in Japan: Consideration from the Viewpoint of Income and Assets). Tokyo: Iwanami Shinsho (in Japanese).

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Does a Wife's Employment Affect her Husband's Retirement Decision? Evidence from Japanese Longitudinal Data

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Abstract

Based on a large longitudinal dataset on Japanese middle-aged and older individuals, the purpose of this study is to investigate whether women's labor force participation affects their husbands' retirement decisions. Employing a simple fixed-effects model, a significant positive effect of wives' labor force participation on husbands' retirement decisions was found, which seems to imply that a husband's leisure is complementary to that of his wife. However, when employing instrumental variables such as the wife's health condition, the existence of care needs in the household, and statutory pensionable age, no significant effect of the wife's employment on her husband's retirement decision was found, regardless of employment type. This result indicates that a Japanese wife's retirement decision is *independent* of her husband's employment and marks a sharp contrast with those of western industrialized countries.

Keywords: Retirement; middle-aged person; interdependence

JEL Classification Codes: **J14 (Economics of the Elderly); J22 (Time Allocation and Labor Supply); J26 (Retirement)**

1. Introduction

It is known that the retirement decisions of men in western industrialized countries are affected by their spouses' employment. According to Schirle (2008), husbands' responses to the rise in their wives' labor force participation account for one-fourth, one-half, and one-third of the increase in the recent labor force participation by older men in the United States, Canada, and the United Kingdom, respectively. This means that a husband's leisure is complementary to that of his wife.

Is this complementarity of leisure time between husband and wife also found in East Asian countries? Whether a husband's employment complements or substitutes for his wife's employment is important, especially in Japan, which is facing a steady labor force decline due to population aging

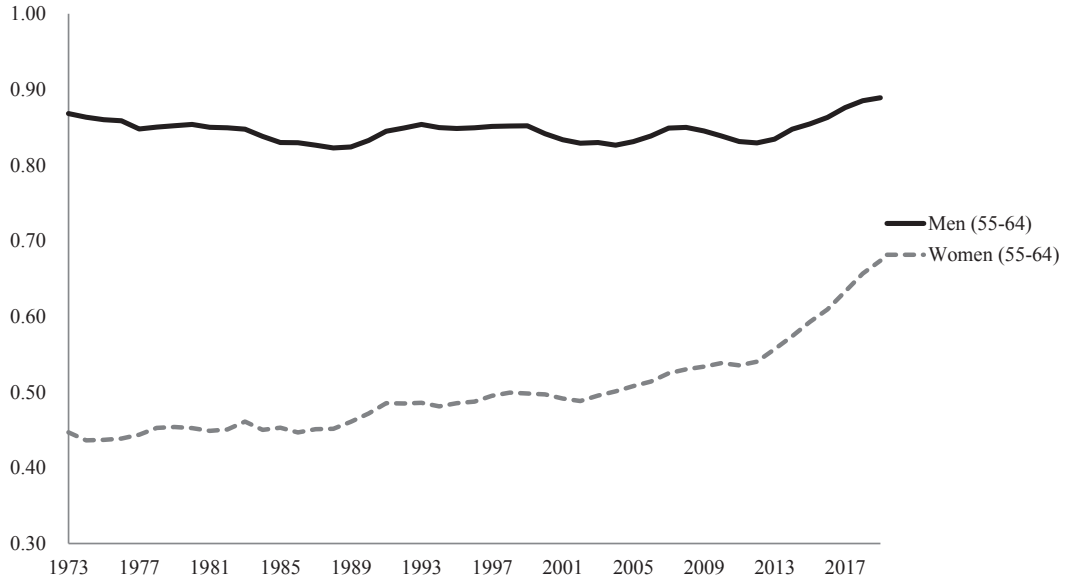

Figure 1. Participation rates of individuals aged 55–64 by sex
Source: Statistics Bureau of Japan, *Labour Force Survey*

and increases in statutory pensionable age; thus, there is an urgent need to raise the labor force participation rate of older individuals.

Figure 1, which corresponds to Figure 1 of Schirle (2008), shows a long-standing gradual rise, and a recent rapid rise in the labor force participation rate of Japanese women aged between 55 and 64 years, whereas it shows a high, stable participation rate of Japanese men in the same age range [1].

If complementarity of leisure between a husband and wife plays a key role in the retirement decision, the recent upward trend in Japanese women's labor participation will lead to a greater participation by older men. In contrast, if the income effect is important, the rise in the Japanese women's labor participation rate will serve as a disincentive for older men to work longer. The goal of this study is to determine which effect is dominant in the husband's retirement decision, using the largest longitudinal dataset on Japanese middle-aged individuals and the elderly.

Although interdependencies between husband and wife have long been considered a central issue in the study of labor supply, there is an impediment to a precise estimate of the impact; the husband and wife may *jointly (or simultaneously)* make decisions about working. This can cause a bias in the result of an estimation by a reduced form equation in which the spouse's labor supply is treated exogenously.

To avoid the bias, several studies exploit exogenous variations in the spouse's labor supply, which are generated by legal changes, such as regulations on the work week and tax reform (Goux et al., 2014; Gelber, 2014). In this study, instead of relying on experimental settings, health status, the existence of care needs in the household, and pensionable ages were used as the instrumental variables (IVs) determining the spouse's labor force participation [2].

Compared to those in their thirties or forties, individuals near retirement age may be more

[1] Almost the same patterns were found when the age range was narrowed to between ages 60 and 64 years, although this is not shown in the figure.

[2] Yamada and Sakai (2016), whose study is based on the same dataset as the present analysis, find only women are likely to leave a job when there is a frail parent in the household. Fukahori et al. (2015) also find that the incidence of a frail individual in the household has a larger negative impact on women's employment than on men's employment.

responsive to their spouse's work-or-leisure choice. Several studies found a positive correlation between the husband and wife's retirement decision (Blau, 1998; Gustman and Steinmeir, 2000). Moreover, there is also evidence that the complementarities of leisure are *asymmetric*, that is, men are very responsive to their wives' employment, while women are not as responsive to their husbands' employment (Coile, 2004).

Our study contributes to the understanding of such interdependencies of married couples' work decisions that also exist in an East Asian country; Japan. To the best of our knowledge, this is the first study that explores such interdependencies by using a large longitudinal dataset on Japanese middle-aged and older individuals, as well as the IV technique.

To conclude, firstly, no significant relationship between a wife's employment and her husband's employment was found in any of the estimations with IVs, although a significant relationship was found in the estimations without IVs. This result marks a sharp contrast with those of existing studies in Europe and the United States, in which complementarity of leisure between a husband and wife has been found.

2. Empirical Model

To examine the interdependencies in spousal labor supply, the following IV fixed-effects model is estimated:

$$L_{it}^{H} = \gamma L_{it}^{W} + X_{it}^{H}\beta + \nu_t + u_i + \varepsilon \tag{1}$$

where, L_{it}^{H} and L_{it}^{W} denote the employment status of the *i*th husband and *i*th wife, respectively, in year *t* and L_{it} takes the value one if the individual is employed and zero otherwise. L_{it}^{W} is an endogenous variable for which the wife's health condition, the existence of care needs in the household, and pensionable age values are utilized as IVs. The health status of the wife consists of three dummy variables, which indicate that her health is "very good," "good," or "fair." The existence of care needs in the household is a dummy variable that equals one if the respondent is living with a family member who needs care. Two pensionable age values are used as IVs: pensionable age for the basic pension and pensionable age for the second-tier pension, both of which have been raised in stages since the 2000s in accordance with the 1994 and 2000 pension reforms. The variable X_{it}^{H} includes variables denoting age, health condition, homeownership, the amount of deposits, and a housing loan taken out by the husband.

The IV fixed-effects model is employed at the cost of abandoning the nonlinear specification to deal with unobserved heterogeneity [3]. The result of the IV fixed-effects model is compared with that of the simple fixed-effects model to demonstrate the role of the IVs. Standard errors are clustered individually, as including fixed effects is not sufficient to control for all the within-cluster correlation of the error (Cameron and Miller, 2015).

3. Data

The data used to estimate the model described in Section 2 come from the Longitudinal Survey of Middle-aged and Elderly Persons (LSMEP), a nationally representative sample of middle-aged and elderly individuals between the ages of 55 and 59 at the end of October 2005. LSMEP is the largest

[3] Following Schirle (2008), the recursive bivariate probit model was also estimated for a nonlinear specification to confirm the robustness of our results. Almost the same results as those in the IV fixed-effects model were found, but these are not shown in this paper.

Table 1. Descriptive Statistics

		N. of Obs.	Mean	Std. Dev.	Min	Max
Husband is currently employed		62,289	0.878	0.327	0	1
Health condition of husband:	Very good	62,289	0.064	0.244	0	1
	Good	62,289	0.318	0.466	0	1
	Fair	62,289	0.424	0.494	0	1
Living in a privately-owned house		62,289	0.912	0.284	0	1
In the middle of paying back a housing loan		62,289	0.309	0.462	0	1
Amount of deposits (10,000 yen)		62,289	887.550	1,621.514	0	47,000
Non-answer to question on amount of deposits		62,289	0.330	0.470	0	1
Living with persons who need care		36,533	0.091	0.287	0	1
Wife is currently employed		62,289	0.630	0.483	0	1
Health condition of wife:	Very good	62,289	0.052	0.222	0	1
	Good	62,289	0.305	0.460	0	1
	Fair	62,289	0.453	0.498	0	1
Wife's age is over pensionable age for basic pension		62,289	0.114	0.317	0	1
Wife's age is over pensionable age for second-tier pension		62,289	0.244	0.429	0	1

longitudinal survey of middle-aged and elderly individuals in Japan, and has been conducted annually by the Japanese Ministry of Labour, Health and Welfare since 2005. This survey included 34,240 respondents in the first year, approximately 70% of them remaining in the survey as of 2012.

The survey provides a rich set of information about the respondents' family background, health status, employment status, and financial situations. Since our main interest is a spouse's employment status, households that had both husband and wife as respondents were selected and their information was matched to create sub-samples of couples. This matched sub-sample is approximately 40% of the whole sample.

Although our base estimation relies on the first eight waves, the IV estimates are based only on the fourth through eighth waves. This is because the question on whether there is a household member in need of care was included only from the fourth wave onwards and the question item is essential to create one of our IVs.

The descriptive statistics of the dataset for the estimation are shown in Table 1.

4. Results

The estimation results of the fixed-effects model are presented in Table 2. In column (1), which shows the result of the estimation based on all couples, it is found that the coefficient of the wife's employment is positive and statistically significant. This result seems to imply that the leisure of a husband and wife are complementary to each other. It is also found that middle-aged and elderly men are more likely to work if they are healthier, do not own houses, and are in the middle of paying back their housing loans.

The models are also estimated on the basis of the sample respondents whose age is above 60 years (column [2] in Table 2). This is because a focus area of the present study is the investigation of elderly men remaining in the labor market beyond the mandatory retirement age [4]. A positive and statistically significant coefficient of the wife's employment is also observed in this case.

The result of the estimation based on couples where the wife is older is presented in Column (3) of Table 2. Among the couples where the wife reaches retirement age before the husband, the wife's employment status is considered to be more exogenous for the husband's retirement decision. In this case, it was found that the coefficient of the wife's employment is positive, but insignificant.

[4] Japanese firms are prohibited from setting the mandatory retirement age below 60 years.

Table 2. Effects of Wife's Employment on Husband's Retirement: Fixed-effects Model (Linear Probability Model)

Type of couple:		(1) All	(2) Husbands aged 60 and older	(3) Husbands who are younger than their wives	(4) Husbands whose wives were employed at age of 59	(5) Husbands who were regular workers at age of 59	(6) Husbands who were self-employed at age of 59
Wife is currently employed		0.023***	0.025***	0.010	0.046***	0.038***	0.055***
		(0.004)	(0.007)	(0.008)	(0.004)	(0.007)	(0.006)
Husband's health condition:	Very good	0.008	0.021*	0.018	0.010	-0.018	0.023***
		(0.006)	(0.012)	(0.014)	(0.007)	(0.012)	(0.009)
	Good	0.020***	0.026***	0.024***	0.017***	-0.005	0.019***
		(0.004)	(0.008)	(0.009)	(0.005)	(0.008)	(0.006)
	Fair	0.025***	0.030***	0.030***	0.024***	0.003	0.017***
		(0.004)	(0.007)	(0.008)	(0.004)	(0.007)	(0.005)
Living in a privately-owned house		-0.049***	-0.054**	0.021	-0.029**	-0.012	-0.019
		(0.010)	(0.022)	(0.023)	(0.012)	(0.022)	(0.015)
In the middle of paying back a housing loan		0.034***	0.012	0.032***	0.033***	0.029***	-0.011*
		(0.004)	(0.010)	(0.010)	(0.005)	(0.008)	(0.006)
Amount of deposits (10,000 yen)		-0.000***	-0.000**	-0.000***	-0.000***	-0.000***	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-answer to question on amount of deposits		-0.004	-0.005	0.015*	-0.006	-0.006	-0.005
		(0.004)	(0.008)	(0.008)	(0.004)	(0.007)	(0.005)
Constant		0.868***	0.621***	0.943***	0.842***	0.605***	0.881***
		(0.015)	(0.025)	(0.042)	(0.018)	(0.076)	(0.055)
Observations		62,289	26,492	9,379	43,382	17,796	9,509
R-squared		0.101	0.077	0.066	0.089	0.166	0.045
Number of id		9,076	6,676	1,382	6,228	2,329	1,273

Note:
The dependent variable is a dichotomous variable which takes the value of 1 if a husband is currently employed.
All models include dummy variables for husband's age and survey year as independent variables.
Cluster-robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Japanese wives often quit their jobs upon marriage and continue to be housewives in the years that follow. In such cases, the husband may not consider his wife's employment status in making his retirement decision. Hence, the same model is re-estimated, limiting the sample to those husbands whose wives are employed at the age of 59. This is done to capture the decision-making of those who may change the timing of their retirement on the basis of their wives' employment. The results are presented in column (4) of Table 2, where it is observed that the coefficient of the wife's employment is significantly positive, and much larger than the case that considers all couples.

To capture the fact that there is a substantial difference in the retirement process between employees and self-employed workers, the sample is divided by the husband's employment type at the age of 59 (columns [5] and [6] in Table 2) [5]. Column (5) shows the result of the estimation conducted on a sub-sample that consists of husbands who were regular workers at the age of 59 and whose wife had a job at the age of 59, whereas the result of the estimation based on the sub-sample

[5] Usui et al. (2015) found that Japanese workers in salaried jobs gradually move to part-time work or retire after beginning to receive pension benefits, while self-employed workers neither retire nor reduce their working hours once pension benefits commence.

Table 3. Effects of Wife's Employment on Husband's Retirement: IV Fixed-effects Model (Linear Probability Model)

Type of couple:		(1) All	(2) Husbands aged 60 and older	(3) Husbands who are younger than their wives	(4) Husbands whose wives were employed at age of 59	(5) Husbands who were regular workers at age of 59	(6) Husbands who were self-employed at age of 59
Wife is currently employed		-0.014	-0.069	-0.233	-0.022	0.033	0.047
		(0.077)	(0.105)	(0.161)	(0.069)	(0.103)	(0.127)
Husband's health condition:	Very good	0.013	0.033**	0.021	0.013	-0.009	0.024*
		(0.010)	(0.014)	(0.021)	(0.011)	(0.019)	(0.014)
	Good	0.022***	0.035***	0.027*	0.015**	0.003	0.018
		(0.007)	(0.009)	(0.016)	(0.007)	(0.013)	(0.012)
	Fair	0.025***	0.034***	0.027*	0.022***	0.008	0.018*
		(0.006)	(0.008)	(0.014)	(0.007)	(0.011)	(0.010)
Living in a privately-owned house		-0.041**	-0.035	0.035	-0.033	-0.008	-0.032
		(0.020)	(0.031)	(0.059)	(0.026)	(0.046)	(0.054)
In the middle of paying back a housing loan		0.029***	0.014	0.043**	0.033***	0.050***	-0.018
		(0.009)	(0.014)	(0.021)	(0.010)	(0.017)	(0.014)
Amount of deposits (10,000 yen)		-0.000***	-0.000**	-0.000**	-0.000***	-0.000**	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-answer to question on amount of deposits		-0.005	-0.009	0.031**	-0.005	-0.006	-0.002
		(0.006)	(0.009)	(0.013)	(0.007)	(0.012)	(0.008)
Observations		36,339	22,803	5,434	25,420	10,842	5,711
R-squared		0.069	0.058	-0.013	0.055	0.109	0.039
Cragg-Donald Wald F stat.		27.716	16.738	5.900	29.855	15.933	3.505
Hansen J stat.		11.684**	9.607*	2.026	9.083	10.771*	6.055
Number of id		7,814	5,781	1,175	5,464	2,256	1,227

Note:
The dependent variable is a dichotomous variable which takes the value of 1 if a husband is currently employed.
All models include dummy variables for husband's age and survey year as independent variables. Columns (2)-(6) are the results of estimations which rely on the 4^{th}-8^{th} waves.
Cluster-robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

of husbands who were self-employed at the age of 59 is shown in column (6). In both columns, it is found that the wife's employment has a significant positive effect.

