An International Comparative Analysis of Household Consumption and Saving Behavior

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Preface

This report presents the results of the research conducted during the final year of the Research Project on "An International Comparative Analysis of Household Consumption and Saving Behavior" of the Asian Growth Research Institute (October 1, 2014, to March 31, 2016). The objective of this project was to conduct an international comparative analysis of household consumption and saving behavior and to shed light on differences and similarities among countries in their household consumption and saving behavior.

This report consists of 2 chapters. In Chapter 1, we conduct an econometric analysis of the determinants of household saving rates in India and Korea using long-term time series data and find that the age structure of the population, the sex ratio, the level of income, and corporate saving have a significant impact on the household saving rate.

During the first 6 months of this project, we conducted an international comparison of bequest motives in order to deepen our understanding of household consumption and saving behavior and found that bequests are selfishly motivated in Japan. In Chapter 2, we examine whether or not the receipt of *inter vivos* transfers or financial assistance from parents influences the degree of burden of parental care provision that children feel using subjective well-being measurements based on Japanese data. We find a negative impact of parental caregiving on the subjective well-being of child caregivers in the case of unmarried children, but such an adverse effect is found to be attenuated if the children have received *inter vivos* transfers or financial assistance from their parents. This suggests that parents save pursuant to a strategic bequest motive and that parent-child relations are governed by an exchange motive.

We are grateful to the Asian Growth Research Institute for its financial support of this research. Furthermore, Chapter 2 uses micro data from the Preference Parameters Study of Osaka University's 21st Century COE Program 'Behavioral Macrodynamics Based on Surveys and Experiments' and its Global COE Project 'Human Behavior and Socioeconomic Dynamics.' We acknowledge the program/project's contributors: Yoshiro Tsutsui, Fumio Ohtake, and Shinsuke Ikeda.

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Abstract

We conduct an econometric analysis of the determinants of household saving rates in India and Korea using long-term time series data and find that the age structure of the population, the sex ratio, the level of income, and corporate saving have a significant impact on the household saving rate. With respect to the impact of the sex ratio, if the sex ratio is unbalanced in favor of the sex that bears a greater share of marriage expenses, parents with children of the overrepresented sex would be expected to increase their saving in order to insure that their children can secure a desirable marriage partner. This, in turn, may cause the saving rate of the household sector as a whole to increase. We find empirical support for this hypothesis in the case of Korea where the male-female ratio is found to have a positive impact on the household saving rate as the parents of males (the overrepresented sex) bear the brunt of marriage-related expenses in this country. However, given that it is the parents of females (the underrepresented sex) who bear the brunt of marriage-related expenses in India, we find instead that the male-female ratio has a negative impact on the household saving rate in the case of India.

We also examine the impact of providing informal care to elderly parents on caregivers' subjective well-being using unique data from the "Preference Parameters Study" of Osaka University, a nationally representative survey conducted in Japan. The estimation results indicate heterogeneous effects: while informal parental care does not have a significant impact on the happiness level of married children regardless of whether they take care of their own parents or parents-in law and whether or not they reside with them, it has a negative and significant impact on the happiness level of unmarried children. However, the adverse effect of parental care provision is found to be attenuated if the children have received *inter vivos* transfers or financial assistance from their parents. This suggests that parents save pursuant to a strategic bequest motive and that parent-child relations are governed by an exchange motive. The findings of this chapter also call for more attention to be paid to unmarried caregivers, who presumably receive less support, both emotional and physical, from family members and tend to be more vulnerable to negative income shocks than their married counterparts.

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Chapter 1: The Impact of Pre-marital Sex Ratios on Household Saving in India and Korea: The Competitive Saving Motive Revisited

Charles Yuji Horioka and Akiko Terada-Hagiwara

1. Introduction

In two widely cited papers, Wei and Zhang (2011a) and Du and Wei (2013) propose what they call the "competitive saving motive," which implies that an increase in the sex (or gender) ratio (the ratio of males to females) of the pre-marital cohort will require the groom's side to save increasingly more to ensure his success in an increasingly competitive marriage market and that this will elevate the saving rate of the household sector as a whole (the same point is also made by Golley and Tyers (2012b)). Wei and Zhang (2011a) and Du and Wei (2013) verify this effect using household-level data and provincial panel data for the People's Republic of China, cross-country data for a sample of about 160 countries, and numerical calibration methods and show that the sharp increase in the pre-marital sex ratio can potentially explain about 60% of the sharp increase in China's household saving rate during the 1990-2007 period (from 16% to 30%) and about half of both the current account surplus of China and the current account deficit of the United States (see Wei and Zhang (2015) for a useful survey).

While the "competitive saving motive" may be applicable outside of China given the unbalanced sex ratios and conventions regarding marriage-related expenses in other countries, empirical investigations have been limited (but see Horioka (1987) for an analysis of saving for marriage in Japan). The purpose of this paper is to contribute to the literature by determining whether or not a similar mechanism has led to a significant relationship between the pre-marital sex ratio and the household saving rate in India and the Republic of Korea (hereafter Korea), two countries in which, as in China, sex ratios are unbalanced and marriage-related expenses are considerable, and to determine whether or not trends over time in the pre-marital sex ratio can explain trends over time in the household saving rate in these two countries. In order to accomplish these objectives, this paper estimates a household saving rate equation for India and Korea using long-term

time series data for the 1975-2010 period, focusing in particular on the impact of the pre-marital sex ratio on the household saving rate.

To summarize the main findings of this paper, it finds that the pre-marital sex ratio (ratio of males to females) has a significant impact on the household saving rate in India and Korea, even after controlling for the usual suspects such as the aged and youth dependency ratios and income. It has a negative impact in India, where the bride's side has to pay substantial dowries to the groom's side at marriage, but a positive impact in Korea, where, as in China, the groom's side has to bear a disproportionate share of marriage-related expenses including purchasing a house or condominium for the newlywed couple. The findings of the paper imply that trends in the pre-marital sex ratio can explain trends in the household saving rate during the first half of the sample period but not during the second half in both countries and that the level of the pre-marital sex ratio can partly explain the high level of Korea's household saving rate but not the high level of India's household saving rate.

The remainder of this paper is organized as follows: Section 2 contains a theoretical discussion of the impact of the pre-marital sex ratio on the household saving rate, section 3 presents and discusses data on trends over time in the pre-marital sex ratio and the household saving rate in India and Korea, section 4 presents the estimation model used in this paper, section 5 discusses the data sources used, section 6 presents the estimation results, and section 7 summarizes, concludes, and explores the policy implications of our findings.

2. Theoretical Considerations

In this section, we discuss the theoretical impact of the sex (male-to-female) ratio of the pre-marital cohort on the household saving rate (this exposition is based on Grossbard-Shechtman (1993), Wei and Zhang (2011a), Du and Wei (2013), and Grossbard (2015)). If the pre-marital sex ratio is unbalanced, families with a child who belongs to the overrepresented gender will presumably increase their saving in order to ensure that their child is able to secure an "attractive" spouse, especially if the custom in that country is for families with a child who belongs to the overrepresented gender to bear a

disproportionate share of marriage-related expenses. At the same time, families with a child who belongs to the underrepresented gender may or may not reduce their saving due to the presence of two mutually offsetting effects. On the one hand, they may reduce their saving because of their favorable bargaining position in the marriage market, but on the other hand, they may increase their saving to ensure that their child does not suffer an erosion of his or her bargaining power vis-à-vis his or her spouse (assuming that the relative wealth levels of the two sides affects the relative bargaining power of the husband and wife vis-à-vis one other after marriage). Thus, families with a child who belongs to the overrepresented gender will unambiguously increase their saving, but it is not clear whether families with a child who belongs to the underrepresented gender will increase or decrease their saving and hence it is not clear whether the saving of the household sector as a whole will increase or decrease, on balance (see, for example, Lafortune (2013)).

As documented by Wei and Zhang (2011a), Du and Wei (2013), and Golley and Tyers (2014), in the case of China, the introduction of the one-child policy and other population control measures strengthened the degree of son preference and led to an increasingly unbalanced pre-marital sex ratio (more males than females). Since the custom in China is for the groom's side to bear a disproportionate share of marriage-related expenses including purchasing a house or condominium for the newlywed couple, this in turn bid up the cost of securing a bride, led families with sons to save more than before, and caused the overall household saving rate to increase over time. Moreover, in general equilibrium, the increased demand for housing caused by the unbalanced pre-marital sex ratio will bid up housing prices and require potential homebuyers to save more, whether or not they have sons, and this will further elevate the saving rate of the household sector as a whole.

What about the cases of India and Korea? In the case of India, the bride's side must pay enormous dowries to the groom's side. According to Anderson (2007), dowries are paid in 93 to 94% of cases in India and amount to 4 to 6 times annual male income, 7 to 8 times annual per capita income, and 68% of total household assets before marriage, and the amount of dowries increased at the phenomenal rate of 15% per year during the 60-year from 1921 until 1981. The Dowry Prohibition Act was enacted in 1961 and it was further strengthened in 1983 and 2005, but the payment of dowries is still common in

many parts of India and the aforementioned laws are primarily concerned with preventing and punishing the cruel treatment, harassment, and even murder of wives in connection with dowry demands rather than with the payment of the dowry itself. Thus, the situation in India is the opposite of that in China.

By contrast, in the case of Korea, the bride's side is expected to pay a (cash) dowry and to pay for the furnishings of the newlywed's home, but the groom's side is expected to return half of the dowry and to pay for the newlywed's home, which has become a more and more onerous burden over time due to the rapid rise in housing prices (see Onishi (2007)). Thus, wedding customs in Korea are very similar to those in China, with the groom's side being expected to bear a disproportionate share of marriage-related expenses, and moreover, housing prices have increased sharply in Korea, as they have in China, thereby further increasing the groom side's burden.

Since marriage-related expenses are considerable and borne disproportionately by one side or the other in both India and Korea, we would expect the pre-marital sex ratio to have a significant impact on the household saving rate in both countries. However, we would expect the direction of its impact on the household saving rate to be opposite in the two countries, being negative in the case of India where the bride's side bears a disproportionate share of marriage-related expenses and positive in the case of Korea where, as in the case of China, the groom's side bears a disproportionate share of marriage-related expenses.

3. Data on Pre-marital Sex Ratios and Household Saving Rates in India and Korea

In this section, we present data on the sex ratio of the pre-marital cohort and the household saving rate in India and Korea during the 1975-2010 period.

In India, the average age at first marriage was 22.7 for males, 17.7 for females, and 20.2 for both sexes in 1971 and 26.0 for males, 22.2 for females, and 24.1 for both sexes in 2011 (all data were taken from Medindia's webpage http://www.medindia.net/health_statistics/general/marriageage.asp), and thus the average age at first marriage for both sexes presumably averaged about 22 during the 1975-2010 period as a whole. By contrast, in Korea, the average age at first marriage was much later-

-26.7 for males, 22.8 for females, and 24.75 for both sexes in 1966 and 32.2 for males, 29.6 for females, and 30.9 for both sexes in Korea in 2013 (the data for 1966 were taken from Lapierre-Adamcyk and Burch (1974) while the data for 2013 were taken from Statistics Korea's webpage http://kostat.go.kr/portal/english/news/1/25/3/index. board?bmode=read&aSeq=327223&pageNo=&rowNum=10&amSeq=&sTarget=&sTxt =), and thus the average age at first marriage for both sexes presumably averaged about 28 during the 1975-2010 period as a whole. We therefore define the pre-marital cohort as the 10 to 19 age group in India and the 15 to 24 age group in Korea, reflecting differences in the average age at first marriage in the two countries. It would have been preferable to use a different definition of the pre-marital cohort in each year to reflect increases over time in the average age at first marriage in the 2 countries, but we were not able to do so because the population data are available only for 5-year age groups. Moreover, it would have been preferable to take account of the age difference between males and females at first marriage (about 4 to 5 years in India and about 3 to 4 years in Korea), but we were not able to do so for the same reason.

Figures 1-1 and 1-2 show data on trends over time in the pre-marital sex ratio in India and Korea during the 1975-2010 period, and as can be seen from this figure, this ratio was relatively stable in India during this period, fluctuating in the 1.080 to 1.103 range. It showed a slight downward trend during the 1975-93 period, declining from 1.094 in 1975 to 1.080 in 1993, remained stable at 1.080 during the 1993-98 period, and showed a slight upward trend during the 1998-2010 period, increasing from 1.080 in 1998 to 1.103 in 2010. In Korea, by contrast, the pre-marital sex ratio showed a sharp upward trend throughout the 1975-2010 period, increasing from 1.045 in 1975 to 1.127 in 2010. There are at least two possible explanations for this trend. One is the increasing availability and/or affordability of sex determination technology (ultrasonography and amniocentesis) and sex-selective abortions (see Guilmoto (2009) and Du and Wei (2013)), and the other is that the sharp decline in fertility increased the strength of son preference because fewer children means that parents will care more about the gender of any given child (see Golley and Tyers (2012b) for a discussion of the population control policies that were largely responsible for the sharp decline in fertility)..

Note that the biologically normal sex ratio at birth is 1.05 to 1.06 (105 or 106 males

for every 100 females). Thus, the sex ratio in both India and Korea is higher than the natural ratio (except until 1979 in Korea), as it is in many, if not most, Asian countries (see Guilmoto (2009) for comparative data on sex ratios at birth for a large number of Asian countries), suggesting that parents have a strong preference for sons in both countries. Parents presumably operationalized their preference for sons via female infanticide in earlier times (observed in some northern Indian states such as Delhi, Haryana, and Rajasthan) and by sex-selective abortions (made possible by sex determination technology such as ultrasonography and amniocentesis) in more recent times (indeed, Cheng, et al. (2013) find using variations across counties in China that access to ultrasound had a significant impact on sex ratios at birth, with 40-50% of the increase in sex ratios at birth in China being due to improved access to ultrasound). The crucial difference between India and Korea is in trends over time, with Korea showing a much more pronounced upward trend in its sex ratio throughout the period of analysis for the reasons noted earlier.

