



BACKGROUND PAPER

Analyzing the Sources of Households Old-Age Self-Dependency and Overall Financial Wellness in Four Major Asian Countries and the United States

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Analyzing the Sources of Households Old-Age Self-Dependency and Overall Financial Wellness in Four Major Asian Countries and the United States

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This analysis uses data or information from the United States' Health and Retirement Study (HRS), the Japan's Study of Aging and Retirement (JSTAR), the Republic of Korea's Longitudinal Study of Aging (KLoSA), the Republic of China's Health and Retirement Longitudinal Study (CHARLS), and the Longitudinal Aging Study in India (LASI). We would like to thank Yuchong Han for his excellent research assistance.

Note: In this report, "\$" refers to United States dollars.

I. INTRODUCTION

In this study, we develop several alternative measures of the preparedness of near-retirement individuals to support their old-age financial needs in five economies: the United States (US), Japan, and the Republic of Korea (ROK) representing developed economies, and the People's Republic of China (PRC), and India representing two fast-growing developing economies. These measures incorporate incomes from four major sources of financial support during the retirement phase: (i) intra-family income transfers to old parents from mainly adult children, which we consider "self-insurance"; (ii) families' own contribution to the accumulated total portfolio of self-managed financial and real assets, which we equate to "self-protection"; (iii) retirement financial benefits acquired through enrollment in private pension plans, which we consider "market insurance"; and (iv) retirement benefits acquired via enrollment in public pension and health programs, which we consider "public insurance." Following the terminology in Ehrlich and Becker (1972), these terms are used as a guidance for identifying the major channels through which both households and the government attempt to pursue financial preparedness and financial wellness at old age.

We begin with estimating each of these four components of the postretirement income and compute the total resource available in present value terms at the start of retirement over the expected retirement life. The larger the resource, the better is the household level of its financial preparedness for old age. It can be used to compare the level of households' financial self-preparedness across different countries, assuming that there is a common desired level of income or consumption during retirement life. The share of the private contributions to the total financial resources that is available at retirement, as summarized in items (i) through (iii), indicates the extent to which households can support all of their old age welfare-contributing objects, including own consumption spending, as well as spending on altruistic objectives including bequest to offspring, through their own means, i.e., without public pensions, or "social security" income. We call this share the "self-dependency ratio" (SDR); one minus this ratio is then defined as "public-dependency ratio", which is the share of public pension in the total available resource (TAR) for old age support. It should be noted at the outset that a high SDR, while suggesting that households are more self-reliant for old age support, may also indicate a low underfunded public pension system.

To measure preparedness against some more specific benchmarks, we develop a consumption-based preparedness measure. At the individual level, the index indicates if postretirement incomes from the four sources are adequate to maintain the preretirement per capita consumption spending throughout the expected retirement life. The retirement life is defined as the difference in years between country- and age-specific life expectancy and the retirement age. The country-specific preparedness index is then defined as the percent of the sample's individuals who are deemed to have adequate income to maintain their level of preretirement consumption throughout the retirement period. This consumption-protection measure is individual-specific because it is defined relative to the actual level of consumption prior to retirement, so that the measure also indicates whether there is any worsening in the individual's

consumption spending over the retirement period. We call this measure “personal consumption protection index”. At the aggregate level, we record this consumption protection index as “the percent of individuals with adequate postretirement incomes” to maintain their preretirement per capita consumption spending throughout the retirement phase of their lives, on the assumption that there is no change in public pension policy and individual saving or investment strategies.

To construct these alternative measures, we use the harmonized Health and Retirement Study (HRS)-type of data we analyzed in the two other studies of our total project on old-age preparedness of four Asian economies: two developed economies of Japan and the ROK, and two fast-growing developing economies of the PRC and India as well as the US. We include the US in this analysis to assess how the four Asian economies’ self- and public-financial preparedness, as well as individual consumption-protection measures, stack against the most developed economy in the world.

Although there is a large body of literature on economics of aging, studies on old-age financial preparedness or readiness for retirement are relatively sparse with most appearing in publications outside the field of economics. Generally, existing studies focus on the concept and measurement of replacement ratios, by which is meant how much income individuals entering their retirement phase will need to maintain their preretirement lifestyle. The ratio most commonly cited is 70%–85% of preretirement income. For example, in Disney and Johnson (2001), the replacement rate is the pension income as a share of preretirement income, which measures the adequacy of pension for old-age support. They use this index to compare the pension adequacy across Organisation for Economic Co-operation and Development (OECD) countries. However, pension is only one of the four potential sources of income for old-age support, as we noted earlier. Other studies, such as Munnell et al. (2006), include annuitized wealth and retirement income in addition to pension income in constructing the income-based replacement rate. Chybalski and Marcinkiewicz (2015) argue that the income-based replacement rate may not be a good indicator of how well one can maintain a specific consumption level. To account for the consumption dimension of old-age support, a targeted replacement rate is usually defined relative to a specific predetermined consumption level and is used as the benchmark to gauge the preparedness for old age consumption need. Specifically, the preparedness status is computed by determining if one’s replacement ratio is greater than the targeted replacement rate.

However, there is no consensus in the literature about the level of the targeted replacement rate. Biggs and Springstead (2008) note that a common rule of thumb figure is 70%, while Greninger et al. (2000) report that four-fifths of financial planners and educators consider a replacement rate of 70%–89% as appropriate. Aon Consulting and Georgia State University (2004) recommend an average replacement rate of about 75% of final earnings. Biggs and Springstead (2008) also point out that, despite the fact that the concept of replacement ratio is widely used, there is no common agreement of how to measure the replacement rates—what is to be included in the numerator and denominator ratio may lead to very different measures.

The Mandatory Fund Scheme Authority (2010) develops targeted replacement rates based on the material needs of pensioners, which reflect the income needed to maintain the same standard of living as during the preretirement years. They also develop a targeted rate based on the expected expenses of pensioners during retirement. Along a similar line, Mutchler et al. (2015) develop the so-called Elder Economic Security Standard Index. This index is based mainly on the expenditure associated with necessities for old-aged people. If the retirement income, including both social security income and wealth-based income, is more than the expenditure for necessities, the individual is considered financially secure at old-age. There are also studies that use different replacement ratios for different income groups and household types to account for the possibility of diminishing income propensity to consume. Munnell et al. (2006), for example, set the targeted replacement rates at 85% for the low-income group and 65% for the high-income group. It is not clear, however, how these figures are derived.

Jackson et al. (2013) develop a so-called Global Aging Preparedness Index, which accounts for both the fiscal sustainability and income adequacy. The income adequacy measure is similar to the replacement ratio, which measures the elderly's total income relative to younger cohort's total income. The Global Aging Preparedness index focuses on comparisons across different countries, but it does not provide a criterion by which to determine whether the elderly in any country are financially prepared for retirement, or what proportion of the elderly can be deemed to be prepared for their old age needs. The motivation for our study is to develop and implement a novel and more general approach to determine old-age preparedness indices based on actual ability of households in different countries to generate wealth or income levels, or support their actual consumption spending at preretirement age levels.

The innovations in our approach include: (i) Our alternative preparedness/replacement rates are based on individual preretirement accumulated wealth and on preretirement consumption level. (ii) We explicitly estimate individual postretirement income from each of the four sources of support available to a typical household, which include what we call self-insurance (including family transfers from adult children or relatives that extant studies completely overlook); self-management of individual portfolios of assets, which we call self-protection; enrollment in private pension plan, which we call market insurance; and public pension funds, such as social security benefits, which we call public insurance. Using this comprehensive approach, we can evaluate the relative contribution of different incomes for old-age financial preparedness. (iii) We identify the important individual characteristics that can serve as good predictors for individual preparedness. Note that our second innovation enables us also to determine the degree to which household old-age preparedness is based on households' self-preparedness or self-dependency as opposed to or their dependency on public/government income support.

We proceed as follows. In section II, we provide a description of the five datasets that we rely on in this study. In section III, we construct the households' total financial preparedness measure, and break it down in terms of the components of this measure to provide some insight into the contribution of the different private sources to the households' self-dependent retirement income across the five economies. In section IV, we present the consumption-based

preparedness index and present our estimated resulting index by country and survey year. In section V, we conclude the study with a discussion of our findings and limitations of the preparedness index.

II. THE SAMPLE AND KEY VARIABLES

A. The Data Sources We Use

The data used in this report come from five longitudinal studies that share a common questionnaire design: the Health and Retirement Study (HRS) in the US, the Japanese Study of Aging and Retirement (JSTAR) in Japan, the Korean Longitudinal Study of Aging (KLoSA) in the ROK, the China Health and Retirement Longitudinal Study (CHARLS) in the PRC, and the Longitudinal Aging Study in India (LASI).

The United States sample. The HRS is the seminal longitudinal household survey dataset that has been used to study retirement and health issues concerning older age groups in the US (Juster and Suzman 1995). The original survey was conducted in 1992, covering heads of households who were aged 50–60 at the time. The original households were followed every 2 years since then. A separate survey of the American oldest old (Asset and Health Dynamics Among the Oldest Old [AHEAD]) was later merged with the original HRS. To maintain a continuing dynamic survey of the elderly population, a new cohort of households aged 50 and 55 has been added to the longitudinal survey every 6 years. Such refresher samples were added in 1998, 2004, 2010, and 2016.

The 2015 RAND HRS file version O, which we actually use in this study, is the result of several data developments that aim to provide a user-friendly version of the HRS.¹ It includes final data files from 12 waves (1992–2010). These longitudinal data contain only a subset of variables from the original HRS, but subsequent survey reports included cleaned and processed variables with consistent and intuitive naming conventions and model-based imputations. Most importantly, these reports added a large number of individual variables, including demographics, job status and history, health, as well as imputed income and assets. In this study, we use three waves of the HRS, as we did in Ehrlich and Liu (2022). These are surveys conducted in 2006, 2008, and 2010.