The estimation results of the IV fixed-effects model are presented in Table 3, in which each column corresponds to the various specifications of Table 2. It is found that the IVs are not weak in most of the specifications. However, the results are in sharp contrast to the results shown in Table 2, as it is found that all the estimated coefficients for the wife's employment from the IV fixed-effects model are insignificant [6].

Although not shown in Table 3, the IV fixed-effects model with two additional sub-samples were also estimated. In the first, the husbands were non-regular workers at the age of 59, and in the second they were employed as non-regular workers in a company with less than 300 workers. Those who are a part of the above sub-samples are considered to have the relative freedom of choosing the

[6] Assuming that husbands who were self-employed at the age of 59 rarely receive the benefit of the second-tier pension, the pensionable age for second-tier pension as an IV is excluded from the first-stage equation for the estimation of column (6) in Table 3.

timing of retirement. However, even among these husbands, no significant coefficient was found for the wife's employment [7].

5. Conclusion

In this study, it was found that a Japanese wife's retirement decision is *independent* of her husband's employment. The finding based on the IV model is robust, regardless of employment type and firm size. Even if this result may require further validation, the fact that it contrasts with results from the estimations that treat the spouse's employment as exogenous is, at least, noteworthy.

Our finding is inconsistent with similar existing studies in Europe and the United States, in which complementarity of leisure between a husband and wife has been found. This may imply that, in Japan, factors such as mandatory retirement age, post retirement employment, increases in pensionable age, and health may be the more important conditions determining retirement timing.

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References

Blau, D., (1998), Labor Force Dynamics of Older Married Couples, *Journal of Labor Economics*, Vol. 16, No. 3, pp. 595-629.

Cameron, C., and D. Miller (2015), A Practitioner's Guide to Cluster-Robust Inference, *Journal of Human Resources*, Vol. 50, No. 2, pp. 317-372.

Coile, C., (2004), Retirement Incentives and Couples' Retirement Decisions, *B.E. Journal of Economic Analysis & Policy*, Vol. 4, No. 1, pp. 1–30.

Fukahori, R., Sakai, T., and K. Sato (2015), The Effects of Incidence of Care Needs in Households on Employment, Subjective Health, and Life Satisfaction among Middle-aged Family Members, *Scottish Journal of Political Economy*, Vol. 62, No. 5, pp. 518-545.

Gelber, A., (2014), Taxation and the Earnings of Husbands and Wives: Evidence from Sweden, *Review of Economics and Statistics*, Vol. 96, No. 2, pp. 287-305.

Goux, D., Maurin, E., and B. Petrongolo (2014), Worktime Regulations and Spousal Labor Supply, *American Economic Review*, Vol. 104, No. 1, pp. 252-76.

Gustman, A., and T. Steinmeier (2000), Retirement in Dual-Career Families: A Structural Model, *Journal of Labor Economics*, Vol. 18, No. 3, pp. 503-545.

Schirle, T., (2008), Why Have the Labor Force Participation Rates of Older Men Increased since the Mid-1990s?, *Journal of Labor Economics*, Vol. 26, No. 4, pp. 549-594.

Yamada, A., and T. Sakai (2016), Labor Supply and Income Reduction of Middle- and Old-Aged People in Japan with a Parent in Need of Long-Term Care, *Economic Analysis*, No. 191, pp.

[7] It was also found that even in the sample of husbands who work in firms that do not have a mandatory retirement age, the estimated coefficient for the wife's employment is insignificant.

183-212 (*in Japanese*).
Usui, E., Shimizutani, S., and T. Oshio (2016), Are Japanese Men of Pensionable Age Underemployed or Overemployed?, *Japanese Economic Review*, Vol. 67, No. 2, pp. 150–168.

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Health Impacts on Labor Participation of Elderly Japanese Males

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Abstract

The main object of this study is to investigate the relationship between individuals' health status and labor participation among middle-aged and elderly males in Japan using a unique panel dataset. Our analysis focuses on three types of health indicators based on respondents' medical history in the three years preceding the survey. To adjust for the potential endogeneity of the health variables, we use individuals' body mass index at age 30 and their parents' medical history as instrumental variables. Our empirical results show that a deterioration in health increases the probability of not working and being retired and, moreover, tends to decrease individuals' average working hours per week. Further, splitting our sample, we find that, compared with males under 60 years of age, the work status of males aged 60 or over is significantly more likely to be affected by having one additional illness and suffering from a lifestyle disease than that of under 60s.

Keywords: Labor participation by elderly males, Health indicators, Instrumental variable method, Body mass index at a young age, Parent medical history

JEL Classification Codes: **I10, J14, J26**

1. Introduction

In a graying society, such as that of contemporary Japan, in which the number of persons in the labor force is gradually decreasing, the promotion of labor participation by elderly workers is an important policy issue. In order to effectively address this issue, society needs to critically review the retirement system for the elderly in Japan. One of the most significant causes for the elderly to leave the labor market in Japan appears to be a deterioration of their health. According to the "Survey on Employment Conditions of Elderly Persons in 2004" conducted by the Ministry of Health, Labour and Welfare (MHLW), 29% of elderly males between 55 and 69 years do not work and do not even wish to work due to "poor health," which is the second most commonly cited reason for having retired.

While the negative impact of poor health on labor participation in Japan is well documented (see, e.g., Iwamoto, 2000; Oishi, 2000; and Hamaaki and Noguchi, 2010), empirical evidence on the size of the effect of poor health is inconclusive due to the limited availability of appropriate data on individuals' labor participation and health status. In addition, studies using the limited data available

suffer from the endogeneity of health indicators, which has made it difficult to identify the "pure" effects of health status on labor supply. Such endogeneity is often caused by measurement errors, unobserved determinants of health and labor supply, and respondents' "justification behavior," that is, the frequently observed pattern that those not working justify the fact that they are not working or took early retirement by overstating their health problems (Bound, 1991; Kerkhofs and Lindeboom, 1995; Kreider, 1999; Gannon, 2009; Lindeboom and Kerkhofs, 2009). [1]

A potential way to resolve such endogeneity problems is to use more objective indicators of individuals' health status, such as activities of daily living (ADL) indicators. However, as pointed out by Mathiowetz and Lair (1994), as long as such data are self-reported, there still remain possible measurement errors. Moreover, even if we were able to use almost perfectly objective health measures, such as diagnoses extracted from medical charts or health care receipts, which are actually used by Datta Gupta and Larsen (2010) and Christensen and Kallestrup-Lamb (2012), it would still be difficult to avoid the endogeneity issue due to the presence of unobserved heterogeneity that affects both individuals' health and work status (or working hours). To adjust for the statistical bias caused by endogeneity, preceding studies therefore have employed a variety of instrumental variables (IVs) such as mortality information (i.e., the date of death) (Bound, 1991) and parents' health and mortality and respondent's degree of obesity (Dwyer and Mitchell, 1999). Moreover, a different IV approach has also been developed, by Bound et al. (1999), Au et al. (2005) and Disney et al. (2006), for examining a dynamic relation through the lifetime between health status and trajectories of working status. Specifically, they construct a latent variable for health stock as a function of individual characteristics and detailed objective health measures, and use the predicted value of this variable as an instrument to estimate the effect of self-assessed health in the second stage regression of their 2SLS estimation. Overall, these previous studies confirm that poor health (and its decline) has a significant impact on individuals' retirement decisions.

More recent studies make efforts to overcome the endogeneity problem of health measures through a matching method (combined with difference-in-differences estimation). Further, in order to prevent the health impact from being contaminated by an anticipation effect, many studies focus on unexpected changes in health (i.e., highly exogenous changes in health), such as the first onset of myocardial infarction (e.g., stroke, cancer, etc.) and a sudden decline in self-reported health. Especially among the studies analyzing the effect of health status on the labor supply for middle-aged and elderly people, it was found that while the health deterioration tends to significantly reduce the probability of being employed, it does not decrease hours worked (conditional on working), on average (see, e.g., García-Gómez, 2011; Trevisan and Zantomio, 2016; Candon 2018; Lenhart, 2019).

Previous studies focusing on Japan have also attempted to address the endogeneity problem of individuals' health status using a variety of instruments. For instance, Iwamoto (2000) uses the average health status of household members except the respondent himself and the respondent's daily activities (i.e., eating, exercising, and sleeping) for maintaining his own physical and mental health as IVs for the respondent's health status. However, it seems that these instruments do not sufficiently capture any change in health status. Second, Oishi (2000) employs prefecture-level average life expectancy and its square as IVs. However, since these instruments are not significantly correlated with individual's subjective health in the first stage of her IV regression, her results on health effects are not robust. Third, Yuda (2010) uses two dummy variables for fitness habits and

[1] Some studies, however, find little evidence of justification behavior (e.g., Dwyer and Mitchell, 1999; Benitez-Silva et al., 2004) or suggest that the overestimation of health effects due to justification behavior is not very serious. Specifically, Au et al. (2005) find that estimated health effects based on subjective health suffer from attenuation bias rather than justification bias.

participation in sports club activities as IVs. Although those variables are significantly correlated with a subjective health measure, significant parts of the correlation might be accounted for by a reverse causality from the health status to physical activities. Finally, Sato (2016) uses as IVs average hours of sleep per day and the amount of exercise with sweating outside of work during a week.

Against this background, the main purpose of this study is to examine to what extent a deterioration in health influences an individual's decision to participate in the labor market for middle-aged and older males in Japan, carefully adjusting for the endogeneity of health indicators. We do so using the unique panel data from the "Survey on Health and Retirement" conducted from 2008 through 2010 by the National Institute of Population and Social Security Research. Our analysis focuses on the effect of the following three types of health indicators defined on the basis of respondents' medical history in the three years preceding the survey: (1) the number of illnesses, (2) whether or not suffering from a lifestyle disease (high blood pressure, hyperlipidemia, sugar diabetes, and gout), and (3) whether or not suffering from at least one of the "three killer diseases" (cancer or malignant growth, heart disease, stroke or cerebrovascular disease). Since these measures are relatively objective and accurate compared to other subjective measures solely based on respondents' self-assessment, they are less likely to be affected by measurement errors and "justification behavior." In order to control for the remaining sources of endogeneity, which likely derive from omitted variables (i.e., unobserved determinants of health and labor supply), we use the degree of obesity in youth and the parents' medical history as IVs, which were first applied to Japanese data in one of our previous studies, Hamaaki and Noguchi (2010). While the present study employs the same instruments, the focus is somewhat different. Specifically, whereas in Hamaaki and Noguchi (2010) we examine the effect of respondents' life-long medical history on labor supply, this study analyzes the more direct and immediate effects of individuals' health status on labor supply by focusing only on the three years preceding the survey.

Focusing on men only, we examine the effect of the three health indicators mentioned above on the probability of not working, on the probability of having retired, and on the average working hours per week. Second, we conduct this examination for all observations in our sample as well as for subsamples of individuals younger than 60 and individuals aged 60 and above, and compare the extent to which health problems affect individuals' labor status for these two age groups. The opportunity cost of retiring tends to be lower for elderly individuals who, moreover, tend to have lower physical resistance to diseases, and splitting the sample into these two age groups allows us to examine how these factors affect the retirement decision.

Our empirical results show that a deterioration of health does affect individuals' decisions on whether to participate in the labor market and how many hours to work. Specifically, both the probability of not working and of having retired tend to be higher for those suffering from one of the three killer diseases in the preceding three years, and their working hours per week tend to be shorter. Further, the magnitude of the health effect of suffering from one of the three killer diseases appears to be considerably larger than that of suffering from one additional illness or suffering from a lifestyle disease. In addition, we find that the instrumented estimates of the health effect are considerably larger than the non-instrumented estimates. This finding suggests that the main cause of the endogeneity in our health indicator is probably omitted variables. Specifically, unobservable determinants of health and labor supply, such as the past employment status and the type of work done in the past, are omitted both from the health and labor supply equations. For example, those who did not work in the past may be in better health since they were not exposed to hard physical labor or hazardous work or did not experience stress. At the same time, they may be less likely to be participating in the labor force on the survey date. Further, we find that the work status of males aged 60 and above is more significantly affected by one additional illness and a history of lifestyle diseases

than that of those under 60.

The remainder of the study is organized as follows. Section 2 describes our data. Section 3 descriptively examines the relationship between health status and labor participation using the basic statistics of our dataset. Section 4 then outlines our empirical strategy and discusses the validity of our instrument. Section 5 presents our empirical results, while Section 6 concludes the study.

2. Data description

2.1. Data source and observations to be analyzed

The data used in this study are taken from waves I to III of the "Survey on Health and Retirement" conducted from 2008 through 2010. The survey is conducted annually in March by the National Institute of Population and Social Security Research to examine the effects of middle-aged and older people's health on their retirement behavior and, to this end, targets respondents aged between 45 and 80 at the time of wave I. For the 2008 survey, 2,747 potential respondents were randomly extracted from the 39,311 "monitors" (individuals that had previously agreed to participate in future surveys) of Central Research Services, Inc. (CRS). [2]

Of the 2,747 monitors contacted, 1,074 responded to wave I of the survey (for a response rate of 39%). In wave II (implemented in March 2009), in addition to a follow-up survey of the 1,074 respondents to the first survey, another 578 individuals were randomly chosen from among the CRS monitors. Responses were obtained from 862 wave I respondents (response rate: 80%) and from 257 newly chosen individuals (response rate: 44%). In wave III (March 2010), the 1,119 wave II respondents were contacted again, of which 954 responded (response rate: 85%).

From wave II onward, the "Survey on Health and Retirement" has included questions regarding respondents' spouses' health and work status that are almost identical to those for respondents themselves. Responses regarding spouses' health and work status are available for 937 individuals in wave II (2009) and 798 individuals in wave III (2010). For the purpose of this study, we concentrate on male respondents/spouses, since – as we pointed out in Hamaaki and Noguchi (2010) – female labor participation is more likely than male labor participation to be affected by factors other than health. As a result, our dataset consists of observations for 497 men in wave I, 665 in wave II, and 656 in wave III.

2.2. Health indicators and work status

In this subsection, we describe the primary variables used for our empirical analyses. First, as for individuals' health status, the "Survey on Health and Retirement" asked respondents and their spouses to indicate whether they had suffered from one or more illnesses from a list of 29 illnesses

[2] CRS conducts a Monthly Omnibus Survey of individuals randomly selected from the basic resident register. "Monitors" are individuals that have agreed to participate in more detailed surveys in the future. CRS then selects "monitors" for various surveys from municipalities around Japan that are representative of the sex and age structure (in five-year age brackets) of the population overall. The composition of monitors is adjusted regularly so that the sex and age structure is identical to that in the *Population Census*. Survey respondents receive a book voucher worth 500 yen as compensation for participating.

(including "other"). [3] The survey also asked about the age at which individuals had contracted these illnesses. Based on these questions, we construct the following three types of health indicators: (1) the number of illnesses contracted in the three years preceding the survey, (2) a dummy variable for suffering from a lifestyle disease in the preceding three years, and (3) a dummy variable for suffering, in the preceding three years, from at least one of the three killer diseases that are the main cause of death in Japan. Even though the data are solely based on self-reporting (rather than on clinical and/or physiological examinations such as blood tests and cytodiagnosis), these health indicators can be considered to be relatively objective. On the other hand, although it is common in epidemiology to measure people's health in terms of the number of illnesses, since this measure does not take into account the severity of an illness and its effects on physical functions, severe and mild illnesses are weighted equally. Therefore, in order to take the heterogeneity across illnesses in terms of their effect on labor participation into account, we also focus on two specific types of illnesses, namely lifestyle diseases and the three killer diseases.

In order to examine whether the incidence of illness affects the labor participation decision through a change in subjective health, we examine the relationship between our objective health indicators and subjective health. For this purpose, we compare the cumulative distribution functions (CDFs) of a subjective health indicator of people with good and with poor objective health. The subjective health indicator is based on a five-grade response to the question: "What is your current health condition?" If, for example, suffering from one of the three killer diseases worsens subjective health, the CDF of those suffering from one of the three killer diseases should be located below that of those not suffering from one of these diseases. Figures 1(a) to 1(c) show the CDFs of subjective health of those suffering from no illness and those suffering from one or more illnesses. In the figures, the CDFs of those suffering from an illness are located below the CDFs of those suffering no illness. In particular, suffering from one of the three killer diseases appears to be associated with a sharp deterioration in individuals' subjective health. This suggests that when people suffer from a severe acute disease, this is likely to result in a greater deterioration in subjective health and hence is more likely to affect individuals' labor participation decisions.