Figures 2-1 and 2-2 show trends over time in the household saving rate in India and Korea during the 1975-2010 period, and as can be seen from this figure, India's household saving rate has shown a long-term upward trend over time, increasing from 9.6% in 1975 to 26.9% in 2010. By contrast, Korea's household saving rate has been highly volatile over time, fluctuating between 0.4% in 2002 and 26.0% in 1988 but generally high (above 10%) until 1999 and generally low (below 10%) thereafter.

We now compare trends over time in the pre-marital sex ratio to trends over time in the household saving rate in India and Korea. In the case of India, the pre-marital sex ratio and the household saving rate showed opposite trends during the 1975-96 period, with the former showing a downward trend and the latter showing an upward trend, whereas they showed similar trends during the 1996-2010 period, with both of them showing upward trends. Since we hypothesized that the pre-marital sex ratio will have a negative impact on the household saving rate in the case of India, trends in the pre-marital sex ratio may be able to explain trends in the household saving rate during the 1975-96 period but not during the 1996-2010 period.

In the case of Korea, the pre-marital sex ratio showed an upward trend throughout the 1975-2010 period but the household saving rate was volatile during this period. Since we

hypothesized that the pre-marital sex ratio will have a positive impact on the household saving rate in the case of Korea and since the household saving rate showed an upward trend during the 1975-78, 1980-88, 1997-98, 2002-04, and 2008-09 periods, trends in the pre-marital sex ratio may be able to explain trends in the household saving rate during these periods but not during other periods.

However, we cannot be certain about the impact of the pre-marital sex ratio on the household saving rate in the two countries unless we conduct a rigorous regression analysis and control for the impact of other factors. It is to this type of analysis that we turn in the remainder of this paper.

4. Estimation Model

In this section, we discuss the estimation model we use in our econometric analysis of the determinants of household saving rates in Korea and India. We start with the most commonly used specification deriving from the life cycle/permanent income hypothesis that posits that the household saving rate is a function of the age structure of the population, income levels, corporate saving, etc. and add to it the pre-marital sex ratio (see, for example, Modigliani (1970), Feldstein (1977, 1980), Modigliani and Sterling (1983), Horioka (1989), Edwards (1996), Horioka (1997), Higgins (1998), Loayza, et al. (2000), Chinn and Prasad (2003), Luhrman (2003), Bosworth and Chodorow-Reich (2007), Horioka and Wan (2007), Kim and Lee (2008), Park and Shin (2009), and Horioka and Terada-Hagiwara (2012) for more details; Fafchamps and Pender (1997), Kochar (1999), and Athukorala and Sen (2004) for papers on India; and Hurd (1995), Kwack and Lee (2005), and Park and Rhee (2005) for papers on Korea).

Thus, the estimation model we use is as follows:

(1) $HHSR(t) = a0 + a1*DEP(t) + a2*AGE(t) + a3*SEXRATIO(t) + a4*PCY(t) + a5*CORPSAV(t) + a6*POP1519(t) + a7*TREND(t) + e(t),$

where HHSR = the household saving rate (defined as the ratio of net household saving to net household disposable income)

DEP = the youth dependency ratio, defined as the ratio of the young population (the population aged 0 to 14 in the case of India and the population aged 0 to 19 in the case of Korea) to the working-age population (the population aged 15 to 59 in the case of India and the population aged 20 to 64 in the case of Korea)

AGE = the aged dependency ratio, defined as the ratio of the aged population (the population aged 60 and older in the case of India and the population aged 65 and older in the case of Korea) to the working-age population

SEXRATIO = the sex (male-to-female) ratio of the pre-marital cohort (defined as the 10 to 19 age group in India and the 15 to 24 age group in Korea).

PCY = per capita real net household disposable income

CORPSAV = the ratio of net corporate saving to net household disposable income

POP1519 = the ratio of the pre-college population (the population aged 15 to 19) to the working-age population (the population aged 20 to 64) (included only in the case of Korea for the reasons given below)

TREND = a time trend

e = an error term

DEP and AGE are meant to capture the impact of the age structure of the population and are included in virtually all aggregate saving rate regressions. The life cycle hypothesis predicts that both coefficients will be negative since the aggregate household saving rate should be lower, the higher is the ratio of the dependent (young or aged) population to the working-age population. The dependent and working-age populations are defined differently in India and Korea to reflect differences in college entrance rates (higher in Korea than in India) and retirement ages (later in Korea than in India).

Turning to the other explanatory variables, one would expect the coefficient of PCY to be positive since households should be able to afford to save more if their income levels are higher, and one would expect the coefficient of CORPSAV to be negative if households see through the corporate veil and reduce their own saving in response to increases in corporate saving.

Yet another demographic variable of possible importance in societies that place value on education is POP1519 (the ratio of pre-college children (the population aged 15 to 19)

to the working-age population (the population aged 20 to 64)). More specifically, in a society in which college expenses are high, one would expect parents with pre-college children to save for their children's college expenses and therefore that the aggregate household saving rate will be higher, the higher is the share of parents with pre-college children. By contrast, in a society in which pre-college expenses such as the expenses of cram schools, private tutoring, etc., are high, one would expect parents with pre-college children to have to draw down their savings in order to pay for such expenses and therefore that the aggregate household saving rate will be lower, the higher is the share of parents with pre-college children (see Horioka (1985) for an analysis of saving for education in Japan). This variable was included only in the case of Korea because its coefficient was not significant when included in the regressions for India, perhaps because educational expenses are not as important in India as they are in Korea, which in turn may be due in part to the much lower proportion of the young who go to college. By 2010, 39.8% of the population aged 25 and above had completed tertiary level education in Korea whereas the corresponding figure for India was still only 9.1%, according to the Barro-Lee Educational Attainment Dataset (available on-line at http://www.barrolee.com/, August 30, 2014, update).

5. Data Sources

In this section, we describe the data sources from which our data were taken.

National accounts data for Korea on the net saving and net disposable income of households and non-profit institutions serving households and net corporate saving (needed to calculate HHSR, PCY, and CORPSAV) were taken from the National Accounts data of the Organisation for Economic Co-operation and Development (OECD), which are available at http://stats.oecd.org/.

National accounts data for India on the net saving and net disposable income of households and non-profit institutions serving households and net corporate saving (needed to calculate HHSR, PCY, and CORPSAV) were taken from the CEIC data manager, WEB (New York, N.Y.), which in turn were taken from the Sequence of National Accounts, India, of the Central Statistics Office, Ministry of Statistics and

Programme Implementation, Government of India, which are available on-line at http://mospi.nic.in/Mospi_New/site/Publications_archive.aspx?status=1&menu_ id=205

In both countries, PCY was calculated by dividing net household disposable income by total population, then deflating by the price deflator for private consumption expenditure. In the case of India, the price deflator was obtained by dividing nominal private consumption expenditure by real private consumption expenditure. In the case of Korea, the price deflator was taken directly from the OECD source noted above.

DEP, AGE, SEXRATIO, and POP1519 were calculated using data taken from the *World Population Prospects: The 2012 Revision* of the United Nations, Department of Economic and Social Affairs, Population Division, Population Estimates and Projections Section, available at http://esa.un.org/wpp (April 14, 2014 revision).

6. Estimation Results

In this section, we present our estimation results.

6.1. Time Series Properties of the Variables

We tested the variables used in our analysis for unit roots using the Dickey-Fuller test, Augmented Dickey-Fuller test, KPSS test, and Zivot-Harvey test (see Dickey and Fuller (1979), Kwiatkowski, et al. (1992), Zivot and Andrews (1992), and Harvey, Leybourne, and Taylor (2013)). The detailed test results are not shown due to space limitations, but we found that all of the variables used in our analysis are non-stationary, meaning that the use of ordinary least squares may lead to spurious results. In particular, most or all tests showed that HHSR, PCY, and CORPSAV are I(1) and that DEP, AGE, SEXRATIO, and CREDIT are I(2) or I(3) in the case of India. Similarly, most or all tests showed that HHSR, CORPSAV, and CREDIT are I(1), that SEXRATIO and FINA are I(1) or I(2), that DEP and AGE are I(2) or I(3), and that the degrees of integration of PCY and POP1519 are not clear in the case of Korea.Thus, there is a real danger that ordinary least squares will lead to spurious correlations, and the use of cointegration techniques is clearly warranted.

6.2. Results of the Tests for Cointegration

We tested for cointegration using the Engle-Granger test (Engle and Granger, 1987), the KPSS test, and the Johansen test (Johansen, 1988, 1991; Johansen and Juselius, 1990). Looking first at the results of the Engle-Granger test and the KPSS test (see Tables 1-1 and 1-2), the results for all specifications for both countries indicate the presence of cointegration, implying the presence of a long-term relationship among the variables.

Turning to the results of the Johansen test (not shown due to space limitations), the trace test as well as the maximum eigenvalue test indicate the presence of cointegration in both countries for all specifications. As for the number of cointegrating vectors, the trace test as well as the maximum eigenvalue test indicate the presence of 2 to 5 cointegrating vectors in the case of India and 2 to 4 cointegrating vectors in the case of Korea. A priori we would expect to find only one cointegrating vector and it is well-known that the Johansen test will lead to an upward bias in cointegrating rank in small samples (see, for example, Cheung and (1993) and Johansen (2002)). Thus, when estimating the cointegrating vector, we constrained the number of vectors to be one.

6.3. The Determinants of Household Saving Rates in India and Korea

In this subsection, we present our estimates of the cointegrating vector, which shed light on the determinants of the household saving rate in India and Korea. The results for India are shown in Table 2-1, and as can be seen from this table, the coefficient of SEXRATIO is negative and significant in both variants, as expected. As for the coefficients of the other variables, the coefficients of AGE and DEP are negative and significant, as predicted by the life cycle hypothesis, the coefficient of PCY is positive and significant, as expected, the coefficient of CORPSAV is negative and significant, as expected, and the coefficient of TREND is negative and significant, indicating a downward trend in the household saving rate.

The results for Korea are shown in Table 2-2, and as can be seen from this table, the coefficient of SEXRATIO is positive and significant in every variant, as expected. As for the coefficients of the other variables, the coefficient of DEP is always negative and

significant, as expected, but the coefficient of AGE is always positive and significant in all but one variant, contrary to expectation. Perhaps this is because Koreans continue to save even after retirement because they are risk-averse (and concerned in particular about longevity risk) and/or because they want to leave a bequest to their children. The coefficient of PCY is positive and significant, as expected, the coefficient of CORPSAV is positive and significant, contrary to expectation, the coefficient of POP1519 is negative and significant, presumably because the cost of cram schools, private tutoring, and other expenses of pre-college students lowers the saving rate of households with pre-college children, and the coefficient of TREND is negative and significant, indicating a downward trend in the household saving rate.

Thus, the results are highly satisfactory, in general, and provide support for the life cycle hypothesis in both India and Korea, and in particular, the coefficient of SEXRATIO has the expected sign (negative in India and positive in Korea) and is always significant in both countries. This suggests that the "competitive saving hypothesis" of Wei and Zhang (2011a) and Du and Wei (2013) applies not only in China but also in India and Korea and that unbalanced pre-marital sex ratios elevate the household saving rate.

We turn now to the implications of our findings for whether trends over time in the pre-marital sex ratio can explain trends over time in the household saving rate in India and Korea. Looking first at the case of India, the negative impact of the pre-marital sex ratio on the household saving rate implies that the downward trend in the pre-marital sex ratio until 1993 can explain the upward trend in the household saving rate until 1993 but that the upward trend in the pre-marital sex ratio after 1998 cannot explain the continuing upward trend in the household saving rate after 1998.

Looking next at the case of Korea, the positive impact of the pre-marital sex ratio on the household saving rate implies that the upward trend in the pre-marital sex ratio throughout the 1975-2011 period can explain the upward trend in the household saving rate until 1998 but not the downward trend therein after 1998.

Turning next to whether the level of the pre-marital sex ratio can explain the level of the household saving rate in India and Korea, the fact that the pre-marital sex ratio has a negative impact on the household saving rate in India and the fact that the India's pre-marital sex ratio is higher than average imply that India's household saving rate should

be lower than average. Thus, India's pre-marital sex ratio cannot explain India's higher than average household saving rate.

Turning to the case of Korea, the fact that the pre-marital sex ratio has a positive impact on the household saving rate and the fact that Korea's pre-marital sex ratio was below average until 1983 and above average thereafter implies that her household saving rate should have been below average until 1983 and above average after 1983. Thus, the pre-marital sex ratio can explain the high level of Korea's household saving rate during the 1984-2000 period but not the high level thereof before 1984 nor the low level thereof after 2000.

As for the impact of the age structure of the population, since DEP was found to have a negative impact on India's household saving rate, the steady decline in DEP during the period of analysis can help explain the steady increase in India's household saving rate during this period. AGE was also found to have a negative impact on India's household saving rate, but since it increased only slowly during the period of analysis, it did not have an appreciable impact on trends over time in India's household saving rate during this period, and India's household saving rate showed a steady increase despite the slight downward pressure exerted on it by the slow increase in AGE.