The Japanese sample. The JSTAR is a panel survey of elderly people aged 50 or older, conducted by the Research Institute of Economy, Trade and Industry, Hitotsubashi University and the University of Tokyo (Ichimura et al. 2009). The survey is designed to ensure, to the maximum extent possible, comparability with the HRS; the English Longitudinal Study of Aging; and the Survey of Health, Ageing and Retirement. To facilitate cross-country comparisons, the Research Institute of Economy, Trade and Industry also created the harmonized JSTAR data, to be compatible as much as possible with the procedures and imputation methods employed in generating the RAND HRS. The JSTAR version we use is version B.

¹ http://hrsonline.isr.umich.edu/modules/meta/rand/randhrso/randhrs_O.pdf.

The JSTAR surveyed people between age of 50 and 75 along with their partners. The first wave was conducted in 2007 with five municipalities. These households were followed up in wave 2 in 2009. But, in wave 2, two more municipalities were added into the study. All households were included in the follow-up wave 3 in 2011, along with three new municipalities added to the survey. The unit of analysis in the JSTAR is the household, with survey weights at the household level provided for analysis. This differs from the HRS where both personal level and household level survey weights are provided. In this study, we use the same three waves of the JSTAR as we did in Ehrlich and Liu (2022): surveys of 2007, 2009, and 2011.

The Republic of Korea sample. The KLoSA is a panel survey in the ROK conducted initially by the Korean Institute of Labor. The KLoSA started the first wave in 2006 for households with at least one person 45 years of age and older, and the respondents were then surveyed every 2 years. Starting in wave 3, the data were collected by the Korea Employment Information Service. There were no refresher samples in waves 2 through 4.² This difference may cause a downward bias when we aggregate individual data to form the household level data. The data we use is the harmonized KLoSA version C. We have obtained the original wave data from the Korea Employment Information Service, and then used a STATA program provided by a team at the Global Aging Project to generate the harmonized version C data.

For comparison purposes, we used only waves 8, 9, and 10 from the RAND HRS, and waves 1, 2, and 3 from the harmonized JSTAR and KLoSA. We note that the KLoSA data were collected in the same year as the corresponding HRS, while the JSTAR data was collected a year later. (Table 2 contains details, which also include the total number of units with non-zero survey weights in each wave.) In this context, we note that the HRS added a fresh cohort in 2010, which led to a larger number of units compared with the previous two waves. For the KLoSA, the number of units kept falling because of attrition, and this is also true for wave 9 of the HRS when compared with wave 8. In contrast, the JSTAR added more municipalities in both the second and third waves, so the number of units in the JSTAR has risen throughout the three waves. To achieve greater consistency among all three datasets concerning financial variables, we also conduct the analysis at the household level. However, to capture individual characteristics like age and education, we also use information on heads of households. In this study, we use the same three waves of the KLoSA as we did in Ehrlich and Liu (2022): the surveys from 2006, 2008, and 2010.

We need to point out briefly some differences that we observe in these three micro datasets of developed economies when using the 2006–2007 wave. First, the heads of households in the HRS and the JSTAR have similar average ages, with the HRS exhibiting a slightly higher average. This is because of the introduction of a new cohort of individuals aged 50 and 59 into the survey in 2004, which was the first wave of the JSTAR. The KLoSA reports a much lower average age because, in the first wave of that survey, the age eligibility for the KLoSA is 45, i.e., 10 years

² One notable difference about the KLoSA is that it does not interview spouses or partners who are younger than 45 years old, a deviation from the treatment in the HRS and the JSTAR.

younger than the early pensionable age of 55 at the time. Throughout all waves, the KLoSA contains much younger households, but the gap with the HRS fell modestly in 2010 when a new cohort was added to the HRS. Average age stayed almost the same between waves 1 and 2 for the JSTAR even though there were more municipalities that were introduced in the second wave. However, the average age in the JSTAR sample became older in wave 3, where more municipalities have been included. I think that the repeated “the” in front of all the surveys is generally redundant throughout, after we defined the acronym, unless we add something to it. We should also note that, even though we use the harmonized version of three micro datasets, these data have their own limitations. For example, the JSTAR does not use a national probabilistic sample. Further, the micro datasets are not entirely equivalent. For example, the US HRS data distinguishes between ownership of homes and second homes, but this is not the case in Japan or the ROK. Consequently, the data comparisons we report below should be viewed with caution, subject to this caveat.

The sample from the People’s Republic of China. The data for the PRC are drawn from the CHARLS, a nationally representative longitudinal survey of people aged 45 and over and their partners living in private households in the PRC. The study is modeled after the HRS and is conducted by the China Center for Economic Research at Peking University. The original national baseline survey was conducted between June 2011 and March 2012, covering about 10,000 households and more than 17,000 individuals from 150 counties. The original households were followed up in 2013, 2015, and 2018. The main survey questionnaire includes information on basic demographics, family status, health status, health care, employment, as well as income, consumption, and wealth at the household level. The longitudinal nature of the data allows us to examine changes in old-age financial preparedness over time. In this study, we use the same four waves of the CHARLS that we pursued in Ehrlich and Liu (2022): the surveys of 2011, 2013, 2015, and 2018.

The sample from India. The data for India are drawn from the LASI. The LASI is designed to be nationally representative of people aged 45 and above in India. The information collected by the LASI is comparable to the information collected by the HRS and its sister surveys in Asia, Europe, Mexico, and elsewhere. Aside from the pilot wave, there is only one wave of the LASI, which was surveyed between 2017 and 2019, covering 35 of India’s 35 states and union territories (except Sikkim). The sample covers 72,262 individuals from 42,951 households. In this study, we pursue the only available wave of the LASI. Therefore, we cannot compare India with other sample countries in terms of trends in the financial preparedness across age-cohorts.

B. The Main and Auxiliary Samples Used in the Analyses

The goal of this study is to evaluate the level of old-age financial preparedness of near-retirement population and their needs for financial support. It is difficult to evaluate how well younger generations of workers are financially prepared for retirement, since they have many years to do so. However, for those who are near retirement age, there is less opportunity and time to accumulate additional wealth. We can thus use their accumulated wealth position of individuals who are close to retirement age as a good proximation of the total private resources

that are available to them for old age support during the retirement phase. Ideally, we would want to select the age group that is as close as possible to the retirement age. However, doing so will substantially reduce the sample size that we can use, which would reduce the statistical power of estimates of preparedness we derive through any statistical analysis. Considering this tradeoff, we decided to select from our five datasets only individuals who will reach their country-specific retirement age within 5 years from their retirement age in each country.³

Our measures of preparedness, although computed based on samples of individuals from a specific age group, can be interpreted as the preparedness level of the general population under the assumption that wealth, income, as well as consumption patterns of younger cohorts follow similar paths as do the near-retirement individuals who are included in our main samples.

For the near-retirement individuals included in our main samples, annual intra-family income transfers, private pension income, and public pension income during retirement are not observable. We estimate each of these expected postretirement incomes by using a sample of retirees for each of the five economies. The key selection criterion is that individuals must be aged between the retirement age and the country-specific life expectancy at the retirement age. We call these samples auxiliary samples. The estimation is done in two steps. In the first step, we establish the functional relationship between each postretirement income per annum and a set of individual and household characteristics by using the auxiliary sample of retirees for whom we have the actual incomes received from the three sources. We estimate the following regression model by the ordinary least squares (OLS) method:

$$Y(i) = a + b \text{edu}(i) + c \text{health}(i) + d \text{gender}(i) + e \text{married}(i) + f \text{nchild}(i) + e(i) \quad (1)$$

where Y is the transfer income or private pension income or public pension income received by individual i, edu is a series of binary variables indicating educational attainment, health is self-rated health status (=1 for good and very good, =0 otherwise), gender is 1 for male and 0 for female, married is 1 for coupled household and 0 for all others, nchild is number of living children, and e is the random error. We estimate equation (1) by country and survey year and separately for annual transfer income, private pension income and public pension income to obtain the parameter estimates. In case of the PRC and India, the regression model is estimated separately for the rural and urban samples.

In the second step, we use equation (1) and the corresponding characteristics of individuals included in our main samples to generate the predicted values of respective annual incomes which are the expected postretirement incomes of individuals in our main samples, i.e., those due to retire within 5 years. The reported net wealth of the group plus the present value of their expected income streams constitutes the total value of their available financial resources over

³ However, we tested the sensibility of the results to an alternative selection criterion for the main samples that include individuals who are due to retire within 3 years and obtained similar results.

the retirement period. We use a discount rate of 2% to compute the present values of the expected incomes.

C. Key Variables Used

To ensure comparability of variables in monetary terms, we first convert their values in local currency into nominal US dollars using purchasing power parity exchange rates (Organisation for Economic Co-operation and Development 2020), and then convert them into 2010 constant US dollars by using the annual US consumer price index available from the Bureau of Labor Statistics.

Table 1 presents the summary statistics of the key variables we use in this study, by country and survey year. They include per capita household wealth, market value of owner-occupied home, per capita income, and per capita consumption for the main sample; and intra-family transfer income, private pension income, public pension income, out-of-pocket medical expenses (all in per capita terms) for the auxiliary samples (consisting of retirees). Per capita consumption is derived by dividing the household's reported consumption values by the household size. Also included in both samples are six individual characteristics: education, health, age, gender, marital status, and number of living children. The statistics for the main and auxiliary samples are reported in Table 1a and Table 1b.