Second, regarding individuals' work status, the "Survey on Health and Retirement" asks survey participants to report their and their spouse's employment status choosing from the following categories: (1) regular employee or civil servant; (2) contract or non-regular employee; (3) temporary employee (agency temp); (4) part-timer; (5) self-employed (own business); employed in agriculture, fishing, or forestry; (6) self-employed; (7) piecework at home; (8) professional job requiring

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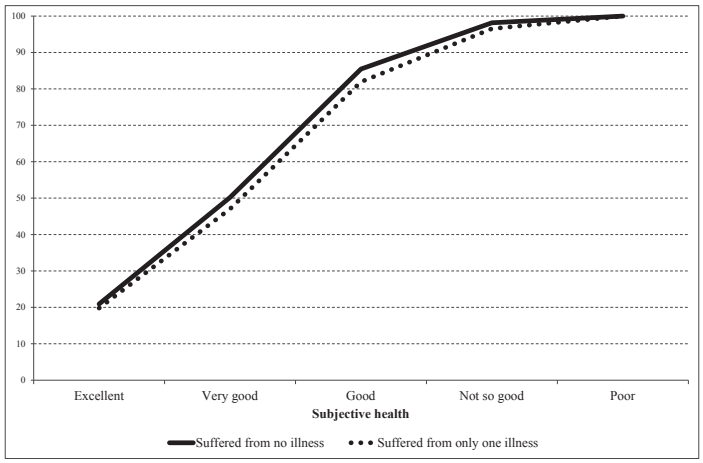
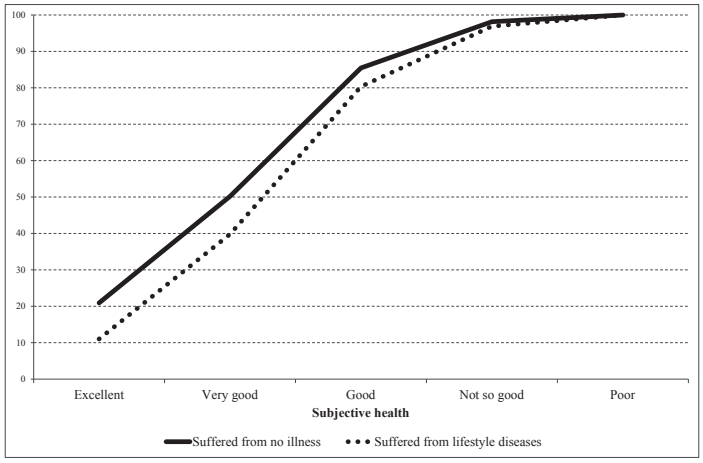
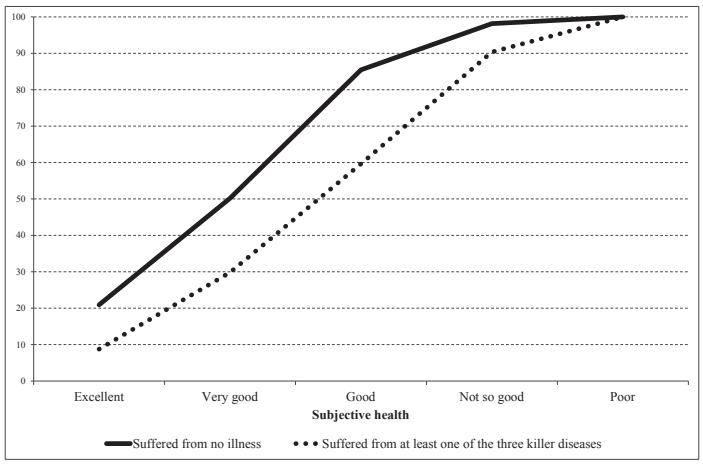
[3] The 29 illnesses are: (1) heart diseases (heart attack and heart failure, heart infarction, valvular heart disease, etc.); (2) high blood pressure; (3) hyperlipidemia; (4) stroke and cerebrovascular disease; (5) cancer and malignant growths (including leukemia and lymphoma; excluding benign skin cancer); (6) sugar diabetes; (7) gout; (8) chronic lung disease (chronic bronchitis, pulmonary emphysema, etc.); (9) asthma; (10) digestive system disorders I (stomach diseases other than cancer such as ulcers); (11) digestive system disorders II (liver diseases other than liver cancer such as hepatitis B and C, cirrhosis of the liver); (12) digestive system disorders III (gall bladder-related diseases); (13) digestive system disorders IV (other or unspecified digestive system disorders); (14) kidney-related diseases; (15) uterine fibroids and ovary-related diseases; (16) thyroid gland-related diseases (Graves' disease, prostatic hyperplasia, etc.); (17) urination problems (incontinence and leakage, urinary hesitancy, ureteral stones); (18) joint diseases (arthritis, rheumatism); (19) hernias, neuralgia; (20) lower back pain, stiff shoulders; (21) femoral neck fracture; (22) osteoporosis; (23) eye diseases (cataract, glaucoma, etc.); (24) ear diseases (deafness, etc.); (25) hay fever, allergies, etc.; (26) Parkinson's disease; (27) skin diseases (including benign skin cancer); (28) mental health problems such as depression; (29) other. It should be noted that the number of categories increased from 21 in wave I to 27 in wave II and finally to 29 in wave III as a result of refinements in the questionnaire by providing separate categories for diseases that made up a large share of the answers given under "other" in the earlier surveys.



(a) CDFs of the subjective health measure of those who suffered from only one illness and those who suffered from no illness



(b) CDFs of the subjective health measure of those who suffered from lifestyle diseases and those who suffered from no illness



(c) CDFs of the subjective health measure of those who suffered from at least one of the three killer diseases and those who suffered from no illness

Figure 1. Comparison of CDFs of subjective health of those suffering from no illness and those suffering from one or more illnesses

qualifications; (9) other; (10) not working. [4] In this study, we group these categories into (1) regular employees; (2)-(4) non-regular employees; (5)-(9) self-employed and other, and (10) not working. Moreover, the survey asked whether respondents and their spouses were looking for work at the time of the survey (from wave II onward) and how many hours per week they currently worked on average. Based on these questions, we create the following three work status variables: "not working" at the time of the survey (1 if (10) was chosen; 0, otherwise); "having retired" at the time of the survey (1 if not working and also not looking for work at the time of the survey; 0, otherwise); and average hours of work per week.

3. Basic statistics

3.1. Individual characteristics

Table 1 shows basic statistics for the main characteristics of the individuals in our dataset for each survey wave. First, the table shows that from wave I to wave III the average age of respondents increased from 61.4 to 63.0 years. At the same time, the share of respondents not working increased from 34.2% to 37.5%, the share of those having retired (i.e., those not working and not looking for work) rose from 31.5% in wave II to 32.8% in wave III, [5] and the average hours of work per week dropped considerably from 33.4 hours in wave I to 25.3 hours in wave III. Taken together, these figures indicate that with advancing age people are more likely to stop working. That being said, the large 7-hour decline in average weekly working hours from 2008 (wave I) to 2009 (wave II) is likely, to a considerable extent, to reflect the impact of the global financial crisis on the labor market for the elderly.

Second, regarding respondents' medical history in the preceding three years, the table shows a gradual deterioration in their health status. Again, to a large extent, this presumably reflects the advancing average age of our survey respondents. In addition, it needs to be pointed out, however, that these figures may be affected by considerable changes in two of the health indicators from 2008 to 2009, namely, the number of illnesses and the share of those who suffered from lifestyle diseases, as a result of revisions in the list of illnesses in the "Survey on Health and Retirement" (see footnote 4 for details). For example, in wave II, "gout" was added as a new item to the list of illnesses, thus increasing the number of illnesses and the share of those who suffered from a lifestyle disease.

Third, let us take a brief look at individual characteristics other than work and health status. The share of married respondents is about 94 to 95% and shows no clear trend. Regarding educational achievement, about 34% of the respondents in our dataset had a university degree. This means that our respondents are better educated than the national average, given that for the age cohorts covered by our survey (those born between 1928 and 1963), the share of those with a university degree ranges from 8.1 to 25.7% percent. [6] Further, the mean of equivalent household wealth, calculated by dividing total household wealth by the square root of the number of household members, ranges from about 20.1 to 21.9 million yen during the three waves. Comparing these figures with the 2009 National Survey of Family Income and Expenditure (NSFIE, conducted by the Ministry of Internal

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[4] Wave I of the survey did not include categories (6) and (8). However, taking respondents and spouses together, there were only 12 individuals in wave II and 15 in wave III that fell into these categories. Given these extremely small numbers, the difference in categories between the waves is unlikely to have any major effect on our results.

[5] Wave I of the "Survey on Health and Retirement" did not ask whether respondents and their spouses were looking for work. We are therefore unable to calculate the share of those having retired.

[6] Figures from the "School Basic Survey," Ministry of Education, Culture, Sports, Science and Technology. Available online (in Japanese) at:
http://www.e-stat.go.jp/SG1/estat/List.do?bid=000001015843&cycode=0.

Table 1. Basic statistics

	Wave I	Wave II	Wave III
Not working	34.2%	34.6%	37.5%
Having retired from the labor market	-	31.5%	32.8%
Average working hours per week	33.4	26.6	25.3
	(22.9)	(23.6)	(23.1)
Health measures			
Number of illnesses in the preceding three years	0.237	1.256	1.712
	(0.516)	(1.785)	(2.063)
Suffered from lifestyle disease in the preceding three years	8.2%	25.7%	32.0%
Suffered from at least one of the three killer diseases in the preceding three years	2.2%	9.5%	13.4%
Age	61.4	62.2	63.0
	(8.99)	(9.237)	(9.097)
Married	95.2%	93.7%	95.4%
University (undergraduate or graduate school) graduate	34.2%	34.9%	34.3%
Household wealth (100,000 yen, gross value)	371.0	342.8	334.6
	(337.0)	(343.5)	(338.0)
Equivalent household wealth (100,000 yen, gross value)	218.8	205.0	201.2
	(212.1)	(213.2)	(213.9)
Hourly market wage (by prefecture, 1,000 yen)	1.937	1.897	1.856
	(0.575)	(0.487)	(0.546)
Number of observations	497	665	656

Note 1: Values in parentheses show standard deviations, shown only for continuous variables.
Note 2: "Survey on Health and Retirement" did not ask whether or not respondents and/or spouses were seeking work in the first wave. We could not therefore obtain the ratio of "having retired" for the year 2008. We also had to exclude some observations with missing variables from the calculation and therefore the entire number of samples for these ratios are 651 and 625 in waves II and III, respectively.
Note 3: The descriptive statistics for working hours in waves I, II, and III are based on 415, 656, and 644 observations, respectively, since observations with missing values were dropped.
Note 4: Regardless of respondents and/or spouses' working status, we impute aggregated hourly market wages by prefecture, industry, and size of firms, based on the "Basic Survey on Wage Structure" conducted by MHLW at each survey year. Hourly market wage is an exogenous variable, calculated by (scheduled cash earnings/(scheduled hours worked+actual number of overtime hours worked)).

Affairs and Communications) to check the national representativeness of our data shows that the mean of equivalent household wealth in our survey is much smaller than the weighted average of equivalent household wealth for two-or-more person households with a household head aged 40–49 years, 50–59 years, 60–69 years, or 70 and above (36.5 million yen). We suspect that the difference may be due to different survey methodologies for real assets. While the NSFIE estimates the value of real assets, including houses and residential land, utilizing information on dwelling structures and areas of land, our survey does not separately inquire about the current value of real assets, but asks about the value of total household assets, including financial assets, houses, and residential land. This means that while respondents to our survey may have quite accurate knowledge of the current value of their financial assets, this is not necessarily the case for their real assets. Respondents may mainly report the value of financial assets, and not knowing exactly the value of real assets would thus result in an underestimation of household assets.

Table 2. The relationship between suffering from illnesses and working status

Panel 2-1. Suffering from illnesses and the probability of "not working"							
		The probability of "not working"					
Health measures	Age	50-59		60-69		70-	
Suffered from at least one illness in the preceding three years	Suffered	5.6%		42.2%		78.4%	
	Not	5.7%		40.0%		75.7%	
Suffered from lifestyle disease in the preceding three years	Suffered	5.1%		35.8%		76.7%	
	Not	5.6%		40.2%		74.9%	
Suffered from at least one of the three killer diseases in the preceding three years	Suffered	23.1%	***	42.5%		94.4%	***
	Not	5.1%		40.2%		74.9%	
Panel 2-2. Suffering from illnesses and the probability of "having retired from the labor market"							
		The probability of "having retired from the labor market"					
Health measures	Age	50-59		60-69		70-	
Suffered from at least one illness in the preceding three years	Suffered	2.4%		36.3%		77.2%	*
	Not	2.8%		36.3%		69.6%	
Suffered from lifestyle disease in the preceding three years	Suffered	3.8%		31.3%		75.4%	
	Not	2.1%		35.3%		69.8%	
Suffered from at least one of the three killer diseases in the preceding three years	Suffered	7.7%	*	38.2%		96.2%	***
	Not	2.1%		35.3%		69.8%	
Panel 2-3. Suffering from illnesses and average working hours per week							
		Average working hours per week					
Health measures	Age	50-59		60-69		70-	
Suffered from at least one illness in the preceding three years	Suffered	46.3		35.2	*	25.1	*
	Not	45.9		38.6		32.0	
Suffered from lifestyle disease in the preceding three years	Suffered	44.2	*	32.4	***	28.3	
	Not	46.2		38.3		28.8	
Suffered from at least one of the three killer diseases in the preceding three years	Suffered	38.3	**	33.7	*	20.0	
	Not	46.2		38.3		28.8	

Note 1: For panels 2-1 and 2-2, the asterisks ***,**, * indicate statistical significance at the 1%, 5%, and 10% significance levels of the null hypothesis that the probability of "Not" minus that of "Suffered" is negative.
Note 2: For panel 2-3, the asterisks ***,**, * indicate statistical significance at the 1%, 5%, and 10% significance levels of the null hypothesis that the average working hours per week of "Not" minus that of "Suffered" is positive.

3.2. The relationship between suffering from an illness and work status

Table 2 shows cross tabulations for the relationship between suffering from an illness in the preceding three years (i.e., suffering from at least one illness, suffering from a lifestyle disease, and suffering from one of the three killer diseases) and variables on the work status at the time of the survey for 10-year age brackets. In order to separate the effect of lifestyle diseases from that of the three killer diseases, we restrict the sample of respondents to those who did not suffer from one of the three killer diseases in the preceding three years when analyzing the effect of lifestyle diseases on the probability of not working and of having retired. Similarly, when examining the effect of contracting one of the three killer diseases, we restrict our sample to those not suffering from a lifestyle disease in the preceding three years.

To start with, in panels (a) and (b) of Table 2 we look at the effect of a deterioration in health on the extensive margin of labor supply (i.e., whether individuals work and participate in the labor

Table 3. The relationship between suffering from illnesses and the continuation of work

The probability of working status and average working hours per week at wave III (in 2010), conditional on working at wave I (in 2008)		(A) The probability of "not working"		(B) The probability of "having retired from the labor market"	(C) Average working hours per week	
Suffering from at least one illness during the period from wave I to wave III	Suffered	10.4%		4.5%	41.4	
	Not	8.7%		5.3%	40.8	
Suffering from lifestyle diseases during the period from wave I to wave III	Suffered	11.6%		2.4%	40.1	
	Not	9.2%		5.3%	41.2	
Suffering from the three killer diseases during the period from wave I to wave III	Suffered	21.4%	*	0.0%	33.3	*
	Not	9.0%		5.1%	41.3	

Note 1: For column (A), the asterisk * indicates statistical significance at the 10% significance level of the null hypothesis that the probability of "Not" minus that of "Suffered" is negative
Note 2: For column (B), the asterisk * indicates statistical significance at the 10% significance level of the null hypothesis that the average working hours per week of "Not" minus that of "Suffered" is positive.

market). The panels show that while suffering from a lifestyle disease does not increase the probability of not working or having retired, and in some cases, in fact, decrease these probabilities, suffering from one of the three killer diseases significantly increases these probabilities. The observed negative correlation between suffering from a lifestyle disease and the probability of not working or having retired may be due to reverse causality, i.e., the fact that working (longer hours) increases the likelihood of contracting a lifestyle disease.