In the case of Korea, both DEP and AGE exerted upward pressure on the household saving rate during the period of analysis because DEP declined over time and has a negative impact on the household saving rate while AGE increased over time and has a positive impact on the household saving rate. Thus, trends in the age structure of the population can explain the upward trend in Korea's household saving rate during the 1975-78, 1980-88, 1997-98, 2002-04, and 2008-09 periods but cannot explain trends in Korea's household saving rate during other periods.[1]

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[1] Finally, we estimated an error correction model to analyze the short-run dynamics of household saving behavior. The results are not shown in detail because they were not very satisfactory, but we provide a brief summary here. In the case of India, virtually none of the coefficients including that of the error correction term were significant. In the case of Korea, the coefficient of the error correction term was negative and significant in some cases, indicating some tendency to return to equilibrium after a deviation. None of the other coefficients were consistently significant, and moreover, their signs were almost always contrary to expectation. These results suggest that the variables included in the analysis cannot adequately explain short-run household saving behavior, which is not surprising because most of the variables included in the analysis are variables that would be expected to have a longer-term impact on household saving behavior.

7. Conclusions

In this paper, we estimated a household saving rate equation for India and Korea using long-term time series data for the 1975-2010 period, focusing in particular on the impact of the pre-marital sex (or gender) ratio (the ratio of males to females) on the household saving rate. To summarize the main findings of the paper, it found that the pre-marital sex ratio has a significant impact on the household saving rate in both India and Korea, even after controlling for the usual suspects such as the aged and youth dependency ratios and income. It has a negative impact in India, where the bride's side has to pay substantial dowries to the groom's side at marriage, but a positive impact in Korea, where, as in China, the groom's side has to bear a disproportionate share of marriage-related expenses including purchasing a house or condominium for the newlywed couple. The findings of the paper imply that trends in the pre-marital sex ratio can explain trends in the household saving rate during the first half of the sample period but not during the second half in both countries and that the level of the pre-marital sex ratio can partly explain the high level of Korea's household saving rate but not the high level of India's household saving rate.

In sum, unbalanced pre-marital sex ratios combined with excessive and asymmetric marriage-related expenses have distorted the saving behavior of households in both countries. Du and Wei (2013) conduct a welfare analysis using numerical calibration methods and show that, in China, the welfare of males decreases while that of females increases and that social welfare (the sum of the welfare of all males and all females) decreases as the sex ratio increases. Thus, the welfare of males as well as social welfare could be increased by bringing the sex ratio back into balance in Korea, where marriage customs are similar to those in China, and conversely in India, where marriage customs are the opposite of those in China.

Another policy implication relates to saving-investment imbalances and current account imbalances. Wei and Zhang (2011a) and Du and Wei (2013) show that more than half of the increase in China's household saving rate was due to the sharp increase in the pre-marital sex ratio and that about half of China's current account surplus was due to her unbalanced sex ratio. Similarly, saving distortions caused by unbalanced sex ratios may very well affect saving-investment imbalances and current account imbalances in India

and Korea as well.

A related policy implication of our results relate to the so-called worldwide saving glut. Our results imply that the imbalanced sex ratios in India and Korea are causing India's household saving rate to be lower than it would be otherwise and Korea's household saving rate to be higher than it would be otherwise. Thus, the net impact of imbalanced sex ratios on worldwide saving is ambiguous.

Turning finally to how to reduce or eliminate the distortions in household saving behavior caused by unbalanced pre-marital sex ratios in the first place, there are at least 3 possible ways: (1) to eliminate son (or daughter) preference, (2) to relax or abolish population control measures, and (3) to reduce excessive and asymmetric marriage-related expenses.

There is a long tradition of son preference in Asian societies because the eldest son traditionally carries on the family line or the family business and it is therefore not easy to weaken this long-held tradition. However, Das Gupta, et al. (2009) argues that Korea did precisely that through direct policy measures although Hvistendahl (2011) disputes this claim (see Golley and Tyers (2014)), and weakening son preference is a potentially effective way of eliminating the distortions in household saving behavior caused by unbalanced sex ratios.

Turning to population control measures, they have been implemented in many developing countries as a way of keeping population growth down and raising living standards, but the most extreme example is the one-child policy in China (see Golley and Tyers (2012b) for an excellent overview of population control measures in China and India). Relaxing or abolishing population control measures would enable parents to have the desired number of children and, at the same time, eliminate the distortions in household saving behavior caused by unbalanced sex ratios, thereby enabling two birds to be killed with one stone. The Chinese government's relaxation of its one-child policy in rural areas and certain cities in the early 1980s (see Golley and Tyers (2012b)) and its sudden decision to abolish the one-child policy altogether starting in 2016 are examples of policies that weakened or abolished population control measures.

Finally, the marriage customs that led to excessive and asymmetric marriage-related expenses have a long tradition and hence would be hard to change, but abolishing such

customs would reduce the financial burden on parents of newlyweds and, at the same time, eliminate the distortions in household saving behavior caused by unbalanced sex ratios, thereby enabling two birds to be killed with one stone. India's efforts to prohibit dowries via legal means is one example of such a policy.

Moreover, policies to weaken son preference and policies to reduce excessive and asymmetric marriage-related expenses would also lead to greater gender equality, which in turn would lead to a decline in sex-selective abortions and infanticide and in the dowry-related harassment and even murder of women, and hence would be desirable for that reason as well.

Thus, policies to eliminate son (or daughter) preference, to relax or abolish population control measures, and to reduce excessive and asymmetric marriage-related expenses are highly desirable because they would not only eliminate the distortions in household saving behavior caused by unbalanced sex ratios but also because they would allow parents to have the optimal number of children, reduce the financial burden of marriage-related expenses, and achieve greater gender equality.

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Figure 1-1: Trends over Time in the Pre-Marital Sex Ratio in India
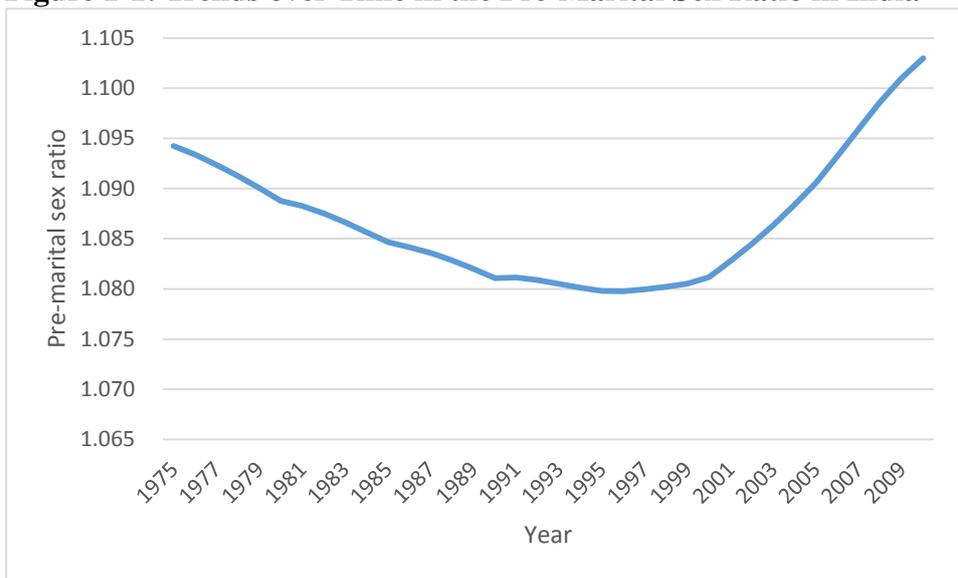
Figure 1-2: Trends over Time in the Pre-Marital Sex Ratio in Korea
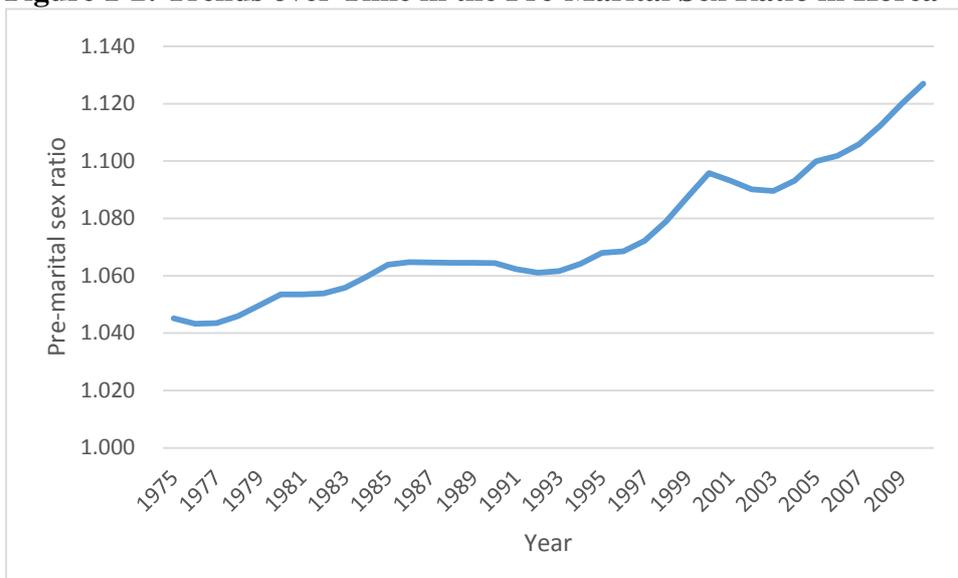
Notes: The pre-marital sex ratio is calculated as the ratio of males to females in the pre-marital cohort (defined as the 10-19 age group in the case of India and the 15-24 age group in the case of Korea). Refer to the main text for data sources.

Figure 2-1: Trends over Time in the Household Saving Rate in India
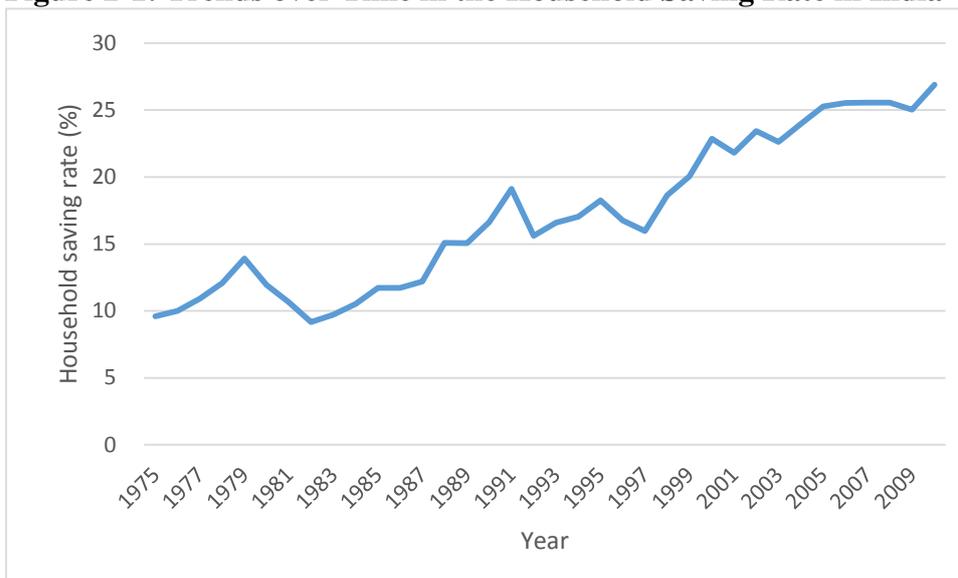
Figure 2-2: Trends over Time in the Household Saving Rate in Korea
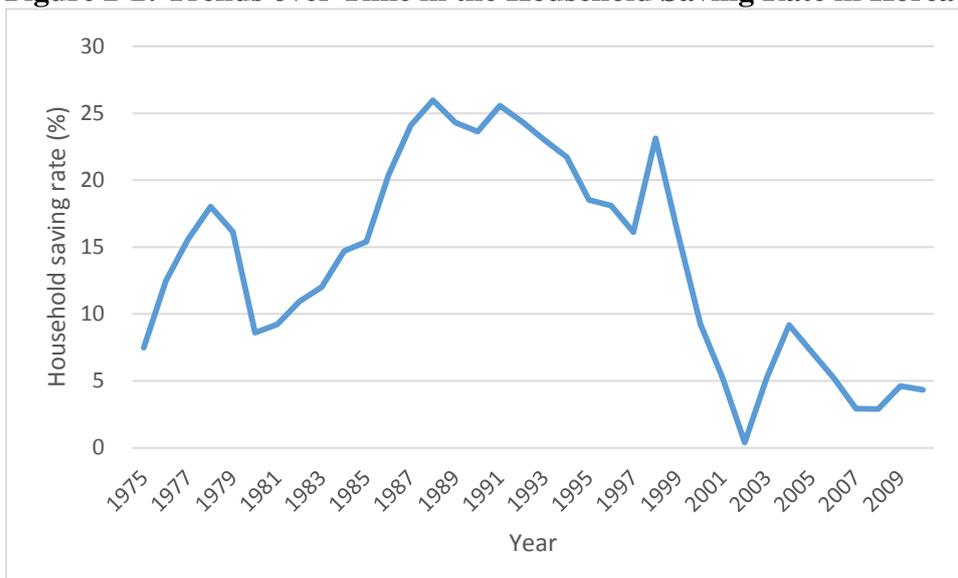
Note: The household saving rate is computed as the ratio of net household saving to net disposable household income (in percent). Refer to the main text for data sources.

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Table 1-1: Results of Engle-Granger and KPSS Cointegration Tests for India				
Specification	Type of test	Time period	Number of obs	Statistic
DEP, AGE, SEXRATIO, PCY	DF	1975-2010	35	-3.389**
	ADF(1)	1976-2010	34	-2.757*
	ADF(2)	1977-2010	33	-3.082**
	KPSS0	1975-2010	35	0.0846
	KPSS1	1976-2010	34	0.0581
	KPSS2	1977-2010	33	0.0476
DEP, AGE, SEXRATIO, PCY, CORPSAV	DF	1975-2010	35	-3.533**
	ADF(1)	1976-2010	34	-2.773*
	ADF(2)	1977-2010	33	-3.088**
	KPSS0	1975-2010	35	0.083
	KPSS1	1976-2010	34	0.0583
	KPSS2	1977-2010	33	0.048

Notes: This table shows the results of Engle-Granger and KPSS tests for cointegration for India. Refer to the main text for variable definitions, data sources, and details on these tests. *, **, and *** denote significance at the 10, 5, and 1 percent levels.