Net wealth [Wealth]. We construct this variable as the sum of the net financial and nonfinancial assets, as well as real estate, of the households. The former includes stocks, bonds, and other banking accounts, while the latter includes home, other real estate assets, including business assets, vehicles, and other assets. The household wealth is assumed to be at the disposal of the head of household and his/her spouse. Therefore, per capita wealth is the household net wealth divided by 2 for those who are married and by 1 for those who are single. The per capita wealth is highest in the US and is followed, in descending order, by Japan, the ROK, the PRC, and India. Market value of home [Home]. Home includes the household main residence. Its market values are reported by the respondents to the surveys. We use home values to estimate the implicit rents that homeowners incur for housing services at 5% of the market value of home of primary residence. The implicit rents, after adjusting for household size, are included as part of the consumption spendings of homeowners. The ranking of countries by home value is similar to the ranking by wealth, except that the ROK overtakes Japan toward the end of the sample period.

Income [Income]. The income reported in the HRS-type of data for all five economies are the total household disposable income. Except for the US, for which household incomes are pre-tax, household incomes in other countries are after-tax. Per capita income is household income divided by household size. The ranking by per capita income is the same as that by wealth.

Consumption [Consumption]. Household consumption information is available for the PRC and India, but not for three developed economies: the US, Japan, and the ROK. For these three economies, we derive household consumption from household income and a country-specific

average propensity to consume that is constructed based on data from consumer surveys of the respective country. Some of the household consumption figures include expenditures on housing, while some exclude them. Accordingly, we adjust the household's consumption variable to include housing costs prior to deriving the household's per capita consumption figures.⁴ We will further discuss the adjustment and computation of the consumption variable in a later section. Overall, per capita consumption is higher the higher the per capita income, except for India where the average per capita consumption is \$3,270, comparable to the PRC's \$3,290, but more than its own average per capita income of \$1,791. We believe that the consumption data for India might have been reported with substantial error. This may contaminate the estimation of the preparedness index for India. To mitigate this data problem, we also derive an alternative per capita consumption value by using the reported household income and an average propensity-to-consume measure

Educational attainments [Education]. All the HRS-type surveys that we use in this study report the educational attainment categories of the respondents. It is coded from 0 up to 10, with 0 for no formal schooling and higher level of attainment with higher numbers. In this study, we use the education variable solely for the purpose of predicting the expected postretirement incomes, rather than analyzing the role of education in affecting individual old-age preparedness. To enhance the fitness of the regression models used for prediction, we introduce education in the models as a series of dummy variables. This is because the education variable is measured differently across the sample economies and, therefore, is not comparable across economies. Specifically, the value of the education variable ranges from 1 to 5 for the US, from 0 to 7 for Japan, from 1 to 9 for the ROK, from 1 to 10 for the PRC, and from 0 to 9 for India.

Health status [Health]. The surveys use a five-point scale for self-reported health status (from poor to very good). Following the literature and our own earlier work, we convert this health status measure into a dummy variable, which assumes the value of 1 for people whose self-reported status is good and very good, and 0 otherwise. The average values of this variable vary considerably across the sample countries. Whether the differences are due to technical issues like reporting method or how people assess their health status remains a question.

Gender, married, and number of living children [Gender, Married, Nchild]. Gender is a dummy variable, equaling 1 for male and 0 for female. Married is 1 for those who are married and living with spouse. Married is 0 for those who were never married or are living without spouse. Number of living children includes all children who are alive regardless of their living arrangement, cohabiting with the respondents or not.

Transfer income, private pension income, public pension income, and out-of-pocket medical expenditures. Most of the surveys we use in this study report information on these variables for

⁴ The term "per capita" strictly applies only to consumption spending where the aggregate data are adjusted by the total household size. However, the wealth and income data are divided by 1 or 2, if the household includes just the head of household or both the head of household and a spouse, in which case we use the terms "per capita" or "per head of household" interchangeably.

retirees who are included in the auxiliary samples. However, income transfers within the family are not reported in the US sample, and out-of-pocket medical expenditures are not available for Japan and the ROK's 2006 survey. Therefore, they are assumed to be zero. As Table 1b shows, there are sizable cross-country differences in these postretirement incomes. Among the three developed economies, (i) the average public pension income is comparable in the US and Japan, and is higher than in the ROK; (ii) the average private pension income in the US is almost five times of that in the ROK and eight times of that in Japan; (iii) the average intra-family transfer income is higher in the ROK than in Japan (this variable is not available for the US); and (iv) the average out-of-pocket medical expenditure is about four times higher in the US than in the ROK (this variable is not available for Japan). For the two developing economies, the average public pension income and family transfer income are lower in the PRC than India; the reverse is true for the average private pension income and out-of-pocket medical expenses.

III. DERIVING AN INCOME-BASED MEASURE OF OLD-AGE FINANCIAL PREPAREDNESS

Our analysis accounts for the role of four major income sources of old age support, or total available resources (TAR): (i) intra-family transfers, especially from adult children; (ii) family-accumulated wealth through ordinary savings plans and investments in financial and real estate markets throughout the preretirement period; (iii) ownership of private pension plans; and (iv) reliance on public pension plans. A natural way to assess a household's preparedness is by the level of the household's net wealth accumulated prior to retirement. "Wealth" represents the major private source of retirement income since, in principle, it can be liquidated in whole upon retirement and held in risk-free assets to cover at least a part of its overall spending capacity, including any donations or bequest to its offspring. The greater the individual household's net wealth, the better is the household's ability to meet all its financial needs over its expected retirement phase.

The net wealth prior to retirement, however, does not exhaust the total private resources that are available to the household in the postretirement phase. The latter also includes intra-family income transfers and private pensions income. Adding the present values of these other resources to accumulated household net wealth prior to retirement provides a measure of the household's expected private financial preparedness, or financial private self-dependency (PSD), measuring the extent to which the household can rely on its own income to support its old-age financial needs.⁵ Adding the present value of the expected public pension income in the postretirement period, or public financial dependency (Pbfd), to the expected PSD results in a measure of the TAR to households in their postretirement period, or their financial retirement preparedness.

⁵ A caveat in our derivation of SDRs across the five economies that are included in our analysis is the assumption that the financial market for especially risky financial assets, like stocks and "investment" (or commercial) real estate assets, are equally liquid across the five countries. Generally, these markets tend to be more liquid in the more developed economies, which may understate the relative values of SDRs in these countries.

We can now define the household's SDR as the share of expected total financial resources that is funded by the household's private resources or $SDR = (PSD/TAR)$. The greater is the SDR the higher is the household's degree of financial independence. The public dependency ratio (PBDR) would then be defined by $PBDR = 1 - SDR$, indicating the extent to which the household depends on public pension income for old age support. Table 2 presents the averages of the four sources of retirement income: net wealth, present values of estimated intra-family transfer, private pension, and public pension; and their shares in the TAR as a measure of the household's financial retirement preparedness and wellness.

It is apparent that financial wellness is highly correlated with the level of economic development. Among the three developed economies, the near-retirement US population has the highest average household's level of TAR and potential financial wellness in retirement, as expected, although the values decline from \$737,037 in 2006 to \$639,074 in 2010, reflecting the consequences of the 2008 financial recession in the US. Japan has the second highest measure of average household's TAR, which is about 60% of that of the US, and it also declines from \$467,467 to \$419,324 over the sample period. The ROK has the lowest level of average TAR, which fluctuates from \$218,827 in 2006 to 245,2130 in 2010.

However, the near-retirement households of the PRC and India are at a much different position regarding their potential financial wellness in retirement. In the PRC, the average TAR is just \$56,801 in 2011, well below the levels of the US and the developed Asian economies. However, average TAR rises to \$129,102 in 2018, thus more than doubling over a period of 7 years. Also, the average Chinese household living in urban areas is much better prepared relative to its rural counterpart; the average TAR level of the former is two to three times higher than the latter.⁶ The near-retirement average households in India, in turn, has a lower level of TAR than its counterpart in the PRC. In 2018, for which data are available for both the PRC and India, India has an average TAR of \$62,818 compared to the PRC's \$129,102. As in the case in the PRC, there is a large gap in the potential financial wellness measure between the urban and rural populations in India; the rural population's average TAR is less than 40% of its urban peer.

As expected, households in the two developing economies—the PRC and India—are still well behind their counterparts in the more developed Asian economies. But the PRC has made significant progress over recent decades. For example, the PRC's average TAR in 2011 was only about 23% of the ROK's \$245,130 in 2010. By 2018, however, it rose to \$129,102 in 2018 which is 53% of that of the ROK's. The corresponding figures for the Chinese urban population are 43% and 79% of the ROK's levels in 2010.

The SDR, which measures the share of the total available financial means that are derived from private sources (wealth, transfers, and private pension), varies considerably not just between

⁶ The abnormally higher value of the TAR for the rural sample in 2015 is driven largely by the high average net wealth in that year. We checked the original data and found that a few individuals reported extremely high net wealth holdings, in the order of \$4 million–\$9 million. While these are high by Chinese standards, they are not entirely implausible. However, the sharp increase in the net wealth among the rural population is a puzzle.

developed and developing economies, but also across the developing economies included in this study. The SDR is very stable for the US, standing at 0.60 over the sample period, higher than Japan's SDR which declined from 0.48 in 2007 to 0.38 in 2011. Thus, the Japanese retirees have therefore become less independent in their ability to self-support their total old-age financial needs from private sources. The decline in accumulated net wealth is the main factor accounting for this decline. Put differently, the Japanese retirees are becoming increasingly dependent on public pension income. However, in the ROK, the SDR ratio has been constant over the sample period at 0.85, the highest among the three developed economies. The high SDR ratio for the ROK, relative to the US and Japan, is driven by a larger wealth share, mostly because of a much higher average level of intra-family income transfers. The latter accounts for about 20% of the total financial resources available for old age support in the ROC. By contrast, the intra-family income transfer source constitutes a paltry 1%–2% in Japan. However, the comparison with the US may be distorted because intra-family income transfer data are not available for the US and is assumed to be zero (identified as n.a. in Table 2).