Next, panel (c) of Table 2 compares the average working hours per week between those who had contracted an illness and those who had not. In this panel, we excluded those working zero hours from the calculation in order to focus on the intensive margin of labor supply (i.e., how much individuals work, conditional upon the fact that they were in work). We find a significant negative correlation between hours worked and deterioration in health.

3.3. The relationship between suffering from an illness and continuing to work

Table 3 shows cross tabulations for the relationship between suffering from an illness and continuing to work from wave I to wave III. In this tabulation, we focus only on those who had a job during wave I of the survey. Therefore, the figures in columns (A) and (B) show the probability of transitioning from working to not working and from working to having retired during our observation period. Further, column (C) presents the average working hours per week of those who remained in the labor market throughout the period.

Starting with column (A), this shows a significantly positive correlation between the incidence of the three killer diseases and the probability of transitioning from working to not working during the observation period. This suggests that contracting a severe acute disease is likely to negatively affect participation in the labor market. On the other hand, we do not observe a significant effect in the case of suffering from at least one illness or from a lifestyle disease. Next, column (B) shows that no significant correlation is observed between contracting an illness and the decision to retire. This suggests that retirement is the result of a long-term decision-making process and is not influenced by a newly diagnosed disease. Finally, column (C) suggests that if workers suffer from one of the three killer diseases, they are likely to decrease their working hours. In contrast, there is little change in hours worked if people suffer from an additional illness or a lifestyle disease.

In sum, contracting a severe acute disease appears to significantly decrease individuals' labor supply. However, the results of the descriptive analysis here are likely to be biased due to endogeneity of the health status. We address this issue in the next two sections to examine the effects of health on individuals' labor supply in a standard econometric framework.

4. Empirical strategy

4.1. Empirical specifications

This section describes our empirical model for examining the effects of health on individuals' work status and working hours. In order to address the problem of potential endogeneity in our health indicators, we estimate a labor participation function using the following IV probit and recursive bivariate probit models: [7]

$$y_{it} = \begin{cases} 1 \ \ (if \ \ y_{it}^{*} = \alpha h_{it} + X_{1,it}\beta + \varepsilon_{it} > 0) \\ 0 \ \ (if \ \ y_{it}^{*} = \alpha h_{it} + X_{1,it}\beta + \varepsilon_{it} \le 0) \end{cases}$$
$$h_{it} = X_{1,it}\gamma + X_{2,i}\delta + \nu_{it} \qquad (1)$$

where y_{it} is a dichotomous variable which takes one if individual *i* is not working (or has retired) at time *t* and zero otherwise. Further, h_{it} stands for individual *i*'s health status in year *t*. $X_{1,it}$ is a vector of individual *i*'s characteristics other than health status at time *t*, such as age, marital status, the hourly market wage in the prefecture where the individual lives, educational attainment, and equivalent household wealth, as well as year dummies. $X_{2,i}$ is a vector of IVs to identify α in the above model. The two error components, ε_{it} and ν_{it}, are allowed to correlate, that is, $\mathrm{Cov}(\varepsilon_{it}, \nu_{it} \mid X_{1,it}, X_{2,i}) = \rho$.

The reason for adding the prefecture-level hourly market wage is to control for individuals' opportunity cost of not working or retiring from the labor market. Specifically, we use the average hourly market wage for all industries and firm sizes of the prefecture where an individual lives using the MHLW's "Basic Survey on Wage Structure" for each survey year, regardless of whether a respondent (or his spouse) works. The hourly market wage is calculated as follows: scheduled cash earnings/(scheduled hours worked + overtime hours worked). The hourly market wage gradually decreased from 1,937 in wave I to 1,856 yen wave III, which probably reflects the weakening of the economy as a result of the global financial crisis.

To estimate the determinants of average working hours per week, we employ a standard censored Tobit model, i.e.:

$$WH_{it} = \begin{cases} WH_{it}^{*} \ \ (if \ \ WH_{it}^{*} = \alpha h_{it} + X_{3,it}\beta + \varepsilon_{it} > 0) \\ 0 \qquad (if \ \ WH_{it}^{*} = \alpha h_{it} + X_{3,it}\beta + \varepsilon_{it} \le 0) \end{cases}$$
$$h_{it} = X_{3,it}\gamma + X_{2,i}\delta + \nu_{it} \qquad (2)$$

where WH_{it} stands for individual *i*'s average working hours per week. $X_{3,it}$ is a vector of individual *i*'s characteristics at time *t*, consisting of the variables contained in $X_{1,it}$ and two additional variables: (1) a dummy variable which takes one if individual *i* was a regular employee or public servant at the survey date; and (2) a dummy variable which takes one if individual *i* fell into

[7] To confirm the robustness of our results, we also conduct linear probability estimations using two-stage least squares (2SLS).

one of the following employment categories at the survey date: self-employed (own business); employed in agriculture, fishing, or forestry; self-employed; piecework at home; professional job requiring qualifications; or other.

4.2. Instrumental variables (IVs)

In order to address the endogeneity of the health indicators in equations (1) and (2), we employ the body mass index (BMI) at age 30 and the parents' medical history as IVs ($X_{2,i}$). The BMI is a standard measure of the degree of obesity and is calculated by dividing a person's weight (kg) by the squared height (m). The BMI at age 30 is calculated from a respondent's present height (i.e., it is assumed that his height has not changed since age 30) and his weight at age 30. The epidemiological literature suggests that overweight and obesity in young adulthood and middle age are associated with subsequent higher morbidity and disability (Taylor and Østbye, 2001; Ferraro et al., 2002; Stenholm et al., 2007), and therefore higher medical expenditure in old age (Daviglus et al., 2004; Daviglus, 2005). We therefore expect that respondents with a high BMI at age 30 are more likely to have lifestyle-related and/or other diseases in old age. Moreover, the BMI at age 30 would be exogenous if the degree of obesity is to a large extent genetically determined. In fact, Comuzzie and Allison (1998) summarized that "40 to 70% of the variation in obesity-related phenotypes, such as body mass index (BMI), sum of skinfold thickness, fat mass, and leptin levels, is heritable." However, it must be noted that people's lifestyle and their personality traits also appear to contribute to obesity. If that is the case, our instrument, the BMI at age 30, might be correlated with unobservable disturbances.

The other IV we use is parents' medical history, with which we expect individuals' health to be correlated due to shared genes. Parents' medical history refers to illnesses that respondents' parents and/or their spouses' parents had suffered up to the time of the survey date. To instrument the number of illnesses and suffering from a lifestyle disease, we use dummies indicating whether parents had contracted a lifestyle disease. On the other hand, we use dummies indicating whether parents had contracted one of the three killer diseases to instrument whether respondents had contracted one of these diseases. In both cases, we construct separate dummies indicating whether one of the parents only or both parents have a history of contracting one of the two types of diseases and use these as IVs.

5. Empirical results

5.1. Results for the entire sample

Table 4 reports the effects of one additional illness contracted in the preceding three years on the probability of not working (Panel 4-1) and having retired from the labor market (Panel 4-2) at the time of the survey (see Table A1 in Appendix for the two-stage least squares coefficients of the all explanatory variables). In both panels, columns (A) and (B) show the results of a simple probit and OLS estimation based on the assumption that the health status is exogenous. On the other hand, columns (C) and (D) show the results based on an IV probit model and a two-stage least squares (2SLS) model to adjust for potential endogeneity of the health indicators. Standard errors in all estimations are adjusted to account for possible correlation within a cluster (i.e., within an individual). [8]

[8] The estimated standard errors in Tables 5, 6, and 7 are also adjusted to account for possible correlation within an individual, except in the case of the bivariate probit model. In the bivariate probit model, the standard errors are estimated by 200 bootstrap replications instead of clustering the standard errors by individual.

Table 4. The effects of the number of illnesses in the preceding three years

Panel 4-1. The effects of the number of illnesses in the preceding three years on the probability of "not working"

Dependent variable=Working status (Not working=1; Working=0)	(A) Probit		(B) OLS		(C) IV estimation: IV Probit		(C) IV estimation: IV Probit		(D) IV estimation: 2SLS	
	Marginal Effect		Coefficient		Coefficient		Marginal Effect		Coefficient	
Number of illnesses in the preceding three years	0.017	**	0.019	**	0.411	***	0.099	***	0.109	*
	(0.007)		(0.008)		(0.137)		(0.038)		(0.062)	
Health status equation (coefficients of IVs)										
BMI at age 30	—		—		0.060	***	—		0.059	***
					(0.021)				(0.023)	
Parents' medical history of lifestyle diseases										
Both parents	—		—		0.480	**	—		0.469	**
					(0.218)				(0.236)	
Either father or mother					0.247	**			0.269	**
					(0.119)				(0.12)	
Test for weak identification										
F statistics of excluded instruments	—		—		—		—		4.69	
Test of over-identification										
p-value of Hansen J statistic	—		—		—		—		0.7777	
R^2/Pseudo R^2	0.374		0.414		—		—		—	
Wald Chi^2/F-value	341.09	***	104.44	***	435.19	***	—		77.82	***
Number of observations	1818									

Panel 4-2. The effects of the number of illnesses in the preceding three years on the probability of "having retired from the labor market"

Dependent variable=Working status (Having retired from the labor market=1; Working or Seeking work=0)	(A) Probit		(B) OLS		(C) IV estimation: IV Probit		(C) IV estimation: IV Probit		(D) IV estimation: 2SLS	
	Marginal Effect		Coefficient		Coefficient		Marginal Effect		Coefficient	
Number of illnesses in the preceding three years	0.014	**	0.017	**	0.251		0.053		0.060	
	(0.006)		(0.008)		(0.162)		(0.036)		(0.044)	
Health status equation (coefficients of IVs)										
BMI at age 30	—		—		0.077	***	—		0.076	**
					(0.029)				(0.030)	
Parents' medical history of lifestyle diseases										
Both parents	—		—		0.664	**	—		0.650	*
					(0.333)				(0.343)	
Either father or mother					0.349	**			0.368	**
					(0.163)				(0.160)	
Test for weak identification										
F statistics of excluded instruments	—		—		—		—		4.71	
Test of over-identification										
p-value of Hansen J statistic	—		—		—		—		0.7002	
R^2/Pseudo R^2	0.399		0.424		—		—		—	
Wald Chi^2/F-value	216.77	***	82.03	***	241.79	***	—		73.79	***
Number of observations	1276									

Note: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level. Columns (A) and (C) report the average marginal effect.

The IV estimations show that having one additional illness raises the probability of not working by about 10-11 percentage points. On the other hand, although the coefficients in the estimations for retiring from the labor market are also positive, they are not significant. However, in both Panels 4-1 and 4-2 the magnitude of the effects in the IV estimations is larger than in the non-instrumented estimations in columns (A) and (B). This is probably because IV estimation mitigates downward bias in these estimates due to omitted variables which affect health status and labor supply behavior. Next, looking at the coefficients on the instruments, these indicate that individuals with a higher BMI at age 30 are more likely to suffer from illness in old age. Further, if parents have a history of lifestyle diseases, respondents are likely to contract more illnesses. In the test of overidentification, the null hypothesis that the IVs are not correlated with the error term of the labor force participation function (ε_{it}) cannot be rejected.

Table 5 reports the effect of suffering from a lifestyle disease in the preceding three years on the probability of not working (Panel 5-1) and of having retired (Panel 5-2). Before we discuss the estimation results, it should be noted that while column (C) reports the average treatment effect (ATE) of suffering from a lifestyle disease, column (D) reports the weighted average of local average treatment effects (LATE). As shown by Imbens and Angrist (1994), the 2SLS coefficient can be interpreted as a weighted average of local average treatment effects, which is generally different from the value of the ATE. Columns (C) and (D) show that while suffering from a lifestyle disease significantly raises the probability of not working, it does not have any significant effect on the probability of being retired. Next, comparing the results in Tables 4 and 5, a notable difference is that while the health effects in the probit and OLS estimations are statistically significant in Table 4, this is not the case in Table 5. A possible explanation is that if past labor participation increases the likelihood of suffering from a lifestyle disease due to, for example, irregular hours and poor sleep, and it also decreases the probability of not working at the survey date, the coefficients in columns (A) and (B) may be underestimated as a result of omitting the variable pertaining to past labor participation.

Table 6 shows the effect of suffering from at least one of the three killer diseases in the preceding three years on the probability of not working (Panel 6-1) and of having retired (Panel 6-2). Column (C) in both panels shows that suffering from one of the three killer diseases raises the probability of not working and of being retired by about 24 and 35 percentage points, respectively. The magnitude of these effects is larger than that in Tables 4 and 5, implying that contracting one of the three killer diseases has a major impact on individuals' ability or desire to remain in the labor market.

However, in both panels of Table 6, the F-statistic for the test for weak identification is substantially smaller than 10, the rule-of-thumb value indicating whether IVs satisfy the relevance condition, suggesting that our instruments may be weak. At least a partial explanation may be preventive action by individuals whose parents have a history of suffering from severe illness such as one of the three killer diseases. That is, such individuals may be particularly aware of various health risks and take extra care to avoid them and stay healthy. Such preventive action would weaken the correlation of the incidence of these diseases between individuals and their parents. Thus, weak instruments may be one reason why the health effect is not significant in the 2SLS estimations in Panels 6-1 and 6-2.

Next, Table 7 shows the marginal effects of the three health status indicators on weekly working hours (see Table A2 in the Appendix for the IV Tobit coefficients and the marginal effects of all explanatory variables). The marginal effects are calculated as the effect of a deterioration in health on the actual hours worked, $\mathrm{E}(WH_i \mid WH_i > 0, h_{it} = 1) - \mathrm{E}(WH_i \mid WH_i > 0, h_{it} = 0)$. The result in column (A) shows that the marginal effect of having one additional disease on weekly working hours is not significant. On the other hand, columns (B) and (C) show that contracting a

Table 5. The effects of suffering from lifestyle diseases in the preceding three years

Panel 5-1. The effects of suffering from lifestyle diseases on the probability of "not working"												
Dependent variable= Working status (Not working=1; Working=0)	(A) Probit		(B) OLS		(C) IV estimation Bivariate Probit				(D) IV estimation 2SLS			
	Marginal Effect		Coefficient		Coefficient		ATE		Coefficient			
Suffered from lifestyle disease in the preceding three years	0.015		0.013		0.801	***	0.193	***	0.341	*		
	(0.027)		(0.029)		(0.251)		(0.064)		(0.204)			
Health status equation (coefficients of IVs)												
BMI at age 30	—		—		0.064	***	—		0.018	***		
					(0.011)				(0.005)			
Parents' medical history of lifestyle diseases												
Both parents	—		—		0.359	**	—		0.097	*		
					(0.121)				(0.052)			
Either father or mother	—		—		0.305	***	—		0.090	***		
					(0.075)				(0.029)			
Test for weak identification												
F statistics of excluded instruments	—		—		—		—		8.31			
Test of over-identification												
p-value of Hansen J statistic	—		—		—		—		0.604			
R^2/Pseudo R^2	0.369		0.410		—		—		—			
Wald Chi^2/F-value	337.42	***	101.13	***	—		—		82.87	***		
Number of observations	1818											
Panel 5-2. The effects of suffering from lifestyle diseases on the probability of "having retired from the labor market"												
Dependent variable= Working status (Having retired from the labor market=1; Working or Seeking work=0)	(A) Probit		(B) OLS		(C) IV estimation Bivariate Probit				(D) IV estimation 2SLS			
	Marginal Effect		Coefficient		Coefficient		ATE		Coefficient			
Suffered from lifestyle disease in the preceding three years	0.014		0.013		0.628		0.139		0.202			
	(0.027)		(0.029)		(0.466)		(0.103)		(0.161)			
Health status equation (coefficients of IVs)												
BMI at age 30	—		—		0.066	***	—		0.022	***		
					(0.015)				(0.006)			
Parents' medical history of lifestyle diseases												
Both parents	—		—		0.417	***	—		0.132	*		
					(0.14)				(0.069)			
Either father or mother	—		—		0.330	***	—		0.111	***		
					(0.088)				(0.036)			
Test for weak identification												
F statistics of excluded instruments	—		—		—		—		8.38			
Test of over-identification												
p-value of Hansen J statistic	—		—		—		—		0.5929			
R^2/Pseudo R^2	0.394		0.419		—		—		—			
Wald Chi^2/F-value	219.57	***	80.15	***	—		—		74.29	***		
Number of observations	1276											

Note: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level. Column (A) reports the average marginal effect.