Table 1-2: Results of Engle-Granger and KPSS Cointegration Tests for Korea				
Specification	Type of test	Time period	Number of obs.	Statistic
DEP, AGE, SEX RATIO, PCY	DF	1976-2010	35	-2.933*
	ADF(1)	1977-2010	34	-3.130**
	ADF(2)	1978-2010	33	-2.522
	KPSS0	1976-2010	35	0.227
	KPSS1	1977-2010	34	0.143
	KPSS2	1978-2010	33	0.119
DEP, AGE, SEXRATIO, PCY, CORPSAV	DF	1976-2010	35	-3.498**
	ADF(1)	1977-2010	34	-3.569**
	ADF(2)	1978-2010	33	-3.340**
	KPSS0	1976-2010	35	0.156
	KPSS1	1977-2010	34	0.106
	KPSS2	1978-2010	33	0.094
DEP, AGE, PCY, SEXRATIO, POP1519	DF	1976-2010	35	0.094
	ADF(1)	1977-2010	34	-4.975***
	ADF(2)	1978-2010	33	-5.267***
	KPSS0	1976-2010	35	0.0382
	KPSS1	1977-2010	34	0.0291
	KPSS2	1978-2010	33	0.0306
DEP, AGE, SEXRATIO, PCY, POP1519, CORPSAV	DF	1976-2010	35	-3.938***
	ADF(1)	1977-2010	34	-5.368***
	ADF(2)	1978-2010	33	-4.595***
	KPSS0	1976-2010	35	0.0465
	KPSS1	1977-2010	34	0.0342
	KPSS2	1978-2010	33	0.0363

Notes: This table shows the results of Engle-Granger and KPSS tests for cointegration for Korea. Refer to the main text for variable definitions, data sources, and details on these tests. *, **, and *** denote significance at the 10, 5, and 1 percent levels.

Variable	Model 1		Model 2	
	Table 2-1: The Determinants of Household Saving in India			
DEP	-32.976	***	-10.949	***
	-8.11		-75.74	
AGE	-176.326	***	-147.382	***
	-6.71		-116.67	
SEXRATIO	-95.957	***	-12.868	***
	-11.06		-45.81	
PCY	500.234	***	164.063	***
	13.60		162.06	
CORPSAV			-1.621	***
			-72.92	
TREND	-29.307	***	-4.748	***
	-11.30		-61.91	
Constant	14394.880		-3622.178	
Sample period	1979-2010		1979-2010	
No. of obs.	32		32	

Notes: This table shows the cointegrating vector estimated using the Johansen method with 4 lags. The dependent variable is the household saving rate. Refer to the main text for variable definitions and data sources. *, **, and *** denote significance at the 10, 5, and 1 percent levels.

Variable	Model 1		Model 2		Model 3		Model 4	
Table 2-2: The Determinants of Household Saving in Korea								
DEP	-2.439	**	-5.552	***	-14.466	***	-5.532	***
	-2.16		-27.23		-72.44		-8.52	
AGE	8.396		27.697	***	71.753	***	20.347	***
	1.44		26.41		77.84		7.87	
SEXRATIO	3.705	***	8.740	***	27.575	***	5.728	***
	2.72		40.06		52.70		4.15	
PCY	50.533	***	117.770	***	255.900	***	111.328	***
	3.69		45.97		76.30		11.69	
CORPSAV			0.460	***			0.450	***
			15.26				3.28	
POP1519					-0.035	***	-0.033	***
					-18.33		-5.42	
TREND	-9.962	*	-28.600	***	-72.134	***	-24.900	***
	-1.89		-30.10		-74.12		-8.64	
Constant	-635.572		-1452.321		-3894.049		-923.198	
Sample period	1979-2010		1979-2010		1979-2010		1979-2010	
No. of obs.	32		32		32		32	

Notes: This table shows the cointegrating vector estimated using the Johansen method with 4 lags. The dependent variable is the household saving rate. Refer to the main text for variable definitions and data sources. *, **, and *** denote significance at the 10, 5, and 1 percent levels.

Chapter 2: The "Costs" of Informal Care: An Analysis of the Impact of Elderly Care on Caregivers' Subjective Well-being in Japan

Yoko Niimi

1. Introduction

The importance of informal elderly care has increasingly become recognized as population aging has rapidly progressed in recent decades. While informal elderly care is sometimes perceived as a cost-saving arrangement as it helps reduce the need for formal care, it is important to take into account the impact of caregiving on caregivers' life when assessing the costs and benefits of informal elderly care. Ignoring such effects might lead to an underestimation of the cost of relying on family members to provide care to the elderly.

There is indeed a growing literature that examines the impact of informal elderly care on caregivers' employment, physical and mental health, and social and marital life.[2] While subjective well-being, such as life satisfaction and happiness, has often been suggested as an important indicator to assess people's well-being in recent years (e.g., Layard, 2005; Stiglitz, Sen and Fitoussi, 2009), existing work on the effect of informal elderly care on caregivers' subjective well-being remains relatively limited.[3] Moreover, the literature provides inconclusive results and suggests heterogeneous effects depending, for example, on the gender of the caregiver, the relationship between the caregiver and the care recipient, and whether the caregiver lives with the care recipient (e.g., Hansen, Slagsvold and Ingebretsen, 2013; Van den Berg and Ferrer-i-Carbonell, 2007).

This paper aims to fill the gap in the literature and to contribute to broadening our understanding of the impact of informal elderly care on caregivers' subjective well-being. The paper focuses its analysis on the experience of Japan mainly for two reasons. First,

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[2] See Bauer and Spousa-Poza (2015) for a comprehensive survey of the literature on the impact of informal caregiving on caregivers' employment, health and family life.

[3] As commonly done in happiness studies, the three terms—subjective well-being, happiness, and life satisfaction—are used interchangeably in this paper.

in the case of Japan, while there have been a number of empirical studies that look at the effect of informal elderly care on, among others, caregivers' mental health and psychological well-being (e.g., Kumamoto, Arai and Zarit, 2006; Oshio 2014, 2015; Sugihara *et al.* 2004) and labor force participation (e.g., Kan and Kajitani, 2014; Sakai and Sato, 2007; Shimizutani, Suzuki and Noguchi, 2008; Sugawara and Nakamura, 2014), there has not been any previous work that analyzes the effect of providing elderly care on caregivers' happiness, to the best of the author's knowledge. It would be interesting to see whether or not previous findings obtained for other advanced economies hold in the case of Japan where filial obligation remains relatively strong and caring for elderly parents has therefore traditionally taken place within the family setting.

Second, while Japan's long-term care insurance (LTCI) system introduced in 2000 does not provide cash allowances for informal care, it covers the cost of services availed from the formal sector. As a result, a large demand for formal care services has been generated and new markets for various services, such as home care, day care, and short-stay care services, have emerged with the introduction of the LTCI system (Sugawara and Nakamura, 2014). This differentiates Japan from most other developed countries where permanent institutional care tends to be the major formal care option and/or market volumes are relatively limited even if markets for home care services exist (Sugawara and Nakamura, 2014). It would thus be interesting to examine whether the use of such formal care services can help mitigate or alleviate the adverse effect of informal elderly care on caregivers' subjective well-being by looking at the case of Japan. This is a valid question given that the negative effect of providing care to the elderly on caregivers' subjective well-being may increase the risk of the institutionalization of care recipients, which would have an important cost implication for the government.

The key hypotheses that this paper will test using data on Japan are as follows: (i) providing care to the elderly negatively affects caregivers' happiness; and (ii) the extent to which informal elderly care affects caregivers' happiness depends on, among others, the marital status of caregivers, the caregiver-care recipient relationship, and caregiving conditions. The latter includes living arrangements, the use of formal care services, and whether or not the caregiver has received any *inter vivos* transfers or financial support from his/her parents or parents-in-law. The results of such an analysis will provide a

useful dimension that policymakers should take into account as part of the assessment of the cost of informal elderly care. The findings will also shed light on what measures would be effective in sustaining the provision of informal elderly care without incurring an excessive burden on caregivers.

The rest of the paper is organized as follows. Section 2 provides an overview of elderly care in Japan. Section 3 reviews the literature on the impact of informal elderly care on caregivers' subjective well-being. Section 4 discusses the econometric methodology, the data, and the empirical variables used for the estimation. Estimation results are presented in Section 5. Section 6 summarizes the key findings and discusses some policy implications.

2. Background

Japan has experienced an unprecedented speed of population aging over the past few decades. The share of population aged 65 and above in Japan (9.9%) was the lowest among the then member countries of the Organisation for Economic Co-operation and Development (OECD) until as recently as 1984, but it had become the highest (20.2%) by 2005.[4] This share was estimated to be 26.8% in 2015 and is expected to reach 30% by 2024 (National Institute of Population and Social Security Research, 2012). Improvements in longevity as well as a significant decline in the fertility rate over the years contributed to this rapid population aging in Japan.

Japan has also observed significant changes in family structure over the past few decades. Among those aged 65 and above, the share of those living alone or only with their spouse increased from 28.1% to 55.4% between 1980 and 2014 (see Figure 1). In contrast, the share of those who live with their children (married and unmarried) decreased by more than 40% from 69.0% to 40.6% during the same period. Nakamura and Sugawara (2014), however, point out that the rate of parent-child co-residence has not changed significantly if we focus only on elderly people who have children. Rather, the observed decline in the parent-child co-residence rate is due mainly to an increase in

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[4] OECD data (https://data.oecd.org/pop/elderly-population.htm, accessed on September 24, 2015).

the number of the elderly who do not have any children. For instance, among elderly person households, the share of childless households (both childless couples and childless singles) rose from 7.9% in 2001 to 15.7% in 2010.[5] Together with rapid population aging as well as other social and economic changes (e.g., increased women's educational attainment and labor force participation), such changes in family structure are likely to reduce the availability of informal caregivers and impose a greater burden on a smaller number of caregivers per elderly person, posing significant challenges to Japan where elderly care has traditionally taken place within the family setting.

Figure 1. Changes in Family Structure among Those Aged 65 and Above
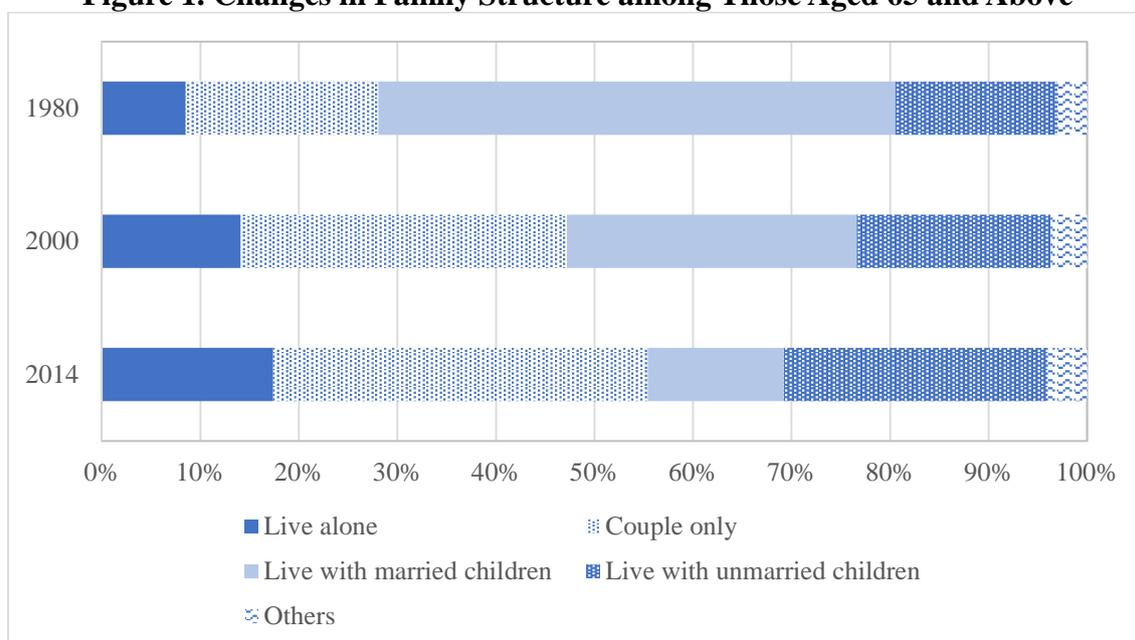
Source: An Overview of Comprehensive Survey of the Living Conditions of People on Health and Welfare (Ministry of Health, Labour and Welfare, http://www.mhlw.go.jp/toukei/list/20-21kekka.html, accessed on September 18, 2015).

Another interesting observation we can make from Figure 1 is that there has been a significant rise in the share of those aged 65 and above who live with their unmarried children (i.e., single, divorced, or widowed children) from 16.5% in 1980 to 26.8% in 2014. This trend contrasts strikingly with the declining trend in the share of the elderly

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[5] Nakamura and Sugawara (2014) argue that the main explanation for this rise in the number of aged population without any children in the 2000s is that there had been an increase in the number of married women who did not bear any children.

living with their married children during the same period. Identifying the causes of these contrasting trends of parent-child co-residence between married and unmarried children is beyond the scope of this paper. However, given this notable change in family structure in recent decades, we will take into account the marital status of caregivers when analyzing the impact of caregiving on caregivers' subjective well-being in the present study.