Somewhat surprisingly, the households' SDR ratios for the developing economies of the PRC and India are higher than those of the three developed economies, especially the US and Japan. In the PRC, the SDR ratio for the overall near-retirement households rose from 0.84 (comparable to the ROK) in 2011 to 0.88 in 2018, and the SDR ratio is higher for the urban households than for the rural ones. A major contributing factor is the larger share of private pension income, which rose to 0.40–0.45 over the sample period, which is oddly higher than the share of private pensions in any of the three developed economies.⁷ The intra-family income transfer share in the PRC falls between the shares for Japan and the ROK, but is lower than India's 0.11 in 2018. Intra-family income transfers account for a larger share of TAR in rural than urban areas in both the PRC and India.

We should point out that, while the higher SDR means a high degree of potential financial self-dependency in retirement, it may also be an indication of a relatively low public pension support. Therefore, the high SDR ratio for the PRC and India and, to some extent, for the ROK may suggest that the public pension system has not yet been fully developed in these countries relative to the more developed economies of Japan and the US.

IV. DERIVING A CONSUMPTION-BASED MEASURE OF RETIREMENT FINANCIAL PREPAREDNESS

The basic idea behind this measure of financial preparedness is the adequacy of expected postretirement incomes from all four sources: —intra-family transfer, self-managed wealth, private pension, and public pension—for maintaining a targeted benchmark level of consumption spending over the expected retirement life of the head of household. By this

⁷ It should be noted that “private” pensions are employer-funded programs. For most Chinese, the state or state-owned enterprises are the employer. Therefore, the distinction between private and public pensions is not clearcut.

measure, individuals are said to be financially prepared for old age if their expected annual income exceeds the target or benchmark annual consumption spending over the duration of the expected retirement life.

To derive the individual-specific consumption preparedness measure, we assume that households liquidate their wealth upon retirement, and invest the proceeds in a risk-free and equally liquid financial instrument that maintains the value of the investment in real terms. This assumption simplifies the estimation of income streams derived from household wealth. Another assumption we make is that retirees first use transfer and pension incomes to support consumption, and draw on wealth as the income source of last resort. Therefore, individuals who expect to have nonnegative net wealth at the end of expected life are deemed to be prepared for supporting their targeted personal consumption level. Mathematically, this amounts to comparing the number of years that the expected postretirement income can cover with the target level of consumption over the expected retirement years. For households deemed to be prepared for old age, the former measure would be greater or equal to the latter.

Let $W(i)$ stands for the net wealth of individual i at retirement, C is the target consumption level per year, $T(i)$ expected transfer income per year, $PriP(i)$ expected annual private pension income, and $PubP(i)$ expected annual public pension income, all in per capita terms.

The number of years that the expected postretirement incomes can support the consumption C for individual i is given by

$$X(i) = W(i) / [C - T(i) - PriP(i) - PubP(i)] \quad (2)$$

and the preparedness indicator for individual i , $Prep(i)$, is

$$Prep(i) = 1, \text{ if } X(i) \geq Ae - Ar \text{ and } Prep(i) = 0, \text{ if } X(i) < Ae - Ar, \quad (3)$$

where Ar is the official retirement age (such as the full social security age for people born in a given year in the US) and Ae is the life expectancy in years for individuals at age Ar .

The country- and year-specific preparedness index, $0 < P \leq 1$, is defined as the share of individuals with preparedness indicator of 1.

$$P = \frac{1}{n} \sum_{i=0}^n Prep(i) \quad (4)$$

The greater the index, the greater is the level of retirement preparedness of the age cohort. In this study, we focus on the cohort of individuals who will reach the retirement age within 5 years. For example, the cohort would be individuals aged 61–65 in the US, assuming that age 66 is the retirement age (the full social security age).

To compute individual preparedness indicator, we need to assemble all the variables on the righthand side of equation (2). While the HRS-type surveys for all five economies (US, Japan, the ROK, the PRC, and India) covered in this study contain information on household's wealth,

only the CHARLS of the PRC and the LASI of India contain information on consumption. Therefore, for economies where consumption data are not available, we derive per capita consumption from the reported household income by using a measure of average propensity to consume. The latter is estimated based on average income and consumption expenditure data that are published in consumer surveys of respective countries.⁸ The average propensity to consume is the ratio of average consumption expenditure to average income. The average income used to compute the propensity to consume is pre-tax income for the US and disposable income for Japan and the ROK. This distinction is made because the household income reported is the pre-tax income in the HRS study and the disposable income in the JSTAR and the KLoSA. The average propensities to consume we use are 79% for the US, 73% for Japan, and 62% for the ROK, respectively.

We also make two adjustments to the preretirement consumption measure to account for implicit rental values of owner-occupied home and expected out-of-pocket medical expenses during the period of retirement. The implicit rent for housing is assumed to be 5% of the market value of home of primary residence, and is added to household consumption for homeowners before deriving the per capita consumption measure. No such adjustment is made for renters since rent payments are included in the consumption spending data for non-homeowner households. We estimate the expected out-of-pocket medical expenses for each of the sample individuals near retirement age via a similar regression specification that we used in equation (1). We add the predicted expected medical expenses and deduct the current medical expenses from the preretirement per capita consumption values so that the adjustment reflects the expected increase in the out-of-pocket medical expenses in retirement relative to the preretirement level.

The three remaining components of equation (2)—expected intra-family transfer income, private pension income, and public pension income during the retirement phase—are estimated following the procedure described in section II.B.

With these estimated expected postretirement incomes along with the reported wealth (W) and a benchmark consumption spending (C), which is reported for the PRC and India and estimated for the US, Japan, and the ROK, we derive the individual preparedness indicators via equation (3) and then compute the preparedness index using equation (4). It should be noted that net wealth, predicted postretirement income, and preretirement consumption are all converted from the household aggregates to per capita or per head of household terms prior to computing the index.

⁸ United States: Bureau of Labor Statistics Consumer Expenditures. <https://www.bls.gov/cex/csxann10.pdf>; Japan: Statistics Bureau of Japan. <https://www.stat.go.jp/english/data/sousetai/9.html>; and ROK: Statistics Korea. <https://kostat.go.kr/board.es?mid=a20106020000&bid=11736>.

V. ESTIMATED COUNTRY-SPECIFIC PREPAREDNESS BASED ON TARGETED LEVELS OF CONSUMPTION AND DETERMINANTS OF CONSUMPTION-BASED AND INCOME-BASED PREPAREDNESS

A. Estimated Consumption-Based Preparedness Index for Each Country

Table 3 presents the estimated consumption-based preparedness index for each country and survey year covered in our sample, using the actual consumption of individuals in the developing economies (or the estimated consumption expenditure of individuals in the three developed economies) near their retirement age during the survey year. Table 3 also presents the conditional life expectancy at the retirement age and the retirement age used for each country and survey year. The estimated index is reported in column (1).

The consumption-based preparedness index for the US is 0.82 in 2010, a one percentage point increase from 0.81 in 2006. This means that 81%–82% of near-retirement Americans have sufficient incomes to support their preretirement levels of consumption throughout their expected retirement life. Depending on the year, 86%–89% of Japanese are in the same position. It is somewhat surprising that a larger proportion of Japanese than Americans are able to maintain their preretirement living standard, given that the Japanese have higher life expectancy, lower wealth, and comparable public pension support. A closer inspection of the consumption data suggests that the main reason for the higher preparedness index for Japan is the low level of per capita consumption spending in Japan relative to the US. For example, in 2011 the per capita consumption spending in Japan, \$12,926, is about half of that in the US, \$25,183 in 2010. The preparedness index for the ROK rose from 0.50 in 2006 to 0.58 in 2010 over the 5-year period. However, the index for the ROK is the lowest among the three developed economies.

The consumption-based preparedness index for the PRC ranges between 0.62 and 0.73 over the period 2013–2018. By this measure, the overall level of preparedness of Chinese households is higher than that in the ROK, but lower relative to that in the US and Japan. However, the urban consumers in the PRC have a comparable level of preparedness as their counterparts in the US and Japan, and a higher level of preparedness than their rural counterparts, whose level of preparedness shows a steady decline from 0.62 in 2011 to 0.44 in 2018.

The consumption-based preparedness index for India is 0.39, the lowest among all five economies that are included in this study. As in the PRC, the urban households in India are better prepared for financing their old age consumption needs than their rural counterparts: 0.57 versus 0.31. However, as noted earlier, the household consumption data reported in LASI seem to be problematic since the average consumption level is almost twice the average income level. To address this data issue, we also report in parentheses a set of alternative estimates for India using a computed per capita consumption variable, which is the product of reported household income and the average propensity to consume (0.68), adjusted for household size. We compute the alternative estimates from two on-line publications of the World Bank, one reporting

India's	net	income
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(<https://data.worldbank.org/indicator/NY.ADJ.NNTY.CD?locations=IN>) and the other reporting India's Households and NPISH Final Consumption Expenditures (<https://data.worldbank.org/indicator/NE.CON.PRVT.CD?locations=IN>). These estimates are much higher than the estimates that are based on the reported consumption data, which make India's level of preparedness comparable to that of the PRC.

The consumption-based preparedness index measures how well the near-retirement population are prepared for old age in terms of the adequacy of their postretirement incomes in covering individual own preretirement consumption spending. Therefore, it is not based on a common level of consumption or quality of life. In this regard, an estimated higher level of consumption-preparedness of Japanese households relative to that of Americans does not necessarily mean that the quality of retirement life is higher in Japan. One way to incorporate the "quality of life" into the index is to use a common level of consumption spending as the benchmark.