Table 6. The effects of suffering from at least one of the three killer diseases in the preceding three years

Panel 6-1. The effects of suffering from the three killer diseases on the probability of "not working"

Dependent variable= Working status (Not working=1; Working=0)	(A) Probit		(B) OLS		(C) IV estimation Bivariate Probit				(D) IV estimation 2SLS	
	Marginal Effect		Coefficient		Coefficient		ATE		Coefficient	
Suffered from the three killer diseases in the preceding three years	0.118 (0.037)	***	0.140 (0.044)	***	1.024 (0.591)	*	0.243 (0.137)	*	0.789 (0.490)	
Health status equation (coefficients of IVs)										
BMI at age 30	—		—		0.051 (0.017)	***	—		0.006 (0.003)	*
Parents' medical history of three killer diseases										
Both parents	—		—		0.301 (0.132)	**	—		0.038 (0.029)	
Either father or mother	—		—		0.358 (0.100)	***	—		0.051 (0.02)	**
Test for weak identification										
F statistics of excluded instruments	—		—		—		—		2.99	
Test of over-identification										
p-value of Hansen J statistic	—		—		—		—		0.7896	
R^2/Pseudo R^2	0.3767		0.4165		—		—		—	
Wald Chi^2/F-value	349.58	***	108.30	***	—		—		77.28	***
Number of observations	1818									

Panel 6-2. The effects of suffering from the three killer diseases on the probability of "having retired from the labor market"

Dependent variable= Working status (Having retired from the labor market=1; Working or Seeking work=0)	(A) Probit		(B) OLS		(C) IV estimation Bivariate Probit				(D) IV estimation 2SLS	
	Marginal Effect		Coefficient		Coefficient		ATE		Coefficient	
Suffered from the three killer diseases in the preceding three years	0.091 (0.033)	***	0.114 (0.044)	***	1.560 (0.801)	***	0.350 (0.173)	**	0.375 (0.361)	
Health status equation (coefficients of IVs)										
BMI at age 30	—		—		0.055 (0.017)	***	—		0.008 (0.004)	**
Parents' medical history of three killer diseases										
Both parents	—		—		0.314 (0.138)	**	—		0.048 (0.035)	
Either father or mother	—		—		0.332 (0.111)	***	—		0.065 (0.026)	**
Test for weak identification										
F statistics of excluded instruments	—		—		—		—		3.42	
Test of over-identification										
p-value of Hansen J statistic	—		—		—		—		0.5523	
R^2/Pseudo R^2	0.3999		0.4249		—		—		—	
Wald Chi^2/F-value	219.51	***	84.31	***	—	***	—		75.44	***
Number of observations	1276									

Note: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level. Column (A) reports the average marginal effect.

Table 7. The effects of health staus on average working hours per week

Health status preceding three years	Number of illnesses		Suffering from lifestyle diseases		Suffering from the three killer diseases	
Dependent variable=Average working hours per week	(A)		(B) IV Tobit		(C)	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Health status	-6.295	-4.008	-20.808	-11.761 *	-79.403	-25.163 ***
	(4.837)	(3.084)	(13.892)	(6.876)	(51.241)	(8.720)
Referece: Non-IV Tobit estimate of health status	-1.447 ***	-0.959 ***	-3.741 ***	-2.422 ***	-7.563 ***	-4.641 ***
	(0.409)	(0.270)	(1.441)	(0.909)	(2.613)	(1.477)
Health status equation (coefficients of IVs)						
BMI at age 30	0.067 ***	—	0.020 ***	—	0.008 ***	—
	(0.021)		(0.005)		(0.003)	
Parents' medical history						
Lifestyle diseases						
Both parents	0.403	—	0.093	—	—	—
	(0.286)		(0.058)			
Either father or mother	0.223	—	0.077 *	—	—	—
	(0.174)		(0.041)			
Three killer diseases						
Both parents	—	—	—	—	0.015	—
					(0.028)	
Either father or mother	—	—	—	—	0.030	—
					(0.025)	
Wald Chi^2	1270.250 ***	—	1271.15 ***	—	760.26 ***	—
Number of observations	1715					

Note 1: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level.
Note 2: Marginal effects are calculated by $E(WH|WH>0, h=1)-E(WH|WH>0, h=0)$.

lifestyle disease or one of the three killer diseases on average decreases weekly working hours by approximately 12 and 25 hours, respectively. Thus, the size of health effects is largest for the three killer diseases, followed by lifestyle diseases, while that of one additional illness is not significant. This ranking is consistent with the results in Figures 1(a) to (c). Based on these regression results, we can conclude that suffering from a lifestyle disease and especially suffering from one of the three killer diseases are significant health factors preventing male workers in Japan from staying in the labor market. Once individuals contract one of these diseases, the probability that they will leave the labor force increases and the hours worked per week significantly declines even for those who stay in the labor market.

5.2. Results for the split sample (those under 60 versus those 60 and older)

Next, we estimate equations (1) and (2) dividing our sample into those under 60 years of age and those 60 years of age and older. Age 60 is the most common retirement age in Japan. Individuals' health status may have a different impact on the labor supply of these different age groups. Apart from having, due to age, lower physical resistance to a deterioration in health, individuals in the older age group in Japan are more likely to be non-regular workers earning a relatively low wage, and thus their opportunity cost of retiring is lower than that for the younger age group.

Tables 8-1 and 8-2 show the effects of one additional illness and of suffering from a lifestyle disease on the probability of not working and on working hours per week, respectively, for the two age groups. [9] It should be noted that we do not examine the effects of the three killer diseases here, because the low F-statistic for the IVs in column (D) of Table 6 suggests that our instruments may be weak. Table 8-1 indicates that for those under 60, having one additional illness has no significant effect on the probability of not working and working hours per week, while for those aged 60 and over, the probability of not working increases significantly, although there also does not appear to be any significant effect on the working hours per week. Thus, at least with regard to the probability of not working, we find that the impact of one additional illness differs between the two age groups.

Next, Table 8-2 shows the effects of contracting a lifestyle disease and indicates that the ATEs on the probability of not working are significant. Specifically, contracting a lifestyle disease increases the probability by 22 percentage points for the younger age group, while for the older age group it raises it by 34 percentage points. Further, suffering from a lifestyle disease significantly decreases the working hours per week for the older age group, namely by about 19 hours. In contrast, no significant effect can be observed for the younger age group. Thus, our results suggest that the effect of suffering from a lifestyle disease on work status and working hours per week differs between the younger and the older age group. This difference is likely due to differences between the two groups in individuals' physical resistance to a deterioration in health and the different opportunity costs of not working.

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[9] In this subsection, we do not analyze the effects of health on the probability of being retired from the labor market. The reason is that we do not have sufficient observations for this variable using a split sample, since data for wave I are not available due to the questionnaire not asking whether individuals had retired. Our analysis is therefore confined to the effects of health on the probability of not working and on working hours per week.

Table 8-1. Results of split sample estimation: The effects of the number of illnesses in the preceding three years on working status and working hours (under 60 versus 60 and older)

Age group	Under 60						60 and older					
Dependent variables	Not working			Average working hours per week			Not working			Average working hours per week		
	(A) IV Probit			(B) 2SLS	(C) IV Tobit		(D) IV Probit			(E) 2SLS	(F) IV Tobit	
	Coefficient		Marginal Effect	Coefficient	Coefficient	Marginal Effect	Coefficient		Marginal Effect	Coefficient	Coefficient	Marginal Effect
Number of illnesses	0.516	**	0.066	0.029	1.888	1.858	0.378	**	0.118 **	0.157	-20.630	-7.592
	(0.216)		(0.052)	(0.038)	(3.228)	(3.176)	(0.173)		(0.053)	(0.113)	(16.065)	(5.871)
Health status equation (coefficients of IVs)												
BMI at age 30	0.056	**	—	0.048 *	0.047	—	0.064	**	—	0.065 *	0.072 *	—
	(0.027)			(0.027)	(0.029)		(0.032)			(0.034)	(0.039)	
Parents' medical history of lifestyle diseases												
Both parents	0.492	**	—	0.526 **	0.475 *	—	0.445		—	0.432	0.088	—
	(0.227)			(0.232)	(0.266)		(0.310)			(0.347)	(0.350)	
Either father or mother	0.427	***	—	0.454 ***	0.478 ***	—	0.141		—	0.137	0.076	—
	(0.145)			(0.140)	(0.136)		(0.169)			(0.182)	(0.159)	
Test for weak identification												
F statistics of excluded instruments	—		—	6.70	—	—	—		—	1.87	—	—
Test of over-identification												
p-value of Hansen J statistic	—		—	0.406	—	—	—		—	0.987	—	—
Wald Chi^2/F-value	110.43	***	—	2.48 ***	78.42 ***	—	234.41	***	—	23.07 ***	281.43 ***	—
Number of observations	721				710		1097				1005	

Note 1: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level.
Note 2：Marginal effects are calculated by E($WH|WH>0$, h=1)-E($WH|WH>0$, h=0).

Table 8-2. Results of split sample estimation: The effects of suffering from lifestyle diseases on working status and working hours (under 60 versus 60 and older)

Age group	Under 60						60 and older					
Dependent variables	Not working			Average working hours per week			Not working			Average working hours per week		
	(A)			(B)	(C)		(D)			(E)	(F)	
	Bivariate Probit			2SLS	IV Tobit		Bivariate Probit			2SLS	IV Tobit	
	Coefficient		ATE	Coefficient	Coefficient	Marginal Effect	Coefficient		ATE	Coefficient	Coefficient	Marginal Effect
Suffering from lifestyle diseases	1.410 **		0.219 *	0.158	6.759	6.671	1.110 ***		0.338 ***	0.487	-61.448	-18.565 *
	(0.563)		(0.124)	(0.155)	(14.409)	(14.270)	(0.341)		(0.099)	(0.343)	(40.639)	(10.397)
Health status equation (coefficients of IVs)												
BMI at age 30	0.074 ***		—	0.019 **	0.017 *	—	0.054 ***		—	0.016 **	0.021 ***	—
	(0.021)			(0.008)	(0.009)		(0.016)			(0.007)	(0.006)	
Parents' medical history of lifestyle diseases												
Both parents	0.304		—	0.094	0.079	—	0.342 **		—	0.095	0.042	—
	(0.259)			(0.094)	(0.099)		(0.151)			(0.065)	(0.079)	
Either father or mother	0.349 ***		—	0.098 **	0.110 ***	—	0.253 ***		—	0.087 **	0.054	—
	(0.119)			(0.042)	(0.04)		(0.093)			(0.040)	(0.054)	
Test for weak identification												
F statistics of excluded instruments	—		—	4.27	—	—	—		—	4.09	—	—
Test of over-identification												
p-value of Hansen J statistic	—		—	0.561	—	—	—		—	0.811	—	—
Wald Chi^2/F-value	—		—	2.43 ***	78.23 ***	—	—		—	24.86 ***	353.95 ***	—
Number of observations	721			710			1097			1005		

Note 1: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level.
Note 2：Marginal effects are calculated by E($WH|WH>0$, h=1)-E($WH|WH>0$, h=0).

6. Conclusion

Over the last two decades or so, slow economic growth and rapid population aging have placed a growing burden on government finances and have imposed increasing strains on the social security system. Therefore, in order to counter the gradual decrease in the working age population and to ensure the financial sustainability of the social security system (pensions in particular), the government has adopted various labor market and social security policies to encourage older people to remain in the labor market for longer periods of time. For example, the MHLW has started to require employers to continue employing workers after they have reached the retirement age, and the government has begun to gradually raise the pensionable age for the Employees' Pension Insurance system from 60 to 65 years for males beginning in 2013. These policies provide older workers with economic incentives to postpone the timing of retirement. However, these measures appear to overlook health-related reasons for the elderly leaving the labor market, which may be considerably more important than economic reasons.

Against this background, the present study, using a unique panel dataset on health and retirement, quantitatively examined the effects of a deterioration in health on the probability of not working and of retiring as well as on working hours per week, employing IV estimation. Focusing on observations for males, our empirical results show that a deterioration in health increases the probability of not working and of being retired and, moreover, tends to decrease working hours per week. In particular, contracting one of the three killer diseases appears to have a substantial negative effect on individuals' ability or desire to continue working. Further, splitting the sample into two age groups, we find that one additional illness or contracting a lifestyle disease are more likely to have a negative effect on the work status and hours worked for those age 60 and over than for those under 60.

Our results thus suggest that contracting a severe acute disease potentially prevents middle-aged or older male workers from remaining in the labor market and may force them to at least temporarily decrease their working hours, possibly resulting in financial difficulties for themselves and their families, if they are the major breadwinner. This implies that preventive health care, and in particular preventing the three killer diseases, which are often caused by individuals' lifestyles at a relatively young age, represents another key policy that would help people to remain in the labor market for longer. A first important step in this direction would be for policy makers to conduct a cost-benefit analysis taking into account preventive health care, health care in old age, and the contribution of the elderly in the labor market.

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References

Au, D.W.H., Crossley, T.F. Schellhorn, M. (2005), The effect of health changes and long-term health on the work activity of older *Canadians, Health Economics*, Vol. 14, pp. 999–1018.

Benitez-Silva, H., Buchinsky, M., Chan, H. M., Cheidvasser, S., Rust, J. (2004), How large is the bias in self-reported disability?, *Journal of Applied Econometrics*, Vol. 19, pp. 649–670.

Bound, J. (1991), Self-reported versus objective measures of health in retirement models, *Journal of Human Resources*, Vol. 26, pp. 106–138.

Bound, J., Schoenbaum, M., Steinbrickner, T. R., Waidmann, T. (1999), The dynamic effects of health on the labor force transitions of older workers, *Labour Economics*, Vol. 6, pp. 179–202.

Candon, D. (2018), The effect of cancer on the labor supply of employed men over the age of 65, *Economics & Human Biology*, Vol. 31, pp. 184–199.

Christensen, B.J., Kallestrup-Lamb, M. (2012), The impact of health changes on labor supply: Evidence from merged data on individual objective medical diagnosis codes and early retirement behavior, *Health Economics*, Vol. 21 (Supplement), pp. 56–100.

Comuzzie, A.G., and Allison, D.B. (1998), The search for human obesity genes, *Science*, Vol. 280, pp. 1374–1377.

Datta Gupta, N., Larsen, M. (2010), The impact of health on individual retirement plans: Self-reported versus diagnostic measures, *Health Economics*, Vol. 19, pp. 792–813.

Daviglus M.L., Liu, K., Yan, L.L., Amber, P., Manheim, L., Manning, W., Garside, D.B., Wang, R., Dyer, A.R., Greenland, P., Stamler, J. (2004), Relation of body mass index in young adulthood and middle age to Medicare expenditures in older age, *Journal of American Medical Association*, Vol. 292, pp. 2743–2749.

Daviglus, M.L. (2005), Health care costs in old age are related to overweight and obesity earlier in life, *Health Affairs*, doi: 10.1377/hlthaff.w5.r97.

Disney, R., Emmerson, C., Wakefield, M. (2006), Ill health and retirement in Britain: A panel data-based analysis, *Journal of Health Economics*, Vol. 25, pp. 621–649.

Dwyer, D.S., Mitchell, O.S. (1999), Health problems as determinants of retirement: Are self-rated measures endogenous?, *Journal of Health Economics*, Vol. 18, pp. 173–193.

Ferraro, K.F., Su, Y.P., Gretebeck, R.J., Black, D.R., Badylak, S.F. (2002), Body mass index and disability in adulthood: A 20-year panel study, *American Journal of Public Health*, Vol. 92, pp. 834–840.

Gannon, B. (2009), The influence of economic incentives on reported disability status, *Health Economics*, Vol. 18, pp. 743–759.

García-Gómez, P. (2011), Institutions, health shocks and labour market outcomes across Europe, *Journal of Health Economics*, Vol. 30, pp. 200–213.

Hamaaki, J., Noguchi, H. (2010), Health effects on labor participation by the elderly (Chukoreisha no kenko-jotai to rodo-sanka), *The Monthly Journal of the Japan Institute of Labour (Nihon Rodo Kenkyu Zasshi)*, Vol. 52, pp. 5–24 (in Japanese).

Imbens, G.W., Angrist, J.D. (1994), Identification and estimation of local average treatment effects, *Econometrica*, Vol. 62, pp. 467–475.

Iwamoto, Y. (2000), Health and income (Kenko to shotoku), In: National Institute of Population and Social Security Research (Ed.). *Family and Household Changes and the Family Security Function (Kazoku-setai no henyo to seikatsu-hosho kino)*, Tokyo: University of Tokyo Press, pp. 95–117 (in Japanese).