In response to rapid population aging and changes in family structure, Japan introduced a mandatory LTCI program in 2000 to cover the long-term care of the elderly, which had previously been provided partly through the health insurance system and partly through welfare measures for the elderly. Under the policy objective of the "Socialization of Care," this new program was designed to promote greater independence of the elderly in daily life and to reduce the burden of elderly care on family members. It has a number of key characteristics. First, everyone aged 40 or above is required to participate in the program and to pay insurance premiums.[6] Given its universal coverage, everyone aged 65 and above as well as those under 65 but with aging-related disabilities are entitled to receive necessary care services regardless of income level or the availability of family caregivers once they are certified as requiring support or long-term care.

Second, eligibility is thus needs-based, and applicants are evaluated through an objective procedure and assigned a care level based strictly on physical and mental disability.[7] Although the Japanese LTCI program largely followed the example of the German system, it does not provide cash allowances to the elderly to support informal caregivers, unlike the German system. It instead covers only the cost of services purchased from the formal sector. Based on a personal care plan provided by a professional care manager, care recipients can choose what services to receive and from

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[6] Although the Japanese LTCI system has largely followed the example of the German system, it incorporates Scandinavian-style community-based management, in which municipalities act as insurers. Based on the national government's guidelines, each municipality administers LTCI and sets insurance premiums for its residents (Tsutsui and Muramatsu, 2005, 2007).

[7] The computer aided standardized needs-assessment system categorizes people into seven levels of needs. The Care Needs Certification Board, a local committee consisting of health, medical, and welfare experts, then reviews this initial assessment and determines its appropriateness (Tsutsui and Muramatsu, 2005). There are currently two levels for those who require support only (Support Levels 1 and 2) and five levels for those who require long-term care (Care Levels 1-5). This support/care level determines the amount of benefits that each person is entitled to receive.

which provider to receive them subject to a 10% co-payment. Service providers are predominantly private, whether for profit or non-profit (Campbell, Ikegami and Gibson, 2010). The existence of such service markets differentiates Japan from many other developed countries in which permanent institutional care comprises the only major formal care sector or market volumes are limited even if formal markets exist for home care or day care services (Sugawara and Nakamura, 2014).

Since the launch of the LTCI system, the number of persons certified for long-term care increased by about 128% from 2.56 million in March 2001 to 5.84 million in March 2014.[8] Among those aged 65 and above, the share of those certified in the total number of persons insured increased from about 11.0% to 17.8% during this period. The monthly average number of long-term care service users grew even faster by about 162% from 1.84 million in Fiscal Year (FY) 2000 to 4.82 million in FY2013. Note that the majority (about 74.1% in FY2013 up from about 67.2% in FY2000) are users of home-based services while the shares of community-based service and facility service users are about 7.3% and 18.5%, respectively.[9]

In response to the popularity and wide acceptance of the LTCI system in Japan, there have been a number of empirical studies that examine the impact of the introduction of the LTCI system on the provision of informal elderly care in the country. Although the universal coverage of the LTCI system has replaced previous stigmatized means-tested long-term care services (Tsutsui and Muramatsu, 2005), some studies find that informal care by adult children continues to be the most common source of caregiving for elderly parents in Japan (Hanaoka and Norton, 2008; Long, Campbell and Nishimura, 2009). Hanaoka and Norton (2008), for instance, find that the presence of adult children acts as a substitute for formal long-term care and that such an effect is found to be strongest for uneducated unmarried daughters. Their results also suggest that the role of daughters-in-law in providing care to the elderly is becoming less important than that of unmarried children in Japan.

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[8] The data in this paragraph come from the "Status Report on the Long-Term Care Insurance Projects (Kaigo Hoken Jigyou Jyokyo Houkoku) (Fiscal Year 2013)", Ministry of Health, Labour and Welfare (http://www.mhlw.go.jp/topics/kaigo/toukei/joukyou.html, accessed on September 30, 2015).
[9] Those who availed themselves of different types of services are double counted here.

3. Literature Review

Informal elderly care has gained increasing attention from policymakers as well as researchers in recent years as population aging has progressed in many parts of the world, particularly in advanced economies. While the importance of informal elderly care provision by family members relative to formal care services varies across countries, family members form the backbone of long-term care systems in all OECD countries (OECD, 2013). It is estimated that across OECD countries, on average, over 15% of people aged 50 and above provided care for a dependent relative or friend in 2010 (OECD, 2013).

It may be tempting for governments to encourage informal care arrangements as it saves the direct costs of professional care services and/or can postpone more costly institutionalization, but these savings could be offset by such indirect costs as reduced employment, possible loss in human capital, and greater health care expenditures for caregivers (Bauer and Spousa-Poza, 2015). Policymakers therefore need to carefully weigh the intended benefits of informal care (e.g., reduced public costs and ensured elderly welfare) against other desirable outcomes, such as gender equality in work and domestic roles, public health, marital stability, and individual and family well-being (Hansen, Slagsvold and Ingebretsen, 2013). There have been an increasing number of empirical studies that analyze the impact of informal elderly care on caregivers' life, particularly on their psychological well-being, health conditions, and employment. The key findings of these studies include a negative, though relatively limited, link between care provision and employment, particularly among female co-residing caregivers; and a negative impact of caregiving on psychological health, especially among female and spousal caregivers, and on caregivers' physical health outcomes (Bauer and Spousa-Poza, 2015).[10]

In contrast, while subjective well-being, such as life satisfaction and happiness, has often been suggested as an important indicator to assess people's well-being in recent years (e.g., Layard, 2005; Stiglitz, Sen and Fitoussi, 2009), existing work on the effect of

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[10] See Bauer and Spousa-Poza (2015) for a comprehensive survey of the literature on the impact of informal caregiving on caregivers' employment, health and family.

informal elderly care on caregivers' subjective well-being remains relatively limited. Among the few studies that exist, Van den Berg and Ferrer-i-Carbonell (2007) suggest that by analyzing the impact of providing informal care and of income on caregivers' happiness level, it is possible to estimate the necessary income (i.e., compensating variation) to maintain the same happiness level of caregivers after they provide an additional hour of informal care. Based on data on Dutch informal caregivers, Van den Berg and Ferrer-i-Carbonell (2007) find that an extra hour of providing informal care is worth about 8 or 9 Euros if the care recipient is a family member and about 7 or 9 Euros if the care recipient is not a family member. They suggest that the reason for observing a greater loss of utility (i.e., happiness) when providing care to a family member than to a non-family member may be due to emotional involvement with the care recipient.

Bobinac *et al*. (2010) also look at the effect of informal caregiving on caregivers' happiness but examine the *family* effect more explicitly. They argue that informal care is usually provided by the care recipient's family or friends because of the social relationship between the care recipient and the caregiver, and as a result, both the *caregiving* effect and the *family* effect are observed in the case of informal caregivers. While the caregiving effect refers to the welfare effect of providing informal care, the family effect refers to the direct impact of the health status of a care recipient on others' well-being (Bobinac *et al*., 2010). Using data on Dutch informal caregivers, Bobinac *et al*. (2010) show that caregivers' happiness is positively associated with the care recipient's (positive) health conditions and negatively associated with the provision of caregiving, confirming the presence of both the caregiving and family effects.

Leigh (2010), on the other hand, finds that while there is a significant negative relationship between providing elderly care and life satisfaction in a cross-sectional specification, the coefficient on the dummy variable for elderly care provision becomes much smaller and insignificant with the inclusion of individual fixed effects based on a panel dataset from the Household, Income and Labour Dynamics in Australia (HILDA) survey for the 2001-2007 period. Van den Berg, Fiebig and Hall (2014) also emphasize the importance of accounting for individual fixed effects, though they find that providing informal care has a negative and significant effect on life satisfaction based on data from the first eleven waves (2001-2011) of the HILDA.

Hansen, Slagsvold and Ingebretsen (2013) distinguish among three categories of outcomes: *cognitive* well-being (life satisfaction, partnership satisfaction, and self-esteem), *affective* well-being (happiness, positive and negative affect, depression, and loneliness), and sense of mastery. Using Norwegian cross-sectional and panel data, they find that providing care to elderly parents is not related to these aspects of well-being, both in cross-section and longitudinally, with the one exception being that caring for a co-resident parent leads to lower affective well-being among women. This effect is particularly marked among un-partnered and less educated women (Hansen, Slagsvold and Ingebretsen, 2013). Given that their findings of non-significant associations between caregiving and well-being measures conflict with the findings from the existing literature based largely on data on the United States, Hansen, Slagsvold and Ingebretsen (2013) highlight the important role played by a country's social care systems in shaping the impact of caregiving on caregivers' well-being. They argue that in the case of the Nordic care regime, personal care (e.g., help with dressing, bathing, and eating) is mainly provided by public (or private) care service providers and the family usually plays only a complementary role, and as a result, informal care provision does not seem to jeopardize caregivers' self-esteem, mental health, or well-being.

This review of the existing literature highlights the inconclusive results with regard to the impact of caregiving on caregivers' subjective well-being. The literature also suggests heterogeneous effects depending, for example, on the gender of the caregiver, the relationship between the caregiver and the care recipient, and whether the caregiver lives with the care recipient. This paper will therefore test the hypotheses outlined in Section 1, namely: (i) providing care to the elderly negatively affects caregivers' subjective well-being, and (ii) the extent to which informal elderly care affects caregivers' subjective well-being depends on, among other things, the marital status of caregivers, the caregiver-care recipient relationship, and caregiving conditions such as living arrangements, the use of formal care services, and caregivers' receipt of *inter vivos* transfers or financial support from parents or parents-in-law.

4. Methodology and Data

4.1 Methodology

When analyzing the impact of informal elderly care on caregivers' subjective well-being, this paper focuses its analysis only on the case of caregivers who provide informal care to their elderly parents. Given that spouses constitute the main source of informal elderly care among married couples, it would have been ideal to also examine the case of spousal caregivers. Unfortunately, the data used for the empirical analysis contain only information on adult children's provision of parental care. Hence, the impact of informal care provision on the subjective well-being of spousal caregivers will be left for future research. On the other hand, given that there has been a significant increase in the number of elderly persons living with their unmarried children in Japan over the past few decades (see Figure 1), this paper will examine whether there is any difference in the impact of informal elderly care between married caregivers and unmarried caregivers by conducting regression analyses separately for married and unmarried individuals. We would expect the burden of informal elderly care to be greater on unmarried caregivers than on married caregivers, especially if they have children, because they do not have a spouse who can help with various responsibilities, including breadwinning, caregiving, childrearing, and housework.

In general terms, the models for unmarried individuals (equation (1)) and married individuals (equation (2)) are, respectively, as follows:

$$W_i = f(C_i, H_p, X_i) \tag{1}$$
$$W_i = f(C_i, CP_i, H_p, HP_{pp}, X_i) \tag{2}$$

where W_i is the individual's subjective well-being, which is assumed to be a function of care provision to his/her own parents (C_i), the health status of his/her parents (H_p), and a vector of demographic and socio-economic characteristics of the individual and his/her household (X_i). Following the work of Bobinac *et al*. (2010), the family effect on individual subjective well-being will be examined separately from the caregiving effect

by including a variable that captures the health status of parents. Additionally, in the case of married people, they may also provide care to their parents-in-law. To examine whether the caregiver-care recipient relationship influences the way informal caregiving affects caregivers' subjective well-being, the effect of providing care to parents-in-law will be estimated separately from the effect of providing care to own parents. Thus, married people's well-being will also be a function of care provision to their parents-in-law (CP_i) and the health status of their parents-in-law (HP_{pp}) in addition to the aforementioned factors. Note that the subscripts i, p and pp denote the individual, his/her parents, and his/her parents-in-law, respectively.

When estimating the above models, there are two key methodological issues that need to be considered. First, information on people's self-reported happiness is commonly reported as a 0-10 categorical ordered variable, and the data used for this paper are no exception. If we want to apply a linear regression analysis to estimate equations (1) and (2), we need to assume the cardinality of this variable. Although this is strictly not valid in the case of happiness data given its ordinal nature, the assumption of cardinality is often made in empirical studies. Ferrer-i-Carbonell and Frijters (2004), for instance, find that assuming the ordinality or cardinality of happiness scores makes little difference to the estimates of the determinants of happiness. Similar findings are also obtained by Frey and Stutzer (2000). These findings seem to be consistent with the view of Van Praag (1991), who shows that respondents tend to translate verbal evaluations to a numerical scale when answering subjective questions. Given that the ordinary least squares (OLS) and ordered logit regressions also generate very similar results in terms of the sign and significance level of the estimated coefficients in the present analysis, the cardinality of the happiness variable is assumed throughout this paper.[11]

Second, it is not clear *a priori* whether informal elderly care provision is endogenous in a model of subjective well-being. Although this does not seem to be addressed in the existing literature that looks at the impact of informal caregiving on caregivers' subjective well-being, it is possible that happier people are more likely to provide informal elderly

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[11] The OLS and ordered logit regressions were estimated separately for married and unmarried individuals and the results of the OLS and ordered logit regressions were similar in both cases. The regression results for the ordered logit models are available from the author upon request.

care than less happy people.[12] Ignoring reverse causality such as this would lead to biased and inconsistent estimates in the case of OLS estimation. It is therefore necessary to empirically test for the endogeneity of informal elderly care, and if it is found to be endogenous, we need to control for it. This can be done by estimating instrumental variables models, which produce consistent parameter estimates as long as valid instruments are available. This is a common approach taken in the related literature, including empirical studies examining the effect of informal care on caregivers' physical and mental health (e.g., Coe and Van Houtven, 2009; Do *et al.*, 2015; Van Houtven and Norton, 2004, 2008; Van Houtven, Wilson and Clipp, 2005) and those examining whether informal elderly care is a substitute or complement for formal care (e.g., Bolin, Lindgren and Lundborg, 2008; Bonsang, 2009; Charles and Sevak, 2005).