We present a set of consumption-based preparedness index estimates in column (2), using the median per capita consumption spending in the US as the benchmark for the US, Japan, and the ROK. These index estimates elevate the level of consumption spending preparedness of the US households, and lowers considerably the corresponding level of preparedness of the Japanese and the ROK households. In Japan, the new index estimates range between 0.78 and 0.79, which are much lower than those reported in column (1). They are also lower than the corresponding indexes for the US. In the ROK, the new index estimates range from 0.12 to 0.23, which are also much lower than those in column (1). By the common consumption new index, American households, on average, are better prepared to support their old age consumption needs than their Japanese and the ROK counterparts over their expected retirement life.

For the PRC and India, we also compute the alternative consumption-based preparedness index, using the median per capita consumption spending in the PRC as the common benchmark. The urban median is used to compute the index for urban households and the rural median is used to compute the index for the rural sample. As the estimates reported in column (2) show, the overall level of preparedness is higher in the PRC than in India for both rural and urban households.

B. Determinants of Individual Levels of Consumption and Income Preparedness

To understand the common determinants of consumption-based and income-based preparedness of individual households, we run a series of linear regressions of alternative preparedness measures on the reported characteristics of the head of household.

$$Y(i) = a + b \text{edu}(i) + c \text{gender}(i) + d \text{married}(i) + c \text{health}(i) + d \text{nchild}(i) + e(i), \quad (5)$$

where the dependent variables denote our individual consumption-based preparedness or overall income-preparedness measures, and the independent variables are education, gender, marital status, health, number of children. Equation (5) can be viewed as a reduced form

regression derived from a set of simultaneous equations where individual characteristics determine incomes from each of the four income sources for retirement support and the total income determines the level of preparedness. As we show in the context of the asset management hypothesis in Ehrlich and Liu (2022 and 2023), *ceteris paribus* (including the opportunity costs of asset management), better-educated individuals are generally more likely to hold stocks and commercial real estate in their overall portfolio of assets, which on average generate higher returns. This role of education is imbedded in the estimated effect of education in equation (5). To see if education has additional impact on the preparedness measure even beyond the impact it has on the individual's portfolio composition, (the extensive margin) we also implement a regression specification that includes two binary variables, indicating if the households hold stocks and investment real estate in their portfolios, respectively.

We begin with the individual consumption-based preparedness measure as the dependent variable, which has the value of one for individuals whose total retirement income support (TAR) is sufficient to support their preretirement annual consumption for the duration of the retirement life and zero otherwise. The estimation results based on equation (5) and an expanded version of equation (5) are reported in Table 4 for each of the five economies included in this study. These estimates suggest that (i) Men are significantly more likely to be self-prepared for consumption support, based on their preretirement consumption needs, than women in all five economies. (ii) College education exerts a positive contribution to self-preparedness in the ROK, the PRC, and India, especially with or without controlling for risky asset holdings. Surprisingly, education plays a negative role in the US and no role in Japan. (iii) Individuals with more children are more likely to be self-prepared, significantly so in the ROK, the PRC, and India, presumably because children in these countries are more likely to provide financial assistance to their aging parents. (iv) Individuals holding stocks and/or investment real estate in their portfolio of wealth are more likely to be classified as self-prepared. (v) While good health increases the likelihood of one's preparedness, being married reduces it.

We next repeat the regressions in Table 4 using an alternative consumption-based preparedness measure defined relative to a common consumption level. Specifically, the median of per capita preretirement consumption of the US is used as the benchmark for the US, Japan, and the ROK, and the median consumption of the PRC is used as the benchmark for the PRC and India. While the common benchmark-based results in Table 5 are largely comparable to those in Table 4, the estimated effects of education, marriage, health, holdings of stocks, and investment real estate are more consistent across our sample economies. Specifically, near-retirement individuals who are male, college educated, not living with a partner, in good health, and holding stocks or investment real estate or both are more likely to be prepared to support their old age consumption needs, albeit the education effect is not statistically significant for the PRC.

It is not surprising that the results are somewhat sensitive to the benchmark consumption level used in calculating the consumption-based preparedness measure. To avoid this problem, and present a similar analysis of the determinants of our overall income-based preparedness

measure, we next repeat the regression using an income-based preparedness measure as the dependent variable, which is the log of the total retirement income available at retirement. Since, for any given consumption benchmark, the larger the total retirement income available for old-age support the more likely one is prepared for old age, factors that determine the total retirement income support are also likely to be contributing factors for achieving higher levels of overall preparedness for old-age support. Indeed, the estimates that are reported in Table 6 warrant similar conclusions. Education, health, number of children, and the holding of stocks and investment real estate are contributing factors to overall preparedness, while having a living partner is a negative factor. Also, all else being the same, men amass more resources at retirement and, therefore, are better prepared to support their lifestyle than women for old age.

VI. DISCUSSION AND CONCLUSIONS

The analysis in this paper offers a succinct summary of the main themes of the three studies that are covered in our investigation of old-age financial preparedness of households in four major Asian economies and the US, as well as its implications concerning the financial wellness of elderly populations in developed and developing economies in general.

Although the extant literature concerning old-age financial support channels has focused mainly on the role of public old-age support schemes, such as social security schemes of mandated defined benefits or defined contribution or public pension plans, the main objective of our study has been to study the extent to which households' own wealth accumulation contributes to their old-age financial preparedness or wellness. To this end, we have investigated the harmonized household longitudinal HRS surveys from two developed Asian economies (Japan and the ROK), with the US serving as a standard of comparison, as well two fast-developing Asian economies (the PRC and India), as described in section II, to assess the own contributions of heads of households from three private support channels, and compare them to those received from the public channel. The four channels assessed in terms of their contribution per head of household thus include (i) intra-family financial support provided by adult children, (ii) the financial and real estate assets that households accumulate prior to their retirement phase and the present value of the income they obtained from these assets during the retirement phase, (iii) the present values of income from private pension plans owned by the households, and (iv) the benefits from the old-age financial support channels that households obtained from public pension plans during retirement.

Below, we cover the main inferences that we are able to derive from this analysis, based on two general measures of household's retirement preparedness. One is an estimated income-based measure that represents the household's TAR incorporating all four channels of old-age support (private and public), and a measure that includes just the first three channels incorporating the household's private income support, or self-dependency channels (PSD). This enables us to compute also the household's SDR ($SDR = PSD/TAR$), based on the share of the private support channels in the total income support measure, relative to the PBDR based strictly on the share of the public pensions in the total, or $1-SDR$. The second general measure

of total old-age financial preparedness is a consumption-based measure, which focuses to the ability of the head of household to fund specific targeted levels of consumption over specified postretirement periods. The complex methodology we use to produce these two general indices are described in sections III and IV. The results we obtain using the estimated income-based and consumption-based indices of old-age financial preparedness are presented in Tables 2 and 3. Below, we briefly summarize the highlights of our finding based on these indices.

A. Comparing the Private Financial Preparedness of Heads of Households Across Four Asian Economies and the United States Using the Income-Based Measure

In the more developed economies—the US, Japan, and the ROK—we find nonsymmetrical ranking of the countries’ total level of household resources per capita (TAR) and the household’s SDR over our samples’ period. Ranked in a descending order, the US has the highest level of TAR (albeit falling down from \$737,037 in 2006 to \$639,074 in 2010 because of the US financial recession over that period, with Japan ranking second (similarly falling down from \$467,467 in 2007 to \$419,324 in 2011) and the ROK ranking third (fluctuating between \$218,827 in 2006 and \$245,130 in 2010). However, the SDRs show a different pattern. In the US, SDR is stable at about 0.60 between 2006 and 2010, and in Japan it is falling from 0.48 in 2007 to 0.38 in 2011, but it is the highest and stable in the ROK at about 0.85 between 2006 and 2010. In the two developing economies—the PRC and India—we also find opposite rankings of TIS and SDR. While the PRC’s total available household resources per capita is much lower than in the ROK (just \$56,801 in 2011, although it more than doubled in 2018, reaching \$129,102), it has already more than doubled relative to India (where it is just \$62,818 in 2018). The SDR in India is 0.82 in 2018, which is slightly lower than in the PRC, where the SDR is 0.88 in 2018. However, the SDRs are higher in both India and the PRC relative to those in the more developed Asian economies and the US, consistent with the higher ranking of the ROK relative to Japan and the US.

The rationale is apparent mainly from the much lower level of public pension contributions in both the PRC and India. Thus, the SDRs are higher in the developing relative to the more developed Asian economies, essentially not because of the accumulated values of net wealth among Chinese and Indian households, which are substantially lower than those in the US (in the PRC, the net wealth is just a tiny 7.6% of that in the US [\$23,603 in the PRC in 2011 relative to \$309,936 in the US in 2010] and in India’s net wealth per head of household [\$45,319 versus \$79,502 in the PRC in 2018]), but because the contributions of public pensions to the present value of total household resources in the PRC and India are much lower than those in the more developed Asian economies and the US.

B. Comparing the Total Financial Preparedness of the Heads of Households Across Four Asian Economies and the United States Using Alternative Targeted Consumption Levels in Selected Years

The cross-country comparisons using these consumption-based measures of retirement preparedness differ from those summarized by the income-based measures since they are based on different criteria—the proportion of individuals in the harmonized samples in the

different countries who have adequate income from all income sources prior to their retirement date to finance the targeted level of consumption over specified periods of retirement, which represent the households' year of retirement relative to the countries' life expectancy. Two versions of the consumption-based indices are presented in Table 3: one where the targeted consumption level is based on the individual-specific level of consumption in the period just prior to retirement, and the other based on the median consumption level of the US as the targeted consumption level for the developed economies (US, Japan, and the ROK); while for the developing economies, the median consumption level in the PRC serves as the target consumption level.