Kerkhofs, M., Lindeboom, M. (1995), Subjective health measures and state dependent reporting

errors, *Health Economics*, Vol. 4, pp. 221–235.
Kreider, B. (1999), Latent work disability and reporting bias, *Journal of Human Resources*, Vol. 34, pp. 734–769.
Lenhart, O. (2019), The effects of health shocks on labor market outcomes: Evidence from UK panel data, *European Journal of Health Economics*, Vol. 20, pp. 83–98.
Lindeboom, M., Kerkhofs, M. (2009), Health and work of the elderly: Subjective health measures, reporting errors and endogeneity in the relationship between health and work, *Journal of Applied Econometrics*, Vol. 24, pp. 1024–1046.
Mathiowetz, N. A., Lair, T. J. (1994), Getting better? Change or error in the measurement of functional limitations, *Journal of Economic and Social Measurement*, Vol. 20, pp. 237–262.
Oishi, A. (2000), The effects of health on elderly persons' decision to work (Koreisha no shugyo-kettei ni okeru kenko-yoin no eikyo), *The Monthly Journal of the Japan Institute of Labour (Nihon Rodo Kenkyu Zasshi)*, Vol. 42, pp. 51–62 (in Japanese).
Sato, K. (2016), The relationship between subjective-rated health and wages (Kenko-jotai no henka to chingin no kankei), *Journal of Social Security Research (Shakai Hosho Kenkyu)*, Vol. 1, pp. 209–221 (in Japanese).
Stenholm, S., Sainio, P., Rantanen, T., Koskinen, S., Jula, A., Heliövaara, M., Aromaa A. (2007), High body mass index and physical impairments as predictors of walking limitation 22 years later in adult Finns, *Journal of Gerontology*: Series A, Vol. 62, pp. 859–865.
Taylor, D.H., Østbye, T. (2001), The effect of middle- and old-age body mass index on short-term mortality in older people, *Journal of the American Geriatrics Society*, Vol. 49, pp. 1319–1326.
Trevisan, E. Zantomio, F. (2016), The impact of acute health shocks on the labour supply of older workers: Evidence from sixteen European countries, *Labour Economics*, Vol. 43, pp. 171–185.
Yuda, M. (2010) Health status and labor productivity (Kenko-jotai to rodo seisan-sei), *The Monthly Journal of the Japan Institute of Labour (Nihon Rodo Kenkyu Zasshi)*, Vol. 52, pp. 25–36 (in Japanese).

Appendix. Estimation results for Tables 4, 5 and 6

Table A1. Effects of all explanatory variables on the probability of "not working" and on the probability of "having retired from the labor market"

Estimation method	2SLS					
Dependent variable	Working status (Not working=1; Working=0)			Working status (Having retired from the labor market=1; Working or Seeking work=0)		
Health status in the preceding three years	Number of illnesses	Suffering from lifestyle diseases	Suffering from the three killer diseases	Number of illnesses	Suffering from lifestyle diseases	Suffering from the three killer diseases
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Health status	0.109 *	0.341 *	0.789	0.060	0.202	0.375
	(0.062)	(0.204)	(0.49)	(0.044)	(0.161)	(0.361)
Age	-0.68 ***	-0.707 ***	-0.723 ***	-0.828 ***	-0.857 ***	-0.89 ***
	(0.154)	(0.146)	(0.149)	(0.159)	(0.154)	(0.15)
Age squared	0.011 ***	0.011 ***	0.012 ***	0.013 ***	0.014 ***	0.014 ***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Age cubed	-0.0000567 ***	-0.0000586 ***	-0.0000595 ***	-0.0000682 ***	-0.0000705 ***	-0.0000729 ***
	(0.0000138)	(0.0000131)	(0.0000135)	(0.0000142)	(0.0000138)	(0.0000135)
Married	-0.015	-0.078	-0.073	0.025	-0.011	-0.021
	(0.083)	(0.061)	(0.055)	(0.071)	(0.057)	(0.053)
University graduate or higher	0.009	0.01	0.016	0.012	0.011	0.018
	(0.029)	(0.029)	(0.028)	(0.028)	(0.029)	(0.027)
Equivalent wealth	0.00000672	-0.0000322	-0.0000464	-0.0000231	-0.0000504	-0.0000588
	(0.0000673)	(0.00007)	(0.0000637)	(0.0000706)	(0.0000716)	(0.0000678)
Hourly market wage	-0.016	-0.007	-0.006	-0.011	-0.002	-0.002
	(0.026)	(0.027)	(0.025)	(0.031)	(0.032)	(0.029)
Year dummy for 2010 (Wave 3)	-0.17 *	-0.093 *	-0.096 *	-0.030	-0.015	-0.016
	(0.092)	(0.052)	(0.056)	(0.022)	(0.014)	(0.017)
Year dummy for 2009 (Wave 2)	-0.129 **	-0.08 **	-0.076 **	-	-	-
	(0.064)	(0.039)	(0.038)	-	-	-
Number of observations	1818			1276		
F-value	77.82 ***	82.87 ***	77.28 ***	73.79 ***	74.29 ***	75.44 ***

Note: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level.

Appendix. Estimation results for Table 7

Table A2. Effects of all explanatory variables on average working hours per week

Health status in the preceding three years	Number of illnesses		Suffering from lifestyle diseases		Suffering from the three killer diseases	
Dependent variable=Average working hours per week	(A)		(B) IV Tobit		(C)	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Health status	-6.295	-4.008	-20.808	-11.761 *	-79.403	-25.163 ***
	(4.837)	(3.084)	(13.892)	(6.876)	(51.241)	(8.72)
Age	13.641	8.686	11.518	7.391	13.119	7.328
	(10.232)	(6.52)	(10.555)	(6.773)	(12.359)	(6.907)
Age squared	-0.197	-0.125	-0.158	-0.102	-0.177	-0.099
	(0.17)	(0.108)	(0.176)	(0.113)	(0.207)	(0.116)
Age cubed	0.001	0.001	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Married	-3.326	-2.189	-0.267	-0.172	-1.275	-0.719
	(5.808)	(3.947)	(3.964)	(2.557)	(4.789)	(2.732)
University graduate or higher	2.358	1.514	2.296	1.485	2.312	1.300
	(1.667)	(1.08)	(1.635)	(1.067)	(2.085)	(1.18)
Equivalent wealth	-0.008 **	-0.005 **	-0.006 *	-0.004 *	-0.003	-0.002
	(0.004)	(0.002)	(0.003)	(0.002)	(0.005)	(0.003)
Hourly market wage	1.808	1.151	1.178	0.756	1.836	1.025
	(1.78)	(1.133)	(1.765)	(1.132)	(2.1)	(1.173)
Regular employee or public servant	27.695 ***	19.222 ***	29.605 ***	20.796 ***	24.365 ***	14.601 ***
	(2.823)	(2.005)	(2.39)	(1.695)	(4.421)	(2.792)
Self-employed (own business); employed in agriculture, fishing, or forestry; self-employed; piecework at home; professional job requiring qualifications, or other	34.678 ***	26.691 ***	36.164 ***	28.171 ***	31.541 ***	20.824 ***
	(2.711)	(2.28)	(2.314)	(1.95)	(4.375)	(3.28)
Year dummy for 2010 (Wave 3)	6.139	3.976	2.052	1.324	4.945	2.794
	(6.95)	(4.581)	(3.41)	(2.215)	(5.227)	(2.989)
Year dummy for 2009 (Wave 2)	3.094	1.986	0.509	0.327	2.036	1.143
	(4.66)	(3.018)	(2.466)	(1.587)	(3.444)	(1.942)
Wald Chi^2	1270.25 ***	—	1271.15 ***	—	760.26 ***	—
Number of observations	1715					

Note 1: Standard errors are shown in parentheses. The asterisks, ***, **, * indicate statistical significance at the 1%, 5%, and 10% significance level.
Note 2：Marginal effects for health status are calculated by $E(WH|WH>0, h=1)-E(WH|WH>0, h=0)$.

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Determinants of Country Risk Premium Revisit: Evidence for Emerging Market and Developing Economies

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Abstract

This paper aims to revisit the issue on the determinants of the country risk premium for emerging market and developing economies to enrich its empirical evidence. The major contributions of this study to the existing literature are: to sample the majority of emerging market and developing economies by estimating the country risk premium, to focus on the domestic fundamentals rather than the world market factors by targeting the period after the 2000s, and to screen the determinants by the causality check between the country risk premium and its supposed determinants in a vector-autoregressive model framework considering their endogeneity problem. The empirical analyses finally identified the factors of the inflation, the external debt, the public debt and the foreign reserves as the determinants of the country risk premium.

Keywords: country risk premium, emerging market and developing economies, fundamentals, causality, vector-autoregressive model

JEL Classification Codes: **F41, F34**

1. Introduction

The country risk premium has been one of the essential issues for policy managements and investors' behaviors for emerging market and developing economies. The country risk premium is, according to ordinary textbooks (e.g. Krugman et al., 2018) , shown by the difference between the riskiness of domestic and foreign assets under the assumption of imperfect asset substitutability. The premium reflects the risk associated with the probability that a country will default on its debts, and thus the compensation to investors for default risk (Edwards, 1984 and 1986). In general, emerging market and developing economies, who often owe some external debts, are considered to have a higher country risk premium than advanced economies.

From the macroeconomic perspective, a high country risk premium is detrimental for emerging market and developing economies, such that a high interest rate accompanied with a high premium would reduce investment and aggregate income in the short run, and further lower capital accumulation and economic growth in the long run (e.g. Mankiw, 2019). In addition, the country risk

premium has tended to affect domestic economies and/or to be affected by the world economic conditions in more sensitive ways under the progressing globalization during the recent decades. As the World Bank (1997) started to argue, private capital flows toward developing countries have been intensified since the 1990s, and their financial integrations have raised the sensitivity of their interest rates to global economic climates such as the US interest rates (e.g. Arora and Cerisola, 2000).

The growing concerns with the country risk premium for emerging market and developing economies have brought academic researchers to accumulating the theoretical and empirical studies of the risk premium determinants. Some works focus on the importance of domestic factors such as heterogeneities in fundamentals, liquidity and solvency variables, and the importance of fiscal and monetary policy variables. The other works, on the other hand, highlight the influence of global factors such as global liquidity, risk appetite and contagion effects. In spite of a plenty of the studies above, there have not necessarily been clear consensuses on the risk premium determinants so far.

This paper aims to revisit the issue on the determinants of the country risk premium for emerging market and developing economies, and to enrich the evidence through the following contributions to the existing literature. First, this study's sample economies (98 economies) covers the majority of emerging market and developing economies, which would be much wider than the coverages of the previous studies. Most of the previous studies adopted the JPMorgan Emerging Markets Bond Index Global (EMBIG) for sovereign bond spreads to represent the country risk premium, which confined the number of sample countries due to the constraint of its data availability. This study, instead, estimates the premium by using short-term interest rates (represented by money market rates) and exchange rates, so that many of economies could be targeted as the estimation sample. In case of estimating the country risk premium, the question would rise on whether the usage of money market rates instead of sovereign bond yields could be a possible choice, since the money market rates often reflect policy manipulations by central banks. There have been the cases in emerging market countries, however, that their policy rates themselves have been affected by the country risks. Calvo and Reinhart (2002) identifies the evidence of "fear of floating" in emerging market countries: an interest rate policy is replacing foreign exchange intervention as the preferred means to avoid exchange rate volatility. The "fear of floating" would thus contain the case: in countries where there is a country risk premium and the exchange rate depreciates, the monetary authorities try to stop the depreciation by raising their policy rates. Many of emerging market economies are not included in the target samples of the JPMorgan EMBIG, since their bond markets stay at premature stages. Thus the only way to show their country risk premium is to estimate it based on their money market rates. On the other hand, even in the country whose bond market is targeted in JPMorgan EMBIG, there seems to be the case that its bond yield does not necessarily reflect the risk premium precisely. Shimizu (2018), for instance, pointed out as one of the challenges in China's bond market that the holding ratio of foreign investors in the bond market is just about 2% due to the regulation that limits participation from abroad. Thus neither money market rates or bond yields are perfect indicators to gauge the country risk premium. Then this study prioritizes enlarging the sample size by using money market rates to enrich the evidence on their country risk premiums.

Second, this study focuses on the factors of the fundamentals of domestic economies as the determinants of the country risk premium by targeting the period of 2001-2019 as the estimation sample. Whereas the 1990s had experienced the Mexican crisis (1994-), the Asian crises (1997-) and the Russian crisis (1998-) that caused contagion effects widely to emerging market economies, the major world- and region- wide financial crisis after the 2000s was the global financial crisis for 2007-2008 triggered by the US subprime shock, which had, however, a limited impact on emerging market economies as Dooley and Hutchison (2009) called it the decoupling. Thus this study could

concentrate on the domestic fundamental factors by only setting the 2008-2009 dummy as an exogenously control variable in the estimation.

Third, this study applies not a single-equation regression but a vector-autoregressive (VAR) model for an analytical methodology, which a fewer previous studies have ever tried on. The reason why the study adopts a VAR model is that the VAR model allows for potential and highly-likely endogeneity among estimation variables, and also for tracing out the dynamic responses of an explained variable to the structural shock of a set of explaining variables. The endogeneity in this study could be described in the reciprocal interaction between the country risk premium and the fundamentals of domestic economies as its supposed determinants: whereas the fundamentals determine the level of the country risk premium, the country risk premium itself would also affect the fundamentals, for instance, through investment activities and capital accumulation as aforementioned. In that case, a single-equation regression causes an estimation bias, and a VAR model estimation, instead, lets the data determine the causality between targeted variables, and makes it possible to trace out the dynamic responses of variables to exogenous shocks overtime. To be specific, this study conducts the test of Granger causality and impulse response under a VAR model estimation among the variables of the country risk premium and the fundamentals of domestic economies.

The rest of the paper is structured as follows. Section 2 reviews the literature related to this study and clarifies this study' contributions to the existing literature. Section 3 conducts an empirical analysis of the determinants of the country risk premium. Section 4 summarizes and concludes.

2. Literature Review and Contributions

This section reviews the literature related to the determinants of the country risk premium, and clarifies this study' contributions to the existing literature. There has been a large volume of the literature in this field, and the literature review focuses on the works after the 2010s, which have adopted sophisticated methodologies to identify the risk premium determinants.

Looking at the sample sizes of targeting economies in the first place, some works focus on the selective samples from specific regions such as Africa, Europe and Latin America. The other ones target emerging market economies in general, but their sample sizes are not so large with the maximum being 46 economies, while the total number of emerging market and developing economies amounts to 155. [1] The limitation of the sample sizes would come from the fact that most of previous works have used the database of JPMorgan EMBIG as the indicator of country risk premium (sovereign bond spreads). The index provider (JP Morgan) imposes the highly restrictive criteria to confine a number of targeting economies (Tebaldi et al. 2018).

Regarding the determinants of the country risk premium, they could be classified into the following five categories: macroeconomic factors (GDP, inflation, stock index and interest rate), external factors (exchange rate, terms of trade, trade openness, current account, external debt, foreign reserves and recent default), fiscal and monetary factors (public debt, fiscal balance and M2), governance factors (government effectiveness, rule of law, fiscal governance and political index), and the world market factors (commodity prices and market sentiment). The determinants commonly used in the category of the macroeconomic factors are GDP and inflation; those in the external factors are external debt and foreign reserves; those in the fiscal and monetary factors are public debt and fiscal balance; that in the governance factors is political index; and that in the world market factors is market sentiment.

[1] The number is based on World Economic Outlook Database of International Monetary Fund.

The previous works have some variations in their emphases on the categories of determinants: Palic et al. (2017), Iara and Wolff (2014), Baldacci et al. (2011), and Baldacci and Kumar (2010) place a premium on fiscal factors; Tebaldi et al. (2018), Martinez et al. (2013), and Hilscher and Nosbusch (2010) prioritize external factors; and the others, namely, Mpapakika and Malikane (2019), Tkalec et al. (2014), Maltritz and Molchanov (2013), and Bellas et al. (2010) cover both categorized factors.

As for the estimation methodologies shown in the bottom line of Table 1, a generalized method of moments is applied in the five out of the total eleven studies, while a VAR model is adopted in Palic et al. (2017). Both methodologies are common in that they address the endogeneity problem between the country risk premium and its supposed determinants. This study employs the VAR model, since the causality check between the country risk premium and its supposed determinants is prioritized by the Granger causality test.

The main features of this study in comparison with the previous works in the literature above are highlighted as follows. First, the coverage of the sample economies of this study (98 economies) that uses the estimated country risk premium instead of EMBIG is much wider than those of previous works (46 economies at maximum), and accounts for the majority of emerging market and developing economies (155 economies). Second, this study targets the determinants of the country risk premium from all the categories above, though they are selected from the ones used commonly in the previous works in each category. As for the category of the world market factors, this study only uses the 2008-2009 dummy as the variable to control exogenously the impacts of the global financial crisis during the total sample range for 2001-2019. Third, this study prioritizes the causality check between the country risk premium and its supposed determinants in a VAR model framework, since the premium and the country's fundamentals would be endogenously interacted as was aforementioned. There have been less studies using the VAR model than those applying the generalized method of moments as far as the literature shown in Table 1 is concerned. Thus this study would contribute to enrich the evidence on the determinants of the country risk premium.