One complication we need to take into account in the current analysis is the fact that our potentially endogenous variable is binary. In such a case, instrumental variables estimation using standard two-stage least squares (2SLS) estimation would generate inconsistent estimates (e.g., Woodridge, 2002). Following Woodridge (Procedure 18.1 in Woodridge (2002, pp. 623-624)), the following three-stage procedure will therefore be used instead: (i) estimate a binary response model (in this case a probit model) of g on instruments and other control variables, (ii) compute the fitted probabilities $\hat{g}$, and (iii) estimate equations (1) and (2) by instrumental variables with 2SLS using $\hat{g}$ as instruments for caregiving. One nice feature of this procedure is that even though some regressors are generated in the first stage, the usual 2SLS standard errors and test statistics are asymptotically valid. In addition, this procedure has an important robustness property whereby it does not require the first-stage binary model to be correctly specified as long as instruments are correlated with the probability of the outcome variable (Woodridge, 2002).[13]

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[12] It is equally possible that those who find helping others fulfilling are more likely to decide to take care of their elderly parents than those who do not. We investigated this possible selection bias using information on whether or not respondents feel happy when they do something that would benefit/help others, which was contained in the survey data used for the empirical analysis. The t test results show that there is no significant difference in the tendency of providing care to elderly parents (or parents-in-law) between those people who find helping others fulfilling and those who do not. Similar test results were obtained for both the married and unmarried samples.

[13] An application of this procedure can be found, for example, in Adams, Almeida and Ferreira (2009).

4.2 Data

The empirical analysis will be based on data from the "Preference Parameters Study" of Osaka University. This survey was conducted annually in Japan during the 2003-2013 period by the 21st Century Center of Excellent (COE) Program "Behavioral Macrodynamics based on Surveys and Experiments" (2003-2008) and the Global COE Project "Human Behavior and Socioeconomic Dynamics" (2008-2013) of Osaka University. It was undertaken with the aim of examining whether the assumptions of conventional economics that people are rational and maximize utility are valid. The sample of individuals aged 20-69 was drawn to be nationally representative using two-stage stratified random sampling. The sample has a panel component although fresh observations were added in 2004, 2006 and 2009 to overcome the problem of attrition.

It would have been ideal to conduct a panel data analysis to take into account individual fixed effects, but unfortunately only the 2013 wave contains detailed information on parental care provision.[14] The empirical analysis is thus undertaken using only data from the 2013 wave in this paper. After excluding observations for which at least one variable included in the econometric analysis is missing, the 2013 wave contains 2,840 individuals, consisting of 2,376 married individuals and 464 unmarried (i.e., never married, divorced, or widowed) individuals.

In addition to basic information on respondents and their households such as household composition, consumption, income, and other socio-economic characteristics, this survey contains unique information on respondents including their subjective well-being (e.g., happiness, life satisfaction, and other emotional attributes) and their preference parameters, such as their degree of time preference, risk aversion, and altruism. In the case of the 2013 wave, the data also contain detailed information on respondents' provision of parental care. By exploiting this rich dataset, it is possible to examine the impact of informal elderly care on caregivers' subjective well-being while controlling for a set of factors that are thought to be relevant to people's happiness in the existing

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[14] Although the 2011 wave also collected information on parental care, the way the key question was asked was different between the 2011 and 2013 waves. It was therefore not possible to conduct a panel data analysis using these two datasets.

literature.

4.3 Empirical Specification

While the goal of the present study is to assess the impact of informal elderly care on caregivers' happiness, we also control for factors that have been found to be the key determinants of happiness, and as such, the empirical model is guided by existing work on happiness.[15] A detailed description of how the variables are constructed is provided in the Appendix.[16]

4.3.1 Dependent variable

The dependent variable is the level of the respondent's subjective well-being, measured in terms of self-reported happiness. The happiness data were collected in the survey by asking respondents how happy they currently feel on a simple visual analogue scale ranging from 0 (very unhappy) to 10 (very happy). As discussed above, we treat this variable as cardinal.

4.3.2 Explanatory variables

Parental care provision

The main variable of interest in this paper is a dummy variable capturing whether respondents provide care to their elderly parents. In order to examine whether the caregiver-care recipient relationship affects the direction and magnitude of the effect of informal elderly care on caregivers' subjective well-being, two separate variables, one for providing care to respondents' own parents and one for providing care to respondents'

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[15] See Frey and Stutzer (2002) and Clark, Frijters and Shields (2008) for a comprehensive survey of the literature on the determinants of the level of happiness.

[16] See Niimi (2015) for a more detailed description of the variables as it constructs similar variables to those used in the present study based on the 2013 wave of the Preference Parameters Study to examine the determinants of happiness inequality in Japan.

parents-in-law, are included in the regression for the married sample. As for the unmarried sample, only a dummy variable for taking care of their own parents is included.[17] Note that these dummy variables equal one if respondents take care of at least one parent and parent-in-law, respectively. We would expect providing care to the elderly to have a negative effect on caregivers' happiness. However, given that unmarried individuals are likely to receive less support from family members and perform more roles than married individuals, we would expect a greater negative effect of informal elderly care on unmarried caregivers than that on married caregivers.

Instruments for parental care provision

Given that parental care provision could be endogenous as discussed above, we will test for its exogeneity by estimating instrumental variables models. We will use respondents' perceived filial obligation norms as an instrument for providing care to own parents. In the Preference Parameter Study, respondents were asked whether they agree with the statement that children should take care of their parents when they require long-term care. Our filial obligation variable thus equals one if respondents strongly agree with such a statement and zero otherwise. Given that respondents' attitude toward filial obligation is likely to be reflected in how responsible they feel for their own parents (e.g., Ganong and Coleman, 2005; Gans and Silverstein, 2006), it is likely to affect their actual caregiving behavior. We would expect those individuals with a strong sense of filial obligation to have a greater tendency to provide parental care than those without. However, respondents' perceived filial obligation norms are unlikely to have a direct effect on the current level of respondents' happiness, though it might have an indirect effect through the channel of informal care provision.

As for providing care to respondents' parents-in-law, respondents' own sense of filial obligation may have less influence on the decision of whether or not to take care of their

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[17] Given that our married sample contains individuals who are divorced or widowed in addition to those who are never married, there might be some divorced or widowed respondents, particularly the latter, who provide care to their parents-in-law even though they are no longer with their spouse. Unfortunately, for divorced or widowed respondents, we do not have information on whether they provide care to their parents-in-law. We therefore need to assume in this paper that those who are no longer with their spouse do not provide care to their parents-in-law.

parents-in-law as their spouse may have more say in such a decision. We will therefore use the number of siblings-in-law instead as an instrument for providing care to parents-in-law. The existing literature (e.g., Van Houtven and Norton, 2004, 2008; Charles and Sevak, 2005) suggests that the number of siblings is a strong instrument for informal parental care provision. On the other hand, respondents' happiness level is unlikely to be affected by how many siblings their spouse has. Given that the number of siblings-in-law indicates the number of potential caregivers for parents-in-law, we would expect the number of siblings-in-law to be negatively associated with the probability of the respondent's care provision to his/her parents-in-law.

Health conditions of parents and parents-in-law

To examine family effects on caregivers' happiness following the work of Bobinac *et al*. (2010), we will take into account the health status of parents and parents-in-law. In the Preference Parameters Study, respondents were asked whether their parents and parents-in-law are certified as one of the seven Support/Care Levels under the LTCI system (see footnote 7). Given that this needs level is assigned based strictly on physical and mental disability, this information would be a good proxy for the health status of elderly parents. Using this information, we constructed a dummy variable that equals one if at least one parent is classified as one of the five Care Levels (the degree of disability is more severe than those who are classified as one of the two Support Levels). A similar variable is also constructed for parents-in-law. We would expect a negative relationship between these variables and respondents' happiness.

Caregiving conditions

Caregiving conditions might influence the way caregiving affects caregivers' happiness. To test this, we include two variables that indicate whether or not respondents live with their own parents and parents-in-law, respectively. In addition, we will examine whether the use of formal care services helps alleviate the negative effect of caregiving by including two variables that capture whether parents and parents-in-law avail

themselves of formal care services, respectively. We will interact these caregiving conditions variables with the care provision variables. It is not clear *a priori* whether co-residing with parents or parents-in-law has a positive or negative effect on respondents' happiness. However, we would expect a negative sign on the interaction term between the caregiving and co-residence variables as the literature suggests that taking care of co-residing parents tends to increase the burden on caregivers. As for the use of formal care services, whether it has a positive or negative effect on respondents' happiness is an empirical question. On one hand, the use of formal care services might have a positive effect on respondents' happiness as it frees them from providing informal elderly care or reduces the burden of informal elderly care. On the other hand, it could make respondents' feel guilty about not (fully) taking care of their parents or parents-in-law, thereby reducing their happiness. Given these reasons, the sign of the coefficient on the interaction term between the caregiving and formal care services usage variables is also ambiguous *a priori*.

We also control for whether or not respondents have received any *inter vivos* transfers or financial support from their parents or parents-in-law, respectively. Parents may provide *inter vivos* transfers or bequests to their children in exchange for old age support from them. This is sometimes called the "exchange motive" or (in the case of bequests) the "strategic bequest motive" in the literature (e.g., Bernheim, Shleifer and Summers, 1985; Horioka 2014). We would expect the receipt of *inter vivos* transfers or financial support from parents and parents-in-law to enhance respondents' happiness. To examine whether such transfers attenuate the negative effect of parental care provision on caregivers' subjective well-being, we will also include an interaction term between the *inter vivos* variables and the caregiving variables.

Respondents' and their households' basic characteristics

A set of individual characteristics capturing respondents' age, gender, educational attainment, health status as well as whether or not they have any children is included. Moreover, variables relating to information at the household level are included in the analysis, such as those capturing household size, annual household income, whether the

household owns a house or an apartment, and whether the household has any loans. We also include a variable that indicates what percentage change respondents' expect in their annual household income in that year in comparison with the previous year's household income. We would expect respondents' happiness to be positively correlated with household income and the expected change in future income.

Respondents' employment status and expected receipt of public pensions

Given that the happiness literature has extensively examined the effect of labor market status, especially unemployment, on happiness, we control for respondents' employment status in the estimation. In addition to controlling for whether respondents are unemployed, we also take into account the security of respondents' employment by including a variable indicating whether respondents have irregular employment as well as a variable indicating whether respondents perceive a high risk of becoming unemployed within the next two years.[18] We would expect both unemployment and job insecurity to reduce happiness. Furthermore, a variable that reflects the percentage of their living expenses that respondents expect to be covered by public pensions after retirement (or the actual percentage in the case of retired respondents) is also included in the regression. Greater insecurity about life after retirement is also expected to be negatively associated with happiness.

Referencing process

To control for the effect of the referencing process on happiness, we include two related variables. In the case of the Preference Parameters Study, respondents are asked whether they think other people's living standard is relatively high or low in comparison with their own living standard. We create a dummy variable that equals one if respondents think that other people's living standard is higher than their own, and another dummy

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[18] Irregular employees include those who are working as a part-time worker, temporary worker, fixed-term worker, or dispatched worker from a temporary agency. These irregular jobs tend to be low paid and insecure in comparison with regular (i.e., full-time) employment.

variable that equals one if respondents think that other people's living standard is lower than their own. These variables in effect capture the relative living standard of respondents.

Preference parameters

Given that utility is defined by preference parameters, it is possible that the level of individuals' happiness would also depend on their preference parameters, such as their degree of time preference, risk aversion, and altruism (Tsutsui, Ohtake and Ikeda, 2009). While it is a challenge to control for these unobserved time-invariant aspects of individuals, we constructed variables that can serve as their proxies using the best available data.[19] In the case of empirical studies that examine the determinants of happiness using cross-sectional data, the problem of endogeneity arising from unobserved heterogeneity can be an issue. This study is no exception, but we cannot undertake a panel data analysis due to the data limitation as explained above. Instead, this problem will be addressed in this paper by including these proxy variables that reflect respondents' preference parameters so that some of the heterogeneity can be controlled for to the extent possible.

In addition to the above explanatory variables, regional dummies as well as a dummy for residing in a major (ordinance-designated) city are included to control for geographical variation.

5. Empirical Results

5.1 Descriptive Statistics

Table 1 provides the key summary statistics for the two samples—married and unmarried individuals. To obtain an overview of the characteristics of caregivers, the

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[19] See Appendix for how these variables were constructed. Similar variables were used as proxies for risk aversion, time preference and altruism in the existing literature on the happiness of the Japanese (e.g., Ohtake, 2012; Tsutsui, Ohtake and Ikeda, 2009; Yamane, Yamane and Tsutsui, 2008)

same statistics are provided for caregivers and non-caregivers separately for each sample. Regarding the outcome of interest, we find that the happiness level of caregivers is slightly lower than that of non-caregivers, though the difference was not statistically significant in either the married or unmarried sample.