According to Table 3, the consumption-based preparedness index with the individual-specific preretirement consumption as the benchmark, over 85% of the near-retirement Japanese heads of households is expected to have enough postretirement incomes to support their preretirement consumption level. By contrast, 80% of Americans and 50%–58% of the Koreans are expected to do the same. The share of the Chinese population who are similarly prepared is between 62% and 73%, higher than India's 39% (column [2], Table 3).

The estimated preparedness indexes, with the median consumption level of the US serving as the benchmark, suggest that Americans are somewhat better prepared than their Japanese counterparts who, in turn, are better prepared than the Korean would-be retirees (over 80% versus 78% versus 12%–23%, respectively). The PRC is still ahead of India, if the index estimates are based on the median per capita consumption of the PRC (column [2], Table 3).

C. The Determinants of Individual Preparedness

We use the two versions of individual preparedness measures that we employed to construct the country-specific preparedness indexes reported in Table 3 as dependent variable to identify the determinants of preparedness at the individual level. One is with the individual preretirement consumption level as the benchmark, and the other with the median preretirement consumptions in the US and the PRC as the benchmarks for the developed and developing economies, respectively. While there are slight differences in the estimated effects of different individual characteristics, college education appears to be largely a key contributing factor. Consistent with the findings in Ehrlich and Liu (2022 and 2023), which focus on the role of education in determining individual decision to invest in risky assets that yield higher portfolio returns in the long term, individuals holding stocks and investment real estate are more likely to be prepared for their retirement phase.

These results are corroborated by a similar regression analysis using the total retirement income available as an alternative income-based preparedness measure. Two noteworthy results are (i) college education is positively associated with the total income available at retirement, and the effect of education is larger in developing than developed economies that are included in this study; and (ii) holding stocks and investment real estate contributes positively to TAR for retirement in all five economies, and the estimated effects of stocks and investment real estate

assets in the regressions concerning the determinants of the income-based measure of TAR are larger for the PRC, India, and the ROK than for the US and Japan (Table 6).

D. The Role of the Economy's Level of Development

Both Tables 2 and 3 present measures of the total level of preparedness in urban versus rural regions of the economy. Such distinctions are reported only in the harmonized HRS samples of the PRC (CHARLS) and India (LASI). However, no such comparisons are available for the US, Japan, and the ROK. Table 2 also enables a comparison of the extent to which urban and rural households are able to support their financial preparedness from private sources that are available to the households, as indexed by our SDRs.

Not surprisingly, the ranking of the total financial preparedness, based on the consumption criterion, is slightly different from that based in the income criterion. In the PRC, urban households are significantly better able to maintain the consumption-based indices of financial preparedness than their rural counterparts, and the same pattern is shown in India. Moreover, these urban-rural difference in the PRC seems to be rising over time. In fact, the financial preparedness levels of urban families in the PRC are virtually tied with those of the rural households in India in 2018.

A quite different pattern is observed when the income criterion is used to compute the level of financial self-dependency (SDR) in urban relative to rural families. The overall levels of SDRs in rural areas in both the PRC and India are higher than those in the US, Japan, and the ROK. Also, the differences between urban and rural households are quite narrower by the SDR index. In fact, the SDR level of urban households in the PRC is quite similar to that of the rural households in India in 2018.

E. Limitations of the Analysis and Policy Implications

There are several limitations in our analysis of total preparedness and private preparedness by both the income and the consumption criteria.

The main limitation of the indices of old-age, or retirement preparedness using both the income and consumption criteria, is our assumption that household wealth does not generate any income from wealth over the retirement income. This is because none of the harmonized HRS surveys report any income from financial assets, interest and dividends, let alone capital gains. The absence of such income from capital may understate the contribution of wealth to postretirement consumption or income and, therefore, causes downward bias in the total and private preparedness estimates in both Tables 2 and 3 (footnote 5).⁹

Another limitation is that we need to use the average propensity to consume in order to derive consumption spending from income data. The population's actual propensity to consume near

⁹ Another limitation with similar consequences is our implicit assumption that the markets for risky financial and real estate assets are equally liquid, although they are typically more efficient in the more developed economies.

retirement may be quite different from the one corresponding to the general population. Finally, for simplicity, we assume that there is no change in public pension policies over the sample periods in terms retirement benefits and the eligible age. These limitations, notwithstanding the findings we obtain in this study, may serve as a guidance for policy makers where there is room to enhance both the total financial preparedness and especially the private preparedness level as measured by the self-dependency, based especially on our analysis of the basic determinants of private portfolio management and self-preparedness (the equivalent of our self-dependency in this study), which we emphasized in our related projects on the determinants of financial wellness at old age. The consistent findings in this study that education and holding risky assets, including stocks and investment real estate, are positively associated with individual consumption-based and income-based retirement preparedness offer important policy implications. They imply that policies that promote education, financial literacy, and financial market development have the potential to improve the financial independence and wellbeing of the elderly population and, on average, reduce acute dependency on public support programs.

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Table 1a: The Main Samples (Individuals Reaching Retirement Age Within 5 Years)—Means and Standard Deviations (in parentheses)

Variables	US	US	US	Japan	Japan	Japan	ROK	ROK	ROK	PRC	PRC	PRC	PRC	India
Year	2006	2008	2010	2007	2009	2011	2006	2008	2010	2011	2013	2015	2018	2018
Wealth	418405	406354	309936	216750	207152	158251	144922	190591	168010	23603	36497	98652	79502	45319
	(116170)	(1219680)	(461507)	(204799)	(226790)	(181520)	(244788)	(443872)	(272202)	(37295)	(107128)	(589565)	(361394)	(517015)
Home	266021	259552	222585	187003	144822	110777	167050	191882	173549	30236	51469	166170	70381	48305
	(315833)	(631741)	(234566)	(136489)	(173015)	(137395)	(250315)	(234364)	(196973)	(40162)	(203027)	(1177965)	(381384)	(526286)
Income	47094	44764	44192	17196	16620	16397	10180	9699	9487	2483	2210	2253	5413	1791
	(123594)	(99950)	(58595)	(11181)	(23066)	(13188)	(13673)	(10489)	(9616)	(6720)	(3518)	(4383)	(14519)	(10627)
Consumption	28934	27167	25183	14019	13723	12916	10294	10260	9706	1357	2188	4607	3290	3270
	(60748)	(66611)	(29177)	(8189)	(15664)	(9551)	(11980)	(9930)	(8799)	(1898)	(3442)	(21628)	(6521)	(21209)
Education	3.41	3.50	3.64	2.45	2.52	2.71	4.17	4.32	4.41	3.38	3.81	4.04	4.58	1.92
	(1.35)	(1.31)	(1.30)	(1.36)	(1.36)	(1.28)	(1.40)	(1.39)	(1.31)	(1.75)	(1.83)	(1.74)	(1.68)	(2.10)
Health	0.78	0.78	0.79	0.88	0.83	0.91	0.52	0.56	0.58	0.25	0.19	0.25	0.33	0.40
	(0.43)	(0.42)	(0.43)	(0.34)	(0.34)	(0.30)	(0.50)	(0.50)	(0.49)	(0.43)	(0.40)	(0.42)	(0.47)	(0.49)
Age	62.94	62.87	62.88	62.14	61.83	62.00	58.80	59.06	58.85	55.81	55.73	55.06	54.40	59.08
	(1.41)	(1.46)	(1.41)	(1.47)	(1.42)	(1.39)	(1.42)	(1.38)	(1.41)	(2.53)	(2.51)	(2.71)	(2.47)	(1.36)
Gender	0.49	0.48	0.46	0.49	0.56	0.46	0.52	0.51	0.50	0.68	0.71	0.59	0.40	0.63
	(0.49)	(0.49)	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.47)	(0.45)	(0.49)	(0.50)	(0.50)
Married	0.74	0.74	0.75	0.98	0.68	0.88	0.76	0.77	0.75	0.85	0.85	0.83	0.90	0.81
	(0.42)	(0.42)	(0.44)	(0.32)	(0.42)	(0.32)	(0.39)	(0.38)	(0.38)	(0.35)	(0.36)	(0.39)	(0.32)	(0.48)
Number of children	3.02	2.87	2.73	2.05	2.02	1.83	2.68	2.54	2.34	2.21	2.20	2.28	1.92	3.71
	(2.03)	(1.93)	(1.92)	(0.82)	(0.99)	(0.96)	(1.07)	(1.00)	(0.90)	(1.12)	(1.11)	(1.06)	(0.92)	(2.07)
Urban	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.35	0.33	0.32	0.53	0.32
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	(0.46)	(0.46)	(0.45)	(0.49)	(0.48)
Sample size	2524	2039	2303	549	525	302	1268	1129	1083	621	379	366	716	3872

n.a. = not available, PRC = People's Republic of China, ROK = Republic of Korea, US = United States.

Notes: Wealth, market value of home, income, and consumption are in 2010 constant United States dollars; and wealth, income, consumption are in per capita terms. The education variable is an integer value that varies across the different countries as described in section II.