3. Empirical Analysis

This section conducts an empirical analysis of the determinants of the country risk premium for emerging market and developing economies. The section starts with describing key variables and data for the estimation, clarifies the estimation methodology, and then presents the estimation outcomes with their discussions.

3.1. Key Variables

The dependent variable, the country risk premium, is estimated in this study, and the explanatory variables, the determinants of the country risk premium, are chosen from the ones commonly used in the previous works: inflation and GDP as the macroeconomic factors, external debt and foreign reserves as the external factors, public debt and fiscal balance as the fiscal factors, and political index as the governance factors. For the world market factors, the 2008-2009 dummy is set to control the impacts of the global financial crisis. All the variable data for the estimation are annual data running for 2001-2019. The variables are listed with their measurements, expected signs of coefficients and data sources in Table 2, and their descriptive statistics are presented in Table 4. The details of each variable are described as follows.

The estimation of the country risk premium (denoted by crp) follows the ordinary formula of interest rate parity (e.g. Krugman et al., 2018 and McKinnon, 2001).

Table 1. List of Previous Studies after the 2010s

Variables	Mpapakika & Malikane (2019)	Tebaldi et al. (2018)	Palic et al. (2017)	Tkalec et al. (2014)
dependent variable	*gov. bond spread central banks*	*gov. bond spread EMBIG* [1)]	*gov. bond spread EMBIG* [1)]	*gov. bond spread EMBIG* [1)]
[Macroeconomic Factors]				
GDP	*	*	*	*
inflation	*		*	*
stock index				
interest rate			*	
[External Factors]				
exchange rate		*		*
terms of trade				
trade openness [2)]	*	*		
current account [2)]				
external debt [2)]				*
foreign reserves [2)]	*	*		*
recent default				
[Fiscal & Monetary Factors]				
public debt [2)]	*		*	*
fiscal balance [2)]				
M2 [2)]				
[Governance Factors]				
gov. effectiveness				
rule of law				
fiscal governance				
political index		*		
[World Market Factors]				
commodity prices	*			
market sentiment	*			*
Samples	10 African countries 1971-2011	31 emerging countries 1994-2014	24 European countries 1994-2015	8 European transition countries 2001-2013
Methodology	Dynamic Fixed Effects Model, GMM	GMM	GARCH, Panel VAR Volatility Analysis	Dynamic Panel Error Correction Model

Table 1. List of Previous Studies after the 2010s (continued)

Variables	Iara & Wolff (2014)	Martinez et al. (2013)	Maltritz & Molchanov (2013)	Baldacci et al. (2011)
dependent variable	*gov. bond spread Bloomberg*	*gov. bond spread EMBIG* [1)]	*gov. bond spread EMBIG* [1)]	*gov. bond spread EMBIG* [1)]
[Macroeconomic Factors]				
GDP				
inflation		*		
stock index		*	*	
interest rate				
[External Factors]				
exchange rate			*	
terms of trade		*		
trade openness [2)]				
current account [2)]		*		
external debt [2)]		*	*	
foreign reserves [2)]		*	*	
recent default			*	
[Fiscal & Monetary Factors]				
public debt [2)]	*			*
fiscal balance [2)]	*		*	*
M2 [2)]		*		
[Governance Factors]				
gov. effectiveness		*		
rule of law				
fiscal governance	*			
political index				*
[World Market Factors]				
commodity prices				
market sentiment				
Samples	11 Euro area countries 1999-2009	7 Latin America coutries 2003-2012	35 emerging countries 1996-2010	46 emerging countries 1997-2008
Methodology	GMM	Dynamic Fixed Effects Model	Bayesian Model Averaging	GMM

Table 1. List of Previous Studies after the 2010s (continued)

Variables	Baldacci &Kumar (2010)	Bellas et al. (2010)	Hilscher & Nosbusch (2010)
dependent variable	*gov. bond yields IFS, etc.*	*gov. bond spread EMBIG* [1)]	*gov. bond spread EMBIG* [1)]
[Macroeconomic Factors]			
GDP	*		
inflation			
stock index			
interest rate			
[External Factors]			
exchange rate			*
terms of trade			
trade openness [2)]		*	
current account [2)]		*	
external debt [2)]		*	*
foreign reserves [2)]			*
recent default			*
[Fiscal & Monetary Factors]			
public debt [2)]	*		
fiscal balance [2)]	*	*	
M2 [2)]			
[Governance Factors]			
gov. effectiveness			
rule of law			
fiscal governance			
political index		*	
[World Market Factors]			
commodity prices			
market sentiment		*	*
Samples	31 advanced & emerging countries 1980-2008	14 emerging countries 1997-2009	32 emerging countries 1998-2007
Methodology	GMM	Pooled Mean Group (PMG) Estimator	Fixed Effects Model

Notes
1) EMBIG denotes JPMorgan Emerging Market Bond Index Global.
2) The indicators are usually expressed as a percentage of GDP.
3) The selected indicators by * are the ones whose coefficients have expected signs and significances at conventional levels.

Source: The author's description

Table 2. List of Variables for Estimation

Variables	Description	Exp. Sign	Sources
Dependent Variable: County Risk Premium			
crp	$i - i^* - Ee$		
	i : money market rate in emerging market and developing economies		
	i^* : money market rate in the US		IFS
	Ee : expected change in exchange rate (per US dollar) = e_{t-1}		
Explanatory Variables			
inf	inflation, % change in average consumer prices	+	WEO
gdp	% change in gross domestic product at constant prices	-	WEO
exd	external debt stocks (% of GNI)	+	WDI
res	total reserves (% of total external debt)	-	WDI
pud	general government gross debt (% of GDP)	+	WEO
fsb	general government net lending/borrowing (% of GDP)	-	WEO
pol	Political Stability and Absence of Violence/Terrorism [from -2.5 (weak) to 2.5 (strong)]	-	WGI

Notes: The data sources are shown as follows:
IFS: International Financial Statistics, International Monetary Fund
WEO: World Economic Outlook Databases, International Monetary Fund
WDI: World Development Indicators, World Bank
WGI: Worldwide Governance Indicators, World Bank
Source: The author's description

$$crp = i - i^* - Ee \tag{1}$$

where i is the domestic interest rate; i^* is the world interest rate; and Ee is the expected change in exchange rate. For the domestic and the world interest rates, this study applies the "money market rate" of domestic economies and the US, retrieved from International Financial Statistics (IFS) of International Monetary Fund (IMF). [2] As for the expected change in exchange rate, there are two kinds of the expectation formations: "adaptive" and "rational" expectations. This study assumes the "adaptive" expectation by $Ee = e_{t-1}$ for the estimation. [3] In addition, the estimation is based on the strong assumption that the observation of the annual change in exchange rate forms the expectations that are applied to short-term money market. The exchange rate is expressed by the local currency value per the US dollar, retrieved also from IFS.

Regarding the explanatory variables, the inflation (*inf*) is expressed by "a percent change in average consumer prices", taken from World Economic Outlook (WEO) Database of IMF. Its coefficient is expected to have a positive sign, since the high inflation is one of the factors of macroeconomic instabilities to raise a country risk.

The GDP (*gdp*) is shown by "a percent change in gross domestic product at constant prices"

[2] In case that the data of the money market rate is not available, the study instead uses the "monetary policy-related interest rate" as a short-term interest rate.

[3] This study also applied the "rational" expectation for the estimation, and the subsequent estimations were not affected seriously by the differences in the expectation formations.

Table 3. List of Sample Economies

Afghanistan	Côte d'Ivoire	Libya	São Tomé and Príncipe
Albania	Croatia	Madagascar	Saudi Arabia
Algeria	Dominica	Malaysia	Senegal
Angola	Dominican Republic	Mali	Serbia
Antigua and Barbuda	Egypt	Mauritius	Sierra Leone
Argentina	Eswatini	Mexico	South Africa
Armenia	Fiji	Moldova	Sri Lanka
Aruba	The Gambia	Mongolia	St. Kitts and Nevis
Azerbaijan	Georgia	Morocco	St. Lucia
The Bahamas	Ghana	Mozambique	St. Vincent and the Grenadines
Bahrain	Grenada	Nepal	Suriname
Bangladesh	Guatemala	Niger	Tajikistan
Belarus	Guinea-Bissau	Nigeria	Thailand
Belize	Guyana	Oman	Togo
Benin	Honduras	Pakistan	Trinidad and Tobago
Bolivia	Hungary	Panama	Tunisia
Brazil	India	Papua New Guinea	Turkey
Bulgaria	Indonesia	Paraguay	Ukraine
Burkina Faso	Iraq	Peru	Uruguay
Cabo Verde	Jamaica	Philippines	Uzbekistan
Chile	Jordan	Poland	Vanuatu
China	Kazakhstan	Qatar	Venezuela
Colombia	Kenya	Romania	Vietnam
Democratic Republic of the Congo	Kuwait	Russia	
Costa Rica	Kyrgyz Republic	Rwanda	

Source: The author's selection from emerging market and developing economies defined by WEO.

Table 4. Descriptive Statistics

Variables	Obs.	Median	Std. Dev.	Min.	Max
Dependent Variable					
crp	1,552	2.924	9.021	-46.089	25.494
Explanatory Variables					
inf	1,835	4.314	7.124	-2.406	80.744
gdp	1,842	4.253	3.774	-15.100	20.720
exd	1,381	40.546	33.585	3.460	250.744
res	1,231	36.523	249.93	0.710	3,636.70
pud	1,783	44.681	31.199	4.641	244.967
fsb	1,835	-2.519	5.055	-19.257	31.355
pol	1,723	-0.227	0.863	-2.500	1.287

Source: The author's description

taken from WEO, and its coefficient is supposed to have a negative sign since the economic growth usually lessons the country's default risk.

The external debt (*exd*) is shown by "external debt stocks as a percentage of GNI (gross national income)" retrieved from World Development Indicator (WDI) of World Bank, and its coefficient's sigh is expected to be positive since the external debt could be a major component of the country risk.

The foreign reserves (*res*) are expressed by "total reserves as a percentage of total external debt" taken from WDI, and its coefficient's sign is supposed to be negative since the accumulation of foreign reserves could be a factor to mitigate the country risk.

The public debt (*pud*) is shown by "general government gross debt as a percentage of GDP" taken from WEO, and its coefficient's sign is expected to be positive since the public debt could also be a major component of the country risk.

The fiscal balance (*fsb*) is expressed by "general government net lending / borrowing as a percentage of GDP" retrieved from WEO, and its coefficient's sign is expected to be negative since the fiscal surplus could a factor to mitigate the country risk.

The political index (*pol*) is shown by "political stability and absence of violence / terrorism" compiled by Worldwide Governance Indicators of World Bank. The index takes the values from -2.5 (weak) to 2.5 (strong), and its coefficient's sign is supposed to be negative since the political stability could reduce the country risk.

3.2. Panel Data Setting

Based on the setting of the key variable above, the study constructs the panel data for the period of 2001-2019 with 98 economies. The sample period after the 2000s is chosen since the study focuses on the fundamentals of domestic economies as the determinants of the country risk premium. As was stated in the introduction, the 1990s was the decade when there had been frequent crises originated in emerging market economies and the crises' contagions had affected the country risk premium. The 98 sample economies, which are listed in Table 3, are selected based on the data availability of the short-term interest rates (money market rate or monetary policy-related interest rate), out of 155 emerging market and developing economies defined by WEO database. The study winsorises the data of all the variables except the foreign reserves at the 0.5th and 99.5th percentile to remove the outliers. [4]

For the subsequent estimation, the study investigates the stationary property of the constructed panel data by employing panel unit root tests: Levin, Lin and Chu test (see Levin et al., 2002) and Im, Pesaran and Shin test (see Im et al., 2003). The former test assumes that there is a common unit root process across cross-sections, and the latter test allows for individual unit root processes that vary across cross-sections. These tests are conducted on the null hypothesis that a level of panel data has a unit root, by including "intercept" and "trend and intercept" in the test equations. Table 5 reports that the null hypothesis of a unit root is rejected at 99 percent significant level in all the variables in both of the tests with their equations including "intercept". Although the data may have cross-sectional dependence, therefore, the problem of low power in the unit root tests does not arise. The study thus uses the level of panel data for the estimation.

3.3. Screening Variables by Causality Tests

This study, as was aforementioned, prioritizes the causality investigation between the country risk premium and its supposed determinants, since the premium and the country's fundamentals would

[4] The data of the foreign reserves is winsorised at the 0.1th and 99.9th percentile by observing the data distribution.

Table 5. Unit Root Tests

	Levin, Lin & Chu Test		Im, Pesaran and Shin W-stat	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
crp	-11.715 ***	-16.843 ***	-10.847 ***	-12.283 ***
inf	-15.562 ***	-15.945 ***	-10.493 ***	-9.576 ***
gdp	-12.312 ***	-14.638 ***	-11.391 ***	-9.566 ***
exd	-10.201 ***	-4.116 ***	-4.715 ***	0.418
res	-5.079 ***	-3.155 ***	-2.466 ***	1.732
pud	-20.730 ***	-24.345 ***	-7.314 ***	-3.423 ***
fsb	-4.968 ***	-5.294 ***	-5.092 ***	-3.750 ***
pol	-6.478 ***	-8.562 ***	-4.989 ***	-5.434 ***

Note: *** denotes the rejection of null hypothesis at the 99% level of significance.
Sources: The author's estimation

be endogenously interacted. To be specific, the study conducts the pairwise Granger causality tests for the combinations between the estimated country risk premium and the explanatory variables set in Section 3.2, and screens the variables that are identified to have the causalities running from them to the country risk premium for the subsequent VAR model estimation. The test takes a one-year lag length, following the Schwarz Information Criterion with the maximum lags being equal to three year lags under the limited number of time-series data. The test equation is specified as follows.

$$crp_t = \alpha_1 + \beta_1\, det_{t-1} + \gamma_1\, crp_{t-1} + \varepsilon_{1t}$$
$$det_t = \alpha_2 + \beta_2\, det_{t-1} + \gamma_2\, crp_{t-1} + \varepsilon_{2t} \qquad (2)$$

where *det* is the supposed determinant of the country risk premium: *inf*, *gdp*, *exd*, *res*, *pud*, *fsb* or *pol*; α_1, α_2, β_1, β_2, γ_1 and γ_2 are constant terms and coefficients of variables; and ε_1 and ε_2 are random error terms. The pairwise Granger causality tests are conducted on the null hypothesis: $\beta_1 = 0$ and $\gamma_2 = 0$. The *crp* is considered to be Granger-caused by *det* if the null hypothesis, $\beta_1 = 0$, is rejected by F-statistics, and the *det* is Granger-caused by *crp* if $\gamma_2 = 0$ is rejected.

Table 6 reports the results of the pairwise Granger causality tests. It is the inflation (*inf*), the external debt (*exd*), the foreign reserves (*res*) and the public debt (*pud*) that do Granger cause the country risk premium (*crp*) at conventionally significant levels of more than 95 % with the expected signs: positive causalities from *inf*, exd and *pud* to *crp* and negative causality from *res* to *crp*.

The causality from the GDP growth (*gdp*) to the country risk premium (*crp*) is not identified against the study's hypothesis. It is speculated that the "convergence" effects are mixed up in the test results. The convergence proposed by Sala-i-Martin (1996) represents the tendency of the less-developed countries to grow faster. The less-developed countries would often be accompanied with the higher country risk, thereby leading to the positive association between the GDP growth and the risk premium. In this study's sample, Vietnam with her per capita GDP being one-tenth of that of Malaysia in 2001, records a higher GDP growth (6.7 percent) than that of Malaysia (4.9 percent) on

Table 6. Pairwise Granger Causality Test

Null Hypothesis	Obs	Lags	F-statistic
inf does not Granger Cause *crp*	1,423	1	6.942 ***
crp does not Granger Cause *inf*		1	36.891 *** (negative)
gdp does not Granger Cause *crp*	1,429	1	0.021
crp does not Granger Cause *gdp*		1	0.704
exd does not Granger Cause *crp*	1,105	1	15.652 ***
crp does not Granger Cause *exd*		1	5.865 ** (negative)
res does not Granger Cause *crp*	986	1	4.885 ** (negative)
crp does not Granger Cause *res*		1	1.099
pud does not Granger Cause *crp*	1,386	1	17.851 ***
crp does not Granger Cause *pud*		1	0.020 (negative)
fsb does not Granger Cause *crp*	1,421	1	0.159 (negative)
crp does not Granger Cause *fsb*		1	0.008
pol does not Granger Cause *crp*	1,337	1	0.879
crp does not Granger Cause *pol*		1	0.342 (negative)

Note: ***, ** denote the rejection of null hypothesis at the 99% and 95% level of significance.
Sources: The Author's estimation

the average for 2001-2019, following the convergence. At the same time, Vietnam's risk premium (3.0 percent) is higher than that of Malaysia (0.8 percent) for the same period. This observation tells that the GDP growth could not simply be a factor to lower the country risk premium.