Table 1. Descriptive Statistics

	Married Caregiver Mean/S.D.		Married Non-caregiver Mean/S.D.		Unmarried Caregiver Mean/S.D.		Unmarried Non-caregiver Mean/S.D.	
Dependent variable								
Happiness	6.58	1.76	6.71	1.67	5.89	1.85	5.97	1.92
Explanatory variables								
Age	55.17	7.82	53.73	11.71	52.30	9.07	46.68	14.96
Age squared/100	31.05	8.50	30.23	12.60	28.15	9.35	24.02	14.47
Female	0.69		0.49		0.57		0.56	
Education								
Secondary school	4.35		7.86		0.00		8.67	
High school	43.48		48.80		54.05		45.43	
Junior college	22.98		16.03		21.62		14.75	
University or above	29.19		27.31		24.32		31.15	
Poor health	0.47		0.45		0.54		0.41	
Child	0.94		0.95		0.30		0.43	
Household size	3.87	1.36	3.62	1.33	2.81	1.27	2.71	1.52
Log of household income	6.39	0.57	6.32	0.59	5.86	0.65	6.01	0.74
Expected change in household income	-0.89	4.70	-0.66	3.89	-1.63	4.26	-0.42	3.95
Homeownership	0.96		0.89		0.84		0.78	
Has loans	0.48		0.49		0.27		0.35	
Employment								
Regular job	29.19		40.32		37.84		48.24	
Irregular job	35.40		30.97		27.03		30.68	
Not in labor force	32.92		27.90		18.92		16.39	
Unemployed	2.48		0.81		16.22		4.68	
Likely unemployed	0.09		0.07		0.08		0.11	
Public pensions	56.37	26.11	51.19	25.90	48.24	30.92	40.74	26.49
Relatively poor	36.65		32.64		48.65		49.88	
Relatively rich	13.04		12.37		13.51		10.54	
Care provision to parents	0.66		0.00		1.00		0.00	
Care provision to parents-in-law	0.42		0.00		-		-	
Poor health of parents	0.37		0.06		0.49		0.04	
Poor health of parents-in-law	0.24		0.06		-		-	
Living with parents	0.30		0.10		0.84		0.39	
Living with parents-in-law	0.25		0.08		-		-	
Use of formal care services (parents)	0.39		0.07		0.41		0.04	
Use of formal care services (parents-in-law)	0.27		0.08		-		-	
Receipt of inter vivos	0.16		0.20		0.32		0.17	

	Married Caregiver Mean/S.D.		Married Non-caregiver Mean/S.D.		Unmarried Caregiver Mean/S.D.		Unmarried Non-caregiver Mean/S.D.	
transfers from parents Receipt of inter vivos transfers from parents-in-law	0.09		0.11		-		-	
Altruistic	0.80		0.76		0.62		0.65	
Low time preference	0.37		0.38		0.27		0.37	
Risk averse	54.83	16.71	52.96	19.12	50.95	18.55	51.89	20.20
Instruments for care provision								
Strong filial obligation	0.11		0.09		0.16		0.09	
Number of siblings-in-law	1.78	1.21	1.96	1.36	-		-	
Regions								
Hokkaido	1.24		4.83		10.81		3.28	
Tohoku	8.70		5.87		8.11		5.39	
Kanto	26.71		29.62		35.14		31.62	
Koshinetsu	4.97		4.74		8.11		3.98	
Hokuriku	5.59		3.07		2.70		3.98	
Tokai	11.18		15.53		8.11		13.11	
Kinki	17.39		17.38		8.11		15.69	
Chugoku	6.21		5.06		2.70		7.49	
Shikoku	4.97		3.21		5.41		3.75	
Kyushu	13.04		10.70		10.81		11.71	
Major city	0.20		0.24		0.30		0.26	
Number of observations	161		2,215		37		427	

S.D. = standard deviation.
Source: Calculations based on data from the 2013 Preference Parameters Study.

Caregivers tend to be older and female, though we observe relatively more male caregivers in the unmarried sample. In the case of the married sample, the share of those who provide care to their own parents was about 58% whereas a full 85% of those who take care of their parents-in-law was female.[20] The relatively large share of female caregivers in the case of care provision to parents-in-law underscores the fact that daughters-in-law still play a relatively important role in elderly care in Japan.[21]

While most married individuals tend to have children regardless of whether or not

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[20] According to the estimation results from the probit model of caregiving behavior (the first stage of the IV estimation procedure as described in Section 4.1), being female has a positive and significant effect on the likelihood of providing care to parents-in-law, though it does not have a significant effect on the probability of providing care to own parents in either the married or unmarried sample. The estimation results are available from the author upon request.

[21] To examine whether daughters-in-law are adversely affected by the provision of care to parents-in-law, we tried including an interaction term between the caregiving variable (parents-in-law) and the female dummy variable, but the coefficient on the interaction term was statistically insignificant.

they provide care, unmarried caregivers are significantly less likely to have children than unmarried non-caregivers, as expected, given that raising a child by oneself might already be burdensome and single parents may therefore be less likely to take up the role of taking care of their elderly parents if they have a choice.[22]

Both married and unmarried caregivers are less likely to have a regular job than their counterparts. It is a matter of concern to observe that unmarried caregivers have the lowest level of household income, expect the largest decline in their household income in that year, and have the greatest tendency to be unemployed. We also observe that unmarried individuals expect to receive less public pensions relative to their living expenses after retirement and are more likely to feel relatively poor than married individuals, though the differences are not significantly different between caregivers and non-caregivers in each sample except for expectations about pensions in the married sample. These statistics suggest that unmarried individuals, particularly unmarried caregivers, appear to be more vulnerable to negative income shocks than married individuals.

On the other hand, married individuals tend to be more altruistic than unmarried individuals while unmarried caregivers tend to have a higher time preference (i.e., place more emphasis on their well-being today than in the future) than married individuals or unmarried non-caregivers. As expected, we find that caregivers' parents and parents-in-law tend to be less healthy and are more likely to use formal care services than non-caregivers' parents and parents-in-law. Consistent with Figure 1, unmarried individuals are more likely to live with their parents than married individuals, though caregivers are more likely to live with their parents than non-caregivers in both samples. It is interesting to find that unmarried caregivers have a higher tendency to have received *inter vivos* transfers or financial support from their parents than married people or unmarried non-caregivers.

As far as the instruments are concerned, caregivers tend to have a stronger sense of filial obligation than non-caregivers in both the married and unmarried samples, though such a tendency is found to be greater among unmarried individuals. Table 1 also shows

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[22] The estimation results from the probit model of the determinants of providing care to own parents (the first stage of the IV estimation procedure as described in Section 4.1) also indicate that having a child has a negative and significant effect on the probability of taking care of own parents among unmarried individuals. The estimation results are available from the author upon request.

that caregivers tend to have fewer siblings-in-law than non-caregivers, as expected, in the married sample.

5.2 Endogeneity of Caregiving Variables

We now turn to testing the endogeneity of the caregiving variables in the happiness model. Following the estimation procedure outlined in Section 4.1, we first estimated the first-stage binary model to obtain the fitted probabilities for providing elderly care separately for the married and unmarried samples.[23] We used respondents' view toward filial obligation as an instrument for providing care to own parents and the number of siblings-in-law as an instrument for providing care to parents-in-law, respectively. As expected, we find that having a strong sense of filial obligation is positively associated with the probability of providing care to own parents in both the married and unmarried samples and that the number of siblings-in-law is negatively correlated with the probability of providing care to parents-in-law. The coefficients on these identifying instruments are significant at the 1% or 5% levels in all cases.

We then estimated the first stage of the 2SLS using the fitted probabilities obtained from the probit model as instruments. Specification tests show that the instruments are strong predictors of each of the caregiving variables ($F(2, 2332) = 40.78$ for providing care to own parents and $F(2, 2336) = 33.27$ for providing care to parents-in-law in the married sample, and $F(1, 425) = 48.93$ for providing care to own parents in the unmarried sample). Note also that we can reject the null hypothesis of weak instruments using the test suggested by Stock and Yogo (2005) in all cases as the value of this test statistic for all equations exceeds the critical value indicating that a Wald test at the 5% level can have an actual rejection rate of at most 10%. Despite having valid instruments, the Durbin-Wu-Hausman test results showed that the null hypothesis of the exogeneity of the caregiving variables cannot be rejected in all cases. We will therefore treat our caregiving variables as exogenous in the happiness model and estimate OLS regressions to examine the impact of informal elderly care on caregivers' happiness.

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[23] Regression results of the instrumental variables models as well as the specification test results are available from the author upon request.

5.3 Main Results

Table 2 presents the OLS estimation results for the married sample ((1) and (2)) and for the unmarried sample ((3) and (4)), respectively. We will first look at the regression results for the married sample (models (1) and (2)). Contrary to expectation, we find that providing informal care to parents or parents-in-law does not have a significant effect on married caregivers' happiness regardless of whether they take care of their own parents or parents-in-law. We tried to see if the caregiving effect differs depending on caregiving conditions, such as living arrangements, the use of formal care services, and the receipt of *inter vivos* transfers from parents or parents-in-law by including the interaction terms between these variables and the caregiving variables, but the caregiving effects remained statistically insignificant (model (2)). The insignificant coefficients on the variables capturing the health status of parents and parents-in-law also indicate the absence of the family effect among married individuals. However, we find a negative and significant effect of parents' use of formal care services on respondents' happiness, which suggests that children may feel guilty about not taking care of their parents even though they require long-term care.

As for the rest of the regression results, we find a U-shaped relationship between happiness and age, as commonly found in the literature. Being female, having tertiary education, household income, the expected change in household income, the expected amount of public pensions to be received relative to living costs after retirement, and being altruistic have a positive effect on happiness. In contrast, household size, having loans, perceiving a high risk of becoming unemployed within the next two years, and being risk averse have a negative and significant effect on happiness. As far as the referencing process is concerned, feeling relatively poor decreases happiness while feeling relatively rich increases it (models (1) and (2)).

Table 2. OLS Regression Results

	Married				Unmarried			
	(1)		(2)		(3)		(4)	
Caregiving and family effects								
Care provision to parents	-0.038	[0.177]	0.136	[0.291]	0.294	[0.309]	-1.731***	[0.532]
Care provision to parents-in-law	0.012	[0.222]	-0.314	[0.359]				
Poor health of parents	0.023	[0.139]	0.029	[0.140]	-0.839**	[0.327]	-0.706**	[0.309]
Poor health of parents-in-law	-0.046	[0.155]	-0.052	[0.156]				
Caregiving conditions								
Living with parents	-0.216*	[0.116]	-0.162	[0.122]	-0.103	[0.222]	-0.208	[0.224]
Care provision to parents*living with parents			-0.445	[0.307]			1.528***	[0.554]
Use of formal care services (parents)	-0.242*	[0.125]	-0.269*	[0.139]	0.702*	[0.372]	0.254	[0.460]
Care provision to parents*use of formal care services (parents)			0.094	[0.327]			1.278**	[0.563]
Receipt of inter vivos transfers from parents	-0.064	[0.087]	-0.054	[0.088]	0.090	[0.214]	-0.076	[0.231]
Care provision to parents*receipt of inter vivos transfers from parents			-0.123	[0.388]			1.306**	[0.522]
Living with parents-in-law	-0.022	[0.126]	-0.073	[0.129]				
Care provision to parents*living with parents-in-law			0.565	[0.416]				
Use of formal care services (parents-in-law)	-0.041	[0.136]	-0.039	[0.140]				
Care provision to parents-in-law*use of formal care services (parents-in-law)			-0.025	[0.424]				
Receipt of inter vivos transfers from parents-in-law	0.038	[0.104]	0.023	[0.106]				
Care provision to parents–in-law*receipt of inter vivos transfers from parents-in-law			0.226	[0.500]				
Basic characteristics								
Age	-0.094***	[0.027]	-0.094***	[0.028]	-0.057	[0.043]	-0.053	[0.043]
Age squared	0.075***	[0.026]	0.076***	[0.026]	0.053	[0.044]	0.049	[0.044]
Female	0.247***	[0.083]	0.246***	[0.084]	0.702***	[0.195]	0.681***	[0.195]
Education (Secondary school)								

	Married				Unmarried			
	(1)		(2)		(3)		(4)	
High school	0.119	[0.140]	0.122	[0.140]	-0.304	[0.336]	-0.235	[0.337]
Junior college	0.163	[0.162]	0.175	[0.162]	-0.014	[0.404]	0.058	[0.409]
University or above	0.419***	[0.151]	0.426***	[0.151]	-0.104	[0.369]	-0.066	[0.370]
Poor health	-0.108	[0.070]	-0.108	[0.070]	-0.262	[0.177]	-0.294*	[0.176]
Child	0.061	[0.141]	0.062	[0.141]	0.228	[0.228]	0.199	[0.227]
Household size	-0.097***	[0.034]	-0.097***	[0.034]	-0.011	[0.065]	-0.018	[0.065]
Log of household income	0.424***	[0.072]	0.420***	[0.072]	0.290*	[0.149]	0.328**	[0.145]
Expected change in household income	0.031***	[0.008]	0.031***	[0.008]	0.053**	[0.023]	0.050**	[0.023]
Homeownership	0.173	[0.123]	0.172	[0.123]	0.306	[0.236]	0.289	[0.235]
Has loans	-0.247***	[0.075]	-0.247***	[0.075]	-0.512***	[0.180]	-0.531***	[0.180]
Employment (Regular job)								
Irregular job	-0.014	[0.091]	-0.010	[0.091]	-0.329	[0.220]	-0.295	[0.221]
Not in labor force	0.040	[0.109]	0.039	[0.110]	-0.262	[0.254]	-0.174	[0.253]
Unemployed	0.056	[0.442]	0.035	[0.439]	-1.087***	[0.387]	-1.132***	[0.373]
Likely unemployed	-0.230*	[0.137]	-0.233*	[0.138]	-0.889***	[0.333]	-0.836**	[0.333]
Public pensions	0.006***	[0.001]	0.006***	[0.001]	1.85E-04	[0.003]	-2.97E-04	[0.003]
Relatively poor	-0.610***	[0.077]	-0.611***	[0.077]	-0.638***	[0.184]	-0.617***	[0.180]
Relatively rich	0.232**	[0.102]	0.227**	[0.103]	0.241	[0.286]	0.211	[0.284]
Altruistic	0.149*	[0.076]	0.147*	[0.076]	0.166	[0.183]	0.172	[0.181]
Low time preference	0.019	[0.066]	0.025	[0.067]	-0.105	[0.177]	-0.096	[0.178]
Risk averse	-0.004**	[0.002]	-0.004**	[0.002]	0.003	[0.004]	0.004	[0.004]
Major city	0.087	[0.080]	0.088	[0.080]	0.074	[0.188]	0.055	[0.187]
Constant	6.879***	[0.753]	6.915***	[0.756]	5.441***	[1.403]	5.185***	[1.383]
No. of observations	2,376		2,376		464		464	
R^2	0.143		0.145		0.289		0.305	

Note: ***, **, * denote statistical significance at the 1%, 5% and 10% levels. Robust standard errors are in parentheses. Regional dummies are included in all regressions.