Table 1b: The Auxiliary Samples (Retirees)—Means and Standard Deviations (in parentheses)

Variables	US	US	US	Japan	Japan	Japan	ROK	ROK	ROK	PRC	PRC	PRC	PRC	India
Year	2006	2008	2010	2007	2009	2011	2006	2008	2010	2011	2013	2015	2018	2018
Age	73.62	73.43	73.46	70.36	70.97	71.22	69.22	69.55	69.80	66.92	67.03	67.16	67.24	68.22
	(5.27)	(5.16)	(5.02)	(2.78)	(3.53)	(3.57)	(5.42)	(5.50)	(5.67)	(6.63)	(6.44)	(6.26)	(6.53)	(4.93)
Gender	0.45	0.45	0.46	0.38	0.35	0.42	0.46	0.46	0.47	0.48	0.53	0.51	0.46	0.72
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)
Education	3.12	3.18	3.30	1.72	1.88	2.14	3.38	3.51	3.66	3.01	3.11	3.35	3.58	1.91
	(1.39)	(1.38)	(1.36)	(1.21)	(1.25)	(1.38)	(1.53)	(1.54)	(1.53)	(1.89)	(1.88)	(1.88)	(1.91)	(2.20)
Married	0.64	0.64	0.67	0.77	0.52	0.69	0.68	0.69	0.68	0.66	0.69	0.66	0.73	0.71
	(0.48)	(0.48)	(0.48)	(0.34)	(0.42)	(0.38)	(0.46)	(0.45)	(0.45)	(0.47)	(0.46)	(0.48)	(0.45)	(0.49)
Health	0.71	0.72	0.76	0.73	0.79	0.83	0.34	0.35	0.35	0.19	0.22	0.21	0.22	0.32
	(0.46)	(0.46)	(0.44)	(0.43)	(0.41)	(0.38)	(0.47)	(0.47)	(0.47)	(0.38)	(0.40)	(0.40)	(0.41)	(0.47)
Number of children	3.34	3.32	3.27	2.17	2.24	2.07	3.66	3.52	3.36	3.16	3.16	3.03	2.65	3.97
	(2.20)	(2.20)	(2.17)	(0.75)	(0.97)	(0.91)	(1.57)	(1.52)	(1.50)	(1.63)	(1.60)	(1.47)	(1.36)	(2.17)
Public pension	11542	11581	12433	11812	12051	12635	635	805	1019	262	282	284	374	738
	(6072)	(6173)	(6723)	(7506)	(7585)	(9767)	(2079)	(2000)	(2208)	(1003)	(720)	(856)	(957)	(4855)
Private pension	8014	7839	6702	472	1165	889	1116	1277	1319	1548	1467	1647	2327	369
	(23544)	(30061)	(62868)	(1653)	(3519)	(2800)	(5772)	(5974)	(6123)	(2884)	(2795)	(3370)	(3240)	(1685)
Transfers	n.a.	n.a.	n.a.	679	676	537	1596	1762	1468	215	347	395	49	147
	n.a.	n.a.	n.a.	(2602)	(2139)	(2204)	(7648)	(5853)	(5128)	(2005)	(2782)	(2087)	(3173)	(889)
Medical expenses	3647	2966	3602	n.a.	n.a.	n.a.	n.a.	999	991	425	676	803	813	668
	(9713)	(10632)	(9971)	n.a.	n.a.	n.a.	n.a.	(2208)	(2153)	(2145)	(3336)	(5099)	(3282)	(3135)
Urban	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.44	0.42	0.45	0.52	0.31
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	(0.49)	(0.48)	(0.48)	(0.49)	(0.48)
Sample size	8585	8657	8264	1114	1263	558	3781	3694	3749	2765	2007	1921	3539	8904

n.a. = not available, PRC = People's Republic of China, ROK = Republic of Korea, US = United States.

Notes: Public pension income, private pension income, intra-family transfer income, and out-of-pocket medical expenses are all per capita and in 2010 constant United States dollars. The education variable is an integer value that varies across the different countries, as described in section II.

Table 2: Present Values of Estimated Retirement Income by Source, and Self-Dependency Ratio (SDR) and Public Dependency Ratio (PDR)

Country	Year	Present value of					SDR	Wealth Ratio	Transfer Ratio	Private Pension Ratio	PDR
		Net Wealth	Transfer Income	Private Pension Income	Public Pension Income	Total Available Resources					
US	2006	418405	n.a.	131547	187085	737037	0.61	0.39	NA	0.22	0.39
US	2008	406354	n.a.	135127	187122	728603	0.60	0.38	NA	0.23	0.40
US	2010	309936	n.a.	141648	187490	639074	0.60	0.35	NA	0.25	0.40
Japan	2007	216750	4109	19391	227217	467467	0.48	0.42	0.01	0.04	0.52
Japan	2009	207152	9019	20509	248396	485077	0.42	0.35	0.02	0.05	0.58
Japan	2011	158251	4216	20899	235958	419324	0.38	0.31	0.01	0.05	0.62
ROK	2006	144922	26241	16770	30894	218827	0.86	0.53	0.22	0.12	0.14
ROK	2008	190591	25446	17196	34786	268018	0.85	0.55	0.19	0.11	0.15
ROK	2010	168010	25577	17704	33838	245130	0.85	0.55	0.19	0.12	0.15
PRC	2011	23603	2276	25273	5623	56801	0.84	0.35	0.10	0.40	0.16
PRC	2013	36497	1512	30124	5441	73574	0.86	0.37	0.08	0.41	0.14
PRC	2015	98652	2258	27329	5558	133979	0.87	0.39	0.09	0.39	0.13
PRC	2018	79502	-1124	48498	6273	129102	0.88	0.4	0.03	0.45	0.12
PRC urban	2011	41384	-74	56812	8218	106484	0.89	0.31	0.02	0.57	0.11
PRC urban	2013	52619	-3306	72198	7898	129410	0.91	0.32	-0.02	0.62	0.09
PRC urban	2015	70830	-1412	63046	8464	141249	0.92	0.35	0	0.57	0.08
PRC urban	2018	109037	-4318	81354	8017	194296	0.92	0.35	-0.02	0.59	0.08
PRC rural	2011	14037	3535	8370	4233	30176	0.81	0.37	0.14	0.30	0.19
PRC rural	2013	28498	3902	9251	4222	45873	0.83	0.40	0.13	0.30	0.17
PRC rural	2015	111710	3965	10715	4207	130597	0.85	0.42	0.13	0.30	0.15
PRC rural	2018	45568	2602	10174	4239	53059	0.84	0.45	0.10	0.29	0.16
India	2018	45319	2087	3732	12158	62818	0.82	0.55	0.11	0.16	0.18
India urban	2018	80499	2427	6185	21370	109135	0.84	0.58	0.10	0.16	0.16
India rural	2018	28973	1931	2602	7916	41488	0.82	0.54	0.12	0.16	0.18

n.a. = not available, PRC = People's Republic of China, ROK = Republic of Korea, US = United States.

Note: Samples used in these calculations include individuals who shall reach the country-specific retirement age within 5 years. All values are in 2010 constant United States dollars. * The discount rate of 2% is used in the calculation of the present values.

Table 3: Consumption-Based Preparedness Index by Country and Year of Survey
(the share of sample individuals who have adequate financial means [from all four income sources] to maintain the level of consumption spendings prior to reaching the retirement age)

Country	Year	(1) Preparedness Index	(2) Preparedness Index [*]	(3) Retirement Age	(4) Life Expectancy
United States	2006	0.81	0.82	66	84
United States	2008	0.81	0.82	66	84
United States	2010	0.82	0.87	66	84
Japan	2007	0.87	0.78	65	86
Japan	2009	0.89	0.78	65	86
Japan	2011	0.86	0.79	65	86
ROK	2006	0.50	0.12	62	83
ROK	2008	0.56	0.19	62	83
ROK	2010	0.58	0.23	62	83
PRC	2011	0.73	0.75	62	80
PRC	2013	0.65	0.64	60	81
PRC	2015	0.62	0.62	60	81
PRC	2018	0.64	0.72	60	81
PRC - urban	2011	0.95	0.98	60	81
PRC - urban	2013	0.88	0.93	60	81
PRC - urban	2015	0.93	0.99	60	81
PRC - urban	2018	0.82	0.96	60	81
PRC - rural	2011	0.62	0.63	60	81
PRC - rural	2013	0.54	0.49	60	81
PRC - rural	2015	0.49	0.45	60	81
PRC - rural	2018	0.44	0.44	60	81
India ^{**}	2018	0.39 (0.73)	0.49	62	80
India - urban	2018	0.57 (0.79)	0.66	62	80
India - rural	2018	0.31 (0.70)	0.41	62	80

PRC = People's Republic of China, ROK = Republic of Korea.

Notes: Life expectancy is conditional life expectancy at the retirement age. For the PRC, the life expectancy for females at the retirement age of 55 is 82 and the life expectancy for males at the retirement age of 60 is 79. We use 81 as the life expectancy for both females and males for the PRC. Samples used consist of individuals who will reach the country-specific retirement age within 5 years. ^{*} For the United States, Japan, and the ROK, the benchmark per capita consumption spending is the United States median consumption level in respective years and, for the PRC and India, the benchmark per capita consumption is the PRC's median consumption level in respective years. Urban and rural median consumptions are used for the urban and rural samples, respectively. ^{**} estimates in parentheses are computed using the estimated per capita consumption, instead of the reported consumption information.