Regarding the fiscal balance (*fsb*), its causality to the country risk premium (*crp*) is not significant though its sign is negative as expected. It might be because the balance contains the cyclical factor affected by business fluctuations, which has little to do with the country risk with structural property.

As for the political index (*pol*), its causality to the country risk premium (*crp*) is not confirmed. It might come from the fact that political turmoil has less happened after the 2000s than before it with e.g. the disintegration of the Soviet Union in 1991, and thus the political risk might not be a major influential factor to constitute the country risk in the sample period.

Another point to be worth noting is that the opposite causalities running from the country risk premium (*crp*) to the inflation (*inf*) and the external debt (*exd*) are all negative at conventionally significant levels. These results imply that the risk premium might provide some disciplines for the macroeconomic balances: the high risk premium take a role to restrain excessive inflations and explosions of external debts.

To sum up, the pairwise Granger causality tests in this section have eventually screened the determinant variables for the subsequent VAR model estimation, by choosing the inflation (*inf*), the external debt (*exd*), the foreign reserves (*res*) and the public debt (*pud*), and dropping the GDP growth (*gdp*), the fiscal balance (*fsb*) and the political index (*pol*).

3.4. VAR Estimation and Results with Discussions

This section turns to the VAR model estimation to examine the impulse responses of the selected explanatory variables on the country risk premium. Before constructing the model, the study investigates the multicollinearity among the explanatory variables. Table 7 shows the bivariate

Table 7. Correlation Matrix and Variance Inflation Factors

Table 7-1	*inf*	*exd*	*pud*	*res*
inf	1.000			
exd	0.026	1.000		
pud	-0.028	0.546	1.000	
res	-0.072	-0.278	-0.210	1.000
VIF	1.634	4.903	4.970	1.076

Table 7-2	*inf*	*exd*	*res*
inf	1.000		
exd	0.021	1.000	
res	-0.072	-0.270	1.000
VIF	1.544	1.524	1.060

Table 7-3	*inf*	*pud*	*res*
inf	1.000		
pud	-0.026	1.000	
res	-0.055	-0.198	1.000
VIF	1.576	1.568	1.035

Sources: The Author's estimation

correlations and the variance inflation factors (VIF) among the explanatory variables. Table 7-1 including all the variables reveals that there is a high correlation (0.546) between the external debt (*exd*) and the public debt (*pud*). The VIF, a method of measuring the level of collinearity between the regressors in an equation, tells that the values of both variables (around 5) are in the risky zone inducing multicollinearity. In case the external debt (*exd*) and the public debt (*pud*) are separately estimated in Table 7-2 and 7-3, there are no serious threat in the multicollinearity among the explanatory variables. Thus, the subsequent VAR model sets up the two groups of variables with the external debt (*exd*) and the public debt (*pud*) being separately included.

Then the model equation is specified for the estimation as follows.

$$y_{it} = \alpha\, y_{it-1} + \mu\, d_{0809} + \varepsilon_{it} \tag{3}$$

where y_{it} is a column vector of the endogenous variables with economy i and year t: $y = (crp, inf, exd, res)$' denoted as Model I, and $y = (crp, inf, pud, res)$' as Model II; y_{it-1} is a vector of the lagged endogenous variables; d_{0809} is the 2008-2009 dummy variable to control exogenously the impacts of the global financial crisis, taking a value one if the year of the data belongs to 2008 and 2009, and zero otherwise; α and μ are coefficient matrixes; and ε_{it} is a vector of the random error terms in the system. The lag length (-1) is selected by the Schwarz Information Criterion with the maximum lags being three year lags under the limited number of time-series data.

Based on the VAR model estimation (2), the study examines the impulse responses of the country risk premium (*crp*) to the shocks of its determinant variables, *inf*, *exd*, *pud* and *res*. Table 8 and Figure 1 report the estimation outcomes of the VAR model and the impulse responses, respectively.

Table 8. VAR Model Estimation Results

[Table 8-1 Model I]

	crp	*inf*	*exd*	*res*
crp $_{-1}$	0.248 ***	-0.184 ***	-0.308 ***	0.217
	[8.499]	[-14.798]	[-11.378]	[1.258]
inf $_{-1}$	0.207 ***	0.761 ***	0.101 **	-0.021
	[4.545]	[39.151]	[2.405]	[-0.079]
exd $_{-1}$	0.014 **	0.025 ***	0.962 ***	0.014
	[2.197]	[9.101]	[157.218]	[0.374]
res $_{-1}$	-0.002 *	0.000	-0.000	0.988 ***
	[-1.754]	[0.954]	[-0.181]	[143.395]
d0809	-0.366	0.718	2.251 **	1.604
	[-0.340]	[1.572]	[2.263]	[0.252]
Adj. R^2	0.101	0.519	0.924	0.951

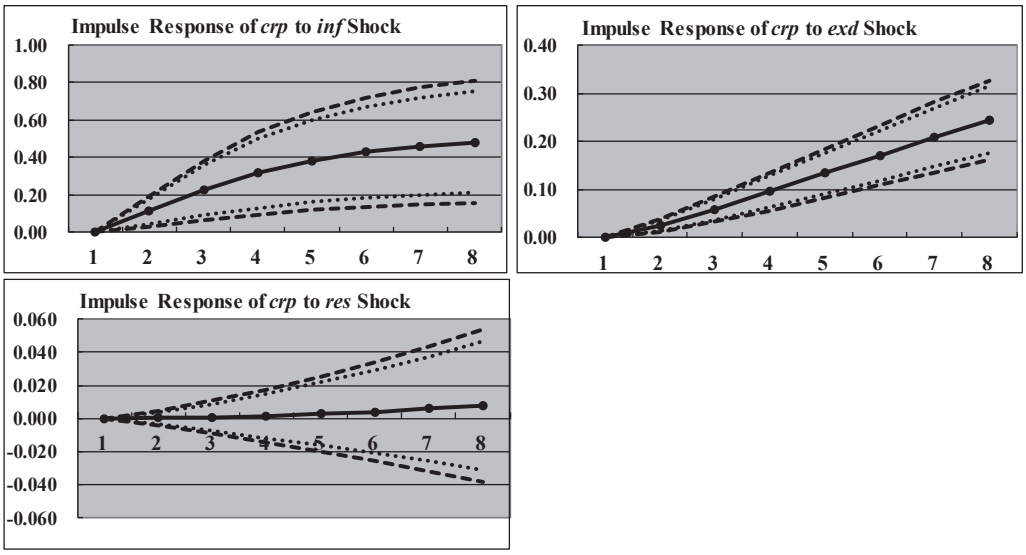
[Table 8-2 Model II]

	crp	*inf*	*pud*	*res*
crp $_{-1}$	0.247 ***	-0.250 ***	-0.184 ***	0.213
	[8.411]	[-14.568]	[-7.951]	[1.231]
inf $_{-1}$	0.085 **	1.080 ***	-0.024	-0.025
	[2.029]	[44.119]	[-0.729]	[-0.102]
pud $_{-1}$	0.034 ***	0.006	0.966 ***	0.021
	[4.777]	[1.643]	[170.736]	[0.504]
res $_{-1}$	-0.002 *	-0.000	0.001	0.988 ***
	[-1.729]	[-0.732]	[1.195]	[142.080]
d0809	0.100	-1.532 **	2.887 ***	1.547
	[0.092]	[-2.416]	[3.379]	[0.242]
Adj. R^2	0.099	0.640	0.927	0.951

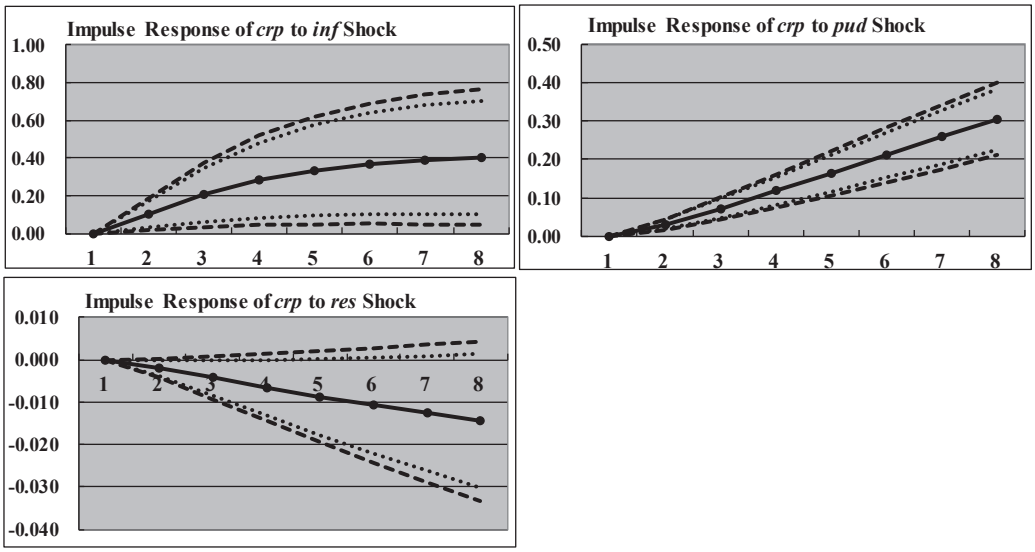
Note: ***, **, * denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance.
Sources: The Author's estimation

Regarding the impulse responses, the Model I in Figure 1-1 shows that the country risk premium (*crp*) responds positively to the shock of the inflation (*inf*) and the external debt (*exd*) with the conventional error bands, but insignificantly to the shock of the foreign reserves (res). The Model II in Figure 1-2 presents that the country risk premium (*crp*) responds positively to the shock of the inflation (*inf*) and the public debt (*pud*) robustly, and negatively to the shock of the foreign reserves (*res*) with the weak significance. Figure 1-1 and 1-2 also indicate that the accumulated responses of the country risk premium toward eight years to the shock of one percent point of the inflation rate

[Figure 1-1 Model I]



[Figure 1-2 Model II]



Note: The fine and coarse dotted lines denote a 90 and 95 percent error band over 8-quarter horizons.
Source: The author's estimation

Figure 1. Impulse Responses

are around 0.4 percent point; and those to the shocks of the external debt as a percentage of GNI and the public debt as a percentage of GDP are 0.2 – 0.3 percent points. These results meet the study's hypotheses described in Section 3.1.

In a nutshell, the VAR model analyses in this study could identify the factors of the inflation, the external debt, the public debt and the foreign reserves as the determinants of the country risk premium. This results are also consistent with the previous works presented in Section 2: the inflation

is proven to be the determinant common to Mpapakika and Malikane (2019), Palic et al. (2017), Tkalec et al. (2014) and Martinez et al. (2013); the external debt common to Tkalec et al. (2014), Martinez et al. (2013), Maltritz and Molchanov (2013), Bellas et al. (2010) and Hilscher and Nosbusch (2010); the public debt common to Mpapakika and Malikane (2019), Palic et al. (2017), Tkalec et al. (2014), Iara and Wolff (2014), Baldacci et al. (2011) and Baldacci and Kumar (2010); and the foreign reserves common to Mpapakika and Malikane (2019), Tebaldi et al. (2018), Tkalec et al. (2014), Martinez et al. (2013), Maltritz and Molchanov (2013) and Hilscher and Nosbusch (2010).

4. Concluding Remarks

This paper revisited the issue on the determinants of the country risk premium for emerging market and developing economies to enrich its empirical evidence. The major contributions of this study are: to sample the majority of emerging market and developing economies by estimating the country risk premium, to focus on the domestic fundamentals rather than the world market factors by targeting the period after the 2000s and, to screen the determinants by the causality check between the country risk premium and its supposed determinants in a VAR model framework.

Through the VAR model estimation, this study could eventually identify the factors of the inflation, the external debt, the public debt and the foreign reserves as the determinants of the country risk premium, which is consistent with the findings of the majority of the previous works. The strategic policy implication is the significance in consolidating fiscal, external and macroeconomic balances for emerging market and developing economies, so that they could avoid excessive risk premiums that would hamper their capital accumulation and their long-term economic growth.

References

Arora, V. and Cerisola, M. (2000), How does U.S. monetary policy influence economic conditions in emerging markets? *IMF Working Paper*, WP/ 00/148.

Baldacci, E. and Kumar, M. (2010), Fiscal Deficits, Public Debt and Sovereign Bond Yields, *IMF Working Paper*, WP/10/184.

Baldacci, E., Gupta, S. and Mati, A. (2011), Political and fiscal risk determinants of sovereign spreads in Emerging markets, *Review of Development Economics*, Vol. 15, pp. 251–63.

Bellas, D., Papaioannou, M. and Petrova, I. (2010), Determinants of Emerging market Sovereign Bond Spreads: Fundamentals vs. Financial Stress, *IMF Working paper*, WP/10/281.

Calvo, G.A. and Reinhart, C. (2002), Fear of floating, *Quarterly Journal of Economics*, Vol. 117, pp. 379–408.

Dooley, M. and Hutchison, M. (2009), Transmission of the U.S. subprime crisis to emerging markets: evidence on the decoupling – recoupling hypothesis, *Journal of International Money and Finance*, Vol. 28, pp. 1331–1349.

Edwards, S. (1984), LDC foreign borrowing and default risk: an empirical investigation 1976–80, *American Economic Review*, Vol. 74, pp. 726–734.

Edwards, S. (1986), The pricing of bonds and bank loans in international markets, *European Economic Review*, Vol. 30, pp. 565–589.

Hilscher, J. and Nosbusch, Y. (2010), Determinants of sovereign risk: Macroeconomic fundamentals and the pricing of sovereign debt, *Review of Finance*, Vol. 14, pp. 235–62.

Iara, A. and Wolff, G. (2014), Rules and risk in the Euro area, *European Journal of Political*

Economy, Vol. 34, pp. 222–36.

Im, K.S., Pesaran, M.H. and Shin, Y. (2003), Testing for Unit Roots in Heterogeneous Panels, *Journal of Econometrics*, Vol. 115, pp. 53–74.

Krugman, P.R., Obstfeld, M. and Melitz, M. (2018), *International Economics: Theory and Policy, 11th edition*, Pearson Education Limited, Harlow.

Levin, A., Lin, C.F. and Chu, C. (2002), Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, Vol. 108, pp. 1–24.

Maltritz, D. and Molchanov, A. (2013), Analyzing determinants of bond yield spreads with Bayesian model averaging, *Journal of Banking and Finance*, Vol. 37, pp. 5275–84.

Martinez, L., Terceno, A. and Terruel, M. (2013), Sovereign bond spreads determinants in Latin American countries: Before and during the XXI financial crisis. *Emerging Markets Review*, Vol. 17, pp. 60–75.

Mankiw, N.G. (2019), *Macroeconomics, 10th Edition*, Worth Publishers, New York.

McKinnon, R.I. (2001), After the Crisis, the East Asian Dollar Standard Resurrected: An Interpretation of High-Frequency Exchange Rate Pegging, in Stiglitz, J.E. and Yusuf, S. (eds) *Rethinking the East Asian Miracle*, the World Bank and Oxford University Press, pp. 197–246.

Mpapalika, J. and Malikane, C. (2019), The Determinants of Sovereign Risk Premium in African Countries, *Journal of Risk and Financial Management*, Vol. 12, pp. 1–20.

Palic, P., Simovic, P.P. and Vizek, M. (2017), The Determinants of Country Risk Premium Volatility: Evidence from a Panel VAR Model, *Croatian Economic Survey*, Vol. 19, pp. 37-66.

Sala-i-Martin, X.X. (1996), The Classical Approach to Convergence Analysis, *The Economic Journal*, Vol. 106, pp. 1019-1036.

Shimizu, S. (2018). Development of Asian Bond Markets and Challenges: Keys to Market Expansion, *Public Policy Review*, Vol. 14, pp. 955-1000.

Tebaldi, E., Nguyen, H. and Zuluaga, J. (2018), Determinants of emerging markets' financial health: A panel data study of sovereign bond spreads, *Research in International Business and Finance*, Vol. 45, pp. 82–93.

Tkalec, M., Vizek, M. and Verbic, M. (2014), Balance sheet effects and original sinners' risk premiums, *Economic Systems*, Vol. 38, pp. 597–613.

World Bank (1997), *Private Capital Flows to Developing Countries: The Road to Financial Integration*, Oxford University Press, New York.

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