Source: Estimation based on data from the 2013 Preference Parameters Study.

Turning to the regression results for the unmarried sample, we find the presence of both the caregiving and family effects in this case. Note that the coefficient on the caregiving variable becomes negative and significant once we interact the caregiving variable with various caregiving conditions variables (model (4)). According to this set of results, we find that having unhealthy parents decreases the happiness level of unmarried individuals by about 0.7. We also find that the provision of parental care reduces the happiness level of unmarried caregivers by about 1.7. The fact that the negative effect of informal caregiving is greater than that of unemployment (about 1.1) or any other factors indicates the nontrivial impact of parental care provision on caregivers' subjective well-being. Similar findings are obtained by Oshio (2014) whose analysis also shows that parental care provision is the most stressful life event for middle-aged adults in Japan.

On the other hand, the regression results suggest that the magnitude of the negative effect of parental care provision varies according to various caregiving conditions. For instance, we find that co-residing with parents reduces the negative effect of parental care provision on unmarried caregivers' happiness by about 1.5. Unmarried individuals may have more trouble juggling all of their responsibilities in their daily life than their married counterparts, especially if they have children, and as a result, having to take care of their co-residing parents, which does not incur any additional time and energy of commuting to their parents' house, might be less stressful for unmarried caregivers. It is encouraging to find that the use of formal care services attenuates the adverse effect of parental care provision on unmarried caregivers' happiness by about 1.3. Furthermore, the regression results indicate that the receipt of *inter vivos* transfers or financial support from parents also helps reduce the burden on unmarried caregivers. This seems to support the "exchange motive" or the "strategic bequest motive" in household bequest behavior (e.g., Bernheim, Shleifer and Summers, 1985; Horioka 2014).

The rest of the results show that being female, household income, and the expected change in household income positively affect happiness. In contrast, having loans, being unemployed, perceiving a high risk of becoming unemployed within the next two years, and feeling relatively poor are negatively correlated with happiness (models (3) and (4)). We also find that having loans, being unemployed and fearing a high risk of becoming

unemployed in the near future have a larger and more highly significant effect on happiness for unmarried individuals than for married counterparts. This seems to underscore the fact that unmarried individuals are more vulnerable to negative income shocks than their married counterparts.

In sum, this paper finds key differences in the impact of informal parental care on caregivers' happiness between married and unmarried caregivers. While an insignificant effect was found for married caregivers, a negative and significant effect was found for unmarried counterparts. The greater burden of informal parental care on unmarried children than married children is consistent with the findings of the previous literature (e.g., Hansen, Slagsvold and Ingebretsen, 2013). However, the negative effect of caregiving was found to be attenuated if unmarried caregivers reside with their parents, make use of formal care services, or/and have received any *inter vivos* transfers or financial support from their parents in the present analysis.

Primary responsibility for parental care used to be borne by daughters-in-law in many East Asian countries, and particular attention tended to be paid to daughters-in-law by researchers when analyzing the impact of informal elderly care on caregivers' life (e.g., Do *et al*., 2015; Sugawara and Nakamura, 2014). However, such traditional norms have been changing in Japan in recent years (e.g., Tsutsui, Muramatsu and Higashino, 2014), and indeed, Hanaoka and Norton (2008) find that the role of daughters-in-law in parental care is becoming less important than that of unmarried children. The findings of this study adds another dimension to these existing studies in that an adverse effect of informal parental care is found only on the subjective well-being of unmarried caregivers and not on that of married caregivers. Such findings call for more attention to be paid to unmarried caregivers, especially if we take into account the fact that unmarried caregivers may have more difficulty juggling all of their responsibilities in their daily life with less support from family members and tend to be more vulnerable to negative income shocks than married caregivers. Unmarried caregivers could therefore be regarded as a potential risk group as their subjective as well as economic well-being face a greater risk of deterioration as a result of parental care provision.

6. Conclusions

This paper has made an attempt to examine the impact of informal elderly care on caregivers' happiness in Japan as part of the assessment of the "cost" of informal elderly care as family members form the backbone of long-term care systems in many parts of the world including Japan. The empirical results of this paper show that while no significant effect of providing parental care on married caregivers' happiness was detected, an adverse and significant effect was found on unmarried caregivers' happiness. However, the negative caregiving effect was found to be alleviated if unmarried caregivers reside with their parents and/or have received any *inter vivos* transfers or financial support from their parents. We also tried to see whether the use of formal care services may alleviate the negative effect of parental care provision. We found that the use of formal care services helps reduce the negative effect of caregiving on unmarried caregivers' happiness, though we did not detect such effects in the case of the married sample.

The current research is though not without limitations. First, although some unique variables capturing respondents' preference parameters were used to control for some of the time-invariant characteristics of individuals, it would have been preferable to conduct a panel data analysis that takes into account individual fixed effects if such data had been available. Second, as mentioned earlier, it would be of interest to examine the impact of informal elderly care on the well-being of spousal caregivers as they are often the primary caregiver in the case of married couples. Unfortunately, data limitations did not allow the current research to examine the case of spouses. Finally, the data used for the empirical analysis did not collect information on the intensity or duration of parental care provision. Such aspects of caregiving are likely to influence the extent to which informal elderly care affects the well-being of caregivers. This is also left as one of the key agendas for future research.

Despite the above limitations, this research has generated some key findings that have important policy implications. The fact that caring for elderly parents is found to have a negative effect on the subjective well-being of unmarried caregivers sheds light on the important role that formal care services could play in reducing the burden on caregivers,

particularly unmarried caregivers who presumably receive less support, both emotional and physical support, from family members. It is encouraging to find that the use of formal care services alleviates the negative impact of parental care provision on unmarried caregivers' subjective well-being.

Reducing the burden of informal elderly care on caregivers should be a critical agenda for the government as the increased burden on caregivers is likely to lead to the more costly institutionalization of care recipients (Kurasawa *et al.*, 2012). Moreover, given that unmarried people are more likely to play a greater number of roles in their daily life, especially if they have children, and to face greater economic insecurity than their married counterparts, more support to facilitate informal care should be provided, for example, through such initiatives as flexible working arrangements, paid and unpaid leave, and respite care, to make informal elderly care more manageable and sustainable even when caregivers have other responsibilities.

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Appendix: Description of Variables

Variables	Description
Age	Age expressed in years
Age squared	Age squared divided by 100
Female	Dummy variable that equals one if respondents are female
Education	
Secondary school	Dummy variable that equals one if respondents have completed secondary school education or lower
High school	Dummy variable that equals one if respondents have completed high school education
Junior college	Dummy variable that equals one if respondents have completed junior college education
University	Dummy variable that equals one if respondents have obtained a university degree or higher
Poor health	Dummy variable that equals one if respondents are receiving treatment at a hospital or a clinic for a chronic disease or injury
Child	Dummy variable that equals one if respondents have a child/children
Household size	Total number of household members
Household income	Log of annual household income in thousands of yen
	Since the choices of the answers to the question on annual household income were in bracket form, a continuous variable was created by assigning the following values to each answer:
	(1) Less than 1 million yen: 800,000 yen
	(2) 1 million to less than 2 million yen: 1.5 million yen
	(3) 2 million to less than 4 million yen: 3 million yen
	(4) 4 million to less than 6 million yen: 5 million yen
	(5) 6 million to less than 8 million yen: 7 million yen
	(6) 8 million to less than 10 million yen: 9 million yen
	(7) 10 million to less than 12 million yen: 11 million yen
	(8) 12 million to less than 14 million yen: 13 million yen
	(9) 14 million to less than 16 million yen: 15 million yen
	(10) 16 million to less than 18 million yen: 17 million yen
	(11) 18 million to less than 20 million yen: 19 million yen
	(12) 20 million yen or over: 25 million yen
Expected change in household income in that year	Percentage change respondents expect in the current year's household income in comparison with that of the previous year.
	Since the choices of the answers to the question on the expected change in household income were in bracket form, a continuous variable was created by assigning the following values to each answer:
	(1) 9% or greater decline: -11.25%
	(2) 7% or greater but less than 9% decline: -8%
	(3) 5% or greater but less than 7% decline: -6%
	(4) 3% or greater but less than 5% decline: -4%
	(5) 1% or greater but less than 3% decline: -2%
	(6) Less than 1% decline or less than 1% increase: 0%
	(7) 1% or greater but less than 3% increase: 2%
	(8) 3% or greater but less than 5% increase: 4%
	(9) 5% or greater but less than 7% increase: 6%
	(10) 7% or greater but less than 9% increase: 8%
	(11) 9% or greater increase: 11.25%
Homeownership	Dummy variable that equals one if respondents own a house or an apartment
Has loans	Dummy variable that equals one if respondents have any loans
Employment	
Regular job	Dummy variable that equals one if respondents have a regular job (i.e., working as a full-time employee)

Variables	Description
Irregular job	Dummy variable equals one if respondents have an irregular job (i.e., working as a part-time worker, temporary worker, fixed-term worker, or dispatched worker from a temporary agency)
Unemployed	Dummy variable that equals one if respondents are unemployed
Not in labor force	Dummy variable that equals one if respondents are not in the labor force (i.e., housewives/husbands, students or retired)
Likely unemployed	Dummy variable that equals one if respondents are currently employed but perceive a high risk of becoming unemployed in the next two years
Public pensions	Percentage of living expenses expected to be covered by public pensions after retirement (or actual percentage if respondents are already retired) Since the choices of the answers to the question about what percentage of their living costs respondents expect public pensions to cover after retirement were in bracket form, a continuous variable was created by assigning the following values to each answer: (1) Between 0 and 9%: 5% (2) Between 10 and 19%: 15% (3) Between 20 and 29%: 25% (4) Between 30 and 39%: 35% (5) Between 40 and 49%: 45% (6) Between 50 and 59%: 55% (7) Between 60 and 60%: 65% (8) Between 70 and 79%: 75% (9) Between 80 and 80%: 85% (10) 90% or over: 95%
Altruistic	Dummy variable that equals one if respondents have donated any money in the previous year
Risk averse	The figure (%) obtained after subtracting from 100% the chance of rain (%) that will make respondents bring an umbrella with them
Low time preference	Dummy variable that equals one if respondents used to get homework done right away or fairly early during school vacations when they were a child
Relatively poor	Dummy variable that equals one if respondents think that the living standard of others is much higher or somewhat higher than their own
Relatively rich	Dummy variable that equals one if respondents think that the living standard of others is much lower or somewhat lower than their own
Care provision to parents	Dummy variable that equals one if respondents care for their parent(s)
Care provision to parents-in-law	Dummy variable that equals one if respondents care for their parent(s)-in-law
Poor health of parents	Dummy variable that equals one if respondents' father or mother is certified as one of the Care Levels 1-5 under the long-term insurance system
Poor health of parents-in-law	Dummy variable that equals one if respondents' father-in-law or mother-in-law is certified as one of the Care Levels 1-5 under the long-term insurance system
Living with parents	Dummy variable that equals one if respondents live with their parent(s)
Living with parents-in-law	Dummy variable that equals one if respondents live with their parent(s)-in-law
Use of formal services (parents)	Dummy variable that equals one if respondents' parents avail themselves of formal care services (home helpers or institutions)
Use of formal services (parents-in-law)	Dummy variable that equals one if respondents' parents-in-law avail themselves of formal care services (home helpers or institutions)
Receipt of inter vivos transfers from parents	Dummy variable that equals one if respondents have received any *inter vivos* transfers or financial support with a total value of 5 million yen or more from their parents

Variables	Description
Receipt of inter vivos transfers from parents-in-law	Dummy variable that equals one if respondents have received any *inter vivos* transfers or financial support with a total value of 5 million yen or more from their parents-in-law
Number of sisters	Number of sisters
Number of brothers	Number of brothers
Number of sisters-in-law	Number of respondents' spouse's sisters
Number of brothers-in-law	Number of respondents' spouse's brothers
Strong filial obligation	Dummy variable that equals one if respondents strongly agree with the statement that children should take care of their parents when they require long-term care
Regions	
Hokkaido	Dummy variable that equals one if respondents reside in Hokkaido
Tohoku	Dummy variable that equals one if respondents reside in Tohoku
Kanto	Dummy variable that equals one if respondents reside in Kanto
Koshinetsu	Dummy variable that equals one if respondents reside in Koshinetsu
Hokuriku	Dummy variable that equals one if respondents reside in Hokuriku
Tokai	Dummy variable that equals one if respondents reside in Tokai
Kinki	Dummy variable that equals one if respondents reside in Kinki
Chugoku	Dummy variable that equals one if respondents reside in Chugoku
Shikoku	Dummy variable that equals one if respondents reside in Shikoku
Kyushu	Dummy variable that equals one if respondents reside in Kyushu
Major city	Dummy variable that equals one if respondents reside in a major (ordinance-designated) city

Note: Given that the questions on respondents' educational attainment as well as the number of siblings and siblings-in-law were not included in the 2013 survey, we obtained the relevant information from the 2011 survey data using respondents' unique ID numbers.

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