Table 4: Determinants of Individual Consumption-Preparedness Defined Relative to Individual-Specific Preretirement Consumption Levels

Variables	United States		Japan		ROK		PRC		India	
(Intercept)	-0.12 (0.21)	-0.11 (0.21)	0.00 (0.42)	0.53 (0.44)	0.87 *** (0.33)	0.89 *** (0.33)	0.11 (0.41)	0.07 (0.41)	0.11 (0.32)	0.18 (0.32)
Age	0.01 *** (0.00)	0.01 *** (0.00)	0.01 ** (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)
Gender	0.11 *** (0.01)	0.11 *** (0.01)	0.05 ** (0.02)	0.06 *** (0.02)	0.02 (0.02)	0.03 * (0.02)	0.08 ** (0.04)	0.07 * (0.04)	0.05 *** (0.02)	0.04 ** (0.02)
College	-0.02 * (0.01)	-0.02 ** (0.01)	0.01 (0.02)	-0.01 (0.02)	0.18 *** (0.03)	0.16 *** (0.03)	0.18 *** (0.07)	0.15 ** (0.07)	0.43 *** (0.03)	0.42 *** (0.03)
Married	-0.06 *** (0.01)	-0.06 *** (0.01)	-0.04 (0.05)	-0.04 (0.05)	-0.37 *** (0.02)	-0.38 *** (0.02)	0.00 (0.03)	0.00 (0.03)	-0.14 *** (0.02)	-0.14 *** (0.02)
Health	-0.01 (0.01)	-0.01 (0.01)	-0.03 (0.03)	-0.07 ** (0.03)	0.04 ** (0.02)	0.03 * (0.02)	0.04 * (0.02)	0.04 (0.02)	0.08 *** (0.02)	0.07 *** (0.02)
Number of children	0.00 (0.00)	0.00 (0.00)	0.00 (0.01)	-0.01 (0.01)	0.05 *** (0.01)	0.04 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)	0.01 *** (0.00)	0.01 *** (0.00)
Stocks		0.03 ** (0.01)		0.00 (0.03)		0.10 * (0.05)		0.05 (0.07)		
IRE		0.00 (0.01)		0.06 *** (0.02)		0.12 *** (0.02)		0.10 *** (0.03)		0.21 *** (0.02)
Wave 2	0.00 (0.01)	0.00 (0.01)	0.01 (0.05)	0.02 (0.05)	0.06 *** (0.02)	0.06 *** (0.02)	-0.07 ** (0.03)	-0.07 ** (0.03)		
Wave 3	0.01 (0.01)	0.02 (0.01)	-0.01 (0.06)	0.01 (0.05)	0.09 *** (0.02)	0.08 *** (0.02)	-0.08 ** (0.03)	-0.08 ** (0.03)		
Wave 4							-0.12 *** (0.03)	-0.14 *** (0.03)		
Urban							0.38 *** (0.02)	0.37 *** (0.02)	0.21 *** (0.02)	0.20 *** (0.02)
Sample size	6720	6720	1200	1125	3479	3479	1841	1841	3834	3834
R ²	0.03	0.03	0.01	0.02	0.12	0.13	0.17	0.18	0.13	0.15

*** = p < 0.01, ** = p < 0.05, * = p < 0.1, PRC = People's Republic of China, ROK = Republic of Korea.

Table 5: Determinants of Individual Consumption-Preparedness Defined Relative to a Common Preretirement Consumption Level

Variables	United States		Japan		ROK	PRC		India		
(Intercept)	0.19 (0.17)	0.23 (0.17)	2.66 *** (0.43)	2.51 *** (0.43)	0.12 (0.26)	0.15 (0.25)	0.24 (0.35)	0.19 (0.35)	0.25 (0.33)	0.31 (0.33)
Age	0.01 ** (0.00)	0.01 * (0.00)	-0.03 *** (0.01)	-0.03 *** (0.01)	0.00 (0.00)	0.00 (0.00)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)
Gender	0.20 *** (0.01)	0.20 *** (0.01)	0.34 *** (0.02)	0.36 *** (0.02)	-0.01 (0.01)	0.00 (0.01)	0.07 ** (0.03)	0.06 * (0.03)	0.01 (0.02)	0.00 (0.02)
College	0.18 *** (0.01)	0.14 *** (0.01)	0.13 *** (0.02)	0.10 *** (0.02)	0.40 *** (0.02)	0.36 *** (0.02)	0.02 (0.06)	0.00 (0.06)	0.45 *** (0.03)	0.45 *** (0.03)
Married	-0.04 *** (0.01)	-0.06 *** (0.01)	-0.19 *** (0.06)	-0.21 *** (0.05)	-0.13 *** (0.01)	-0.14 *** (0.01)	-0.15 *** (0.03)	-0.15 *** (0.03)	-0.07 *** (0.02)	-0.07 *** (0.02)
Health	0.21 *** (0.01)	0.19 *** (0.01)	0.11 *** (0.03)	0.08 *** (0.03)	0.06 *** (0.01)	0.05 *** (0.01)	0.16 *** (0.02)	0.15 *** (0.02)	0.06 *** (0.02)	0.05 *** (0.02)
Number of children	-0.03 *** (0.00)	-0.02 *** (0.00)	-0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	-0.01 ** (0.00)	-0.01 ** (0.00)
Stocks		0.09 *** (0.01)		0.15 *** (0.02)		0.30 *** (0.04)		0.03 (0.06)		
IRE		0.10 *** (0.01)		0.08 *** (0.02)		0.17 *** (0.01)		0.10 *** (0.02)		0.20 *** (0.02)
Wave 2	-0.01 (0.01)	0.00 (0.01)	-0.09 (0.06)	-0.08 (0.06)	0.06 *** (0.02)	0.06 *** (0.01)	-0.10 *** (0.03)	-0.11 *** (0.03)		
Wave 3	0.03 *** (0.01)	0.04 *** (0.01)	-0.02 (0.07)	0.00 (0.06)	0.10 *** (0.02)	0.09 *** (0.01)	-0.10 *** (0.03)	-0.10 *** (0.03)		
Wave 4							-0.10 *** (0.02)	-0.11 *** (0.02)		
Urban							0.47 *** (0.02)	0.46 *** (0.02)	0.18 *** (0.02)	0.17 *** (0.02)
Sample size	6720	6720	1372	1259	3480	3480	2041	2041	3834	3834
R ²	0.25	0.29	0.23	0.28	0.15	0.20	0.29	0.30	0.11	0.13

*** = p < 0.01, ** = p < 0.05, * = p < 0.1, PRC = People's Republic of China, ROK = Republic of Korea.

Note: The common consumption levels are the United States' median consumption for the United States, Japan, and the ROK, and the PRC's median consumption for the PRC and India.

Table 6: Determinants of Individual Income-Based Measure of Retirement Preparedness (TAR)

Variables	United States		Japan		ROK		PRC		India	
(Intercept)	11.52 *** (0.29)	11.69 *** (0.25)	13.89 *** (0.40)	13.72 *** (0.40)	11.79 *** (0.49)	11.88 *** (0.46)	11.18 *** (0.59)	10.86 *** (0.58)	9.21 *** (0.66)	9.40 *** (0.65)
Age	0.02 *** (0.00)	0.02 *** (0.00)	-0.02 ** (0.01)	-0.01 ** (0.01)	0.00 (0.01)	0.00 (0.01)	-0.02 ** (0.01)	-0.02 (0.01)	0.01 (0.01)	0.01 (0.01)
Gender	0.26 *** (0.01)	0.26 *** (0.01)	0.29 *** (0.02)	0.30 *** (0.02)	0.09 *** (0.02)	0.11 *** (0.02)	0.35 *** (0.06)	0.31 *** (0.06)	0.00 (0.03)	-0.02 (0.03)
College	0.54 *** (0.01)	0.42 *** (0.01)	0.19 *** (0.02)	0.15 *** (0.02)	0.87 *** (0.04)	0.76 *** (0.03)	0.97 *** (0.10)	0.75 *** (0.10)	1.54 *** (0.06)	1.51 *** (0.06)
Married	-0.10 *** (0.02)	-0.20 *** (0.01)	-0.31 *** (0.06)	-0.33 *** (0.05)	-0.34 *** (0.03)	-0.39 *** (0.03)	-0.22 *** (0.04)	-0.23 *** (0.04)	-0.41 *** (0.04)	-0.41 *** (0.04)
Health	0.30 *** (0.02)	0.22 *** (0.01)	0.11 *** (0.03)	0.10 *** (0.03)	0.32 *** (0.02)	0.30 *** (0.02)	0.16 *** (0.03)	0.13 *** (0.03)	0.13 *** (0.03)	0.12 *** (0.03)
Number of children	-0.05 *** (0.00)	-0.04 *** (0.00)	0.03 ** (0.01)	0.04 *** (0.01)	0.04 *** (0.01)	0.02 * (0.01)	0.04 ** (0.01)	0.04 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)
Stocks		0.38 *** (0.01)		0.20 *** (0.02)		0.67 *** (0.07)		0.50 *** (0.10)		
IRE		0.38 *** (0.01)		0.15 *** (0.02)		0.51 *** (0.03)		0.40 *** (0.04)		0.64 *** (0.05)
Wave 2	-0.04 ** (0.02)	-0.02 (0.01)	-0.11 * (0.06)	-0.09 * (0.05)	0.09 *** (0.03)	0.07 ** (0.03)	0.19 *** (0.04)	0.16 *** (0.04)		
Wave 3	-0.11 *** (0.02)	-0.09 *** (0.01)	-0.16 ** (0.07)	-0.14 ** (0.06)	0.11 *** (0.03)	0.07 ** (0.03)	0.31 *** (0.05)	0.32 *** (0.04)		
Wave 4							0.35 *** (0.04)	0.27 *** (0.04)		
Urban							1.31 *** (0.03)	1.27 *** (0.03)	0.82 *** (0.03)	0.80 *** (0.03)
Sample size	6720	6720	1372	1259	3480	3480	2073	2073	3822	3822
R ²	0.33	0.49	0.23	0.34	0.23	0.33	0.53	0.56	0.30	0.34

*** = p < 0.01, ** = p < 0.05, * = p < 0.1, PRC = People's Republic of China, ROK = Republic of Korea.

Note: The dependent variable is the log of total retirement income support.