The Japanese Economic Review
The Journal of the Japanese Economic Association

The Japanese Economic Review
Vol. 67, No. 4, December 2016

doi: 10.1111/jere.12107

DO THE RICH SAVE MORE IN JAPAN? EVIDENCE BASED ON TWO MICRO DATA SETS FOR THE 2000S

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Using two household surveys, this paper investigates whether the saving rates of richer households are higher than those of poorer households in Japan. We construct a number of proxies for lifetime wealth, including those original to this study, and find marginally positive correlations between saving rates and lifetime wealth for working age households. We further find that the relationship between saving rates and lifetime wealth differs depending on the life stage of individual households. Older households with higher lifetime wealth appear to be dissaving to some extent, which is more or less consistent with the lifecycle model of consumption.

JEL Classification Numbers: D12, D91.

1. Introduction

Do the rich (i.e. households with higher lifetime wealth or permanent income) save more?[1] This is a longstanding empirical question in economics that has important implications for tax and macroeconomic policies. For instance, if, for some reason, the rich save more, how policy shocks are distributed across households with different levels of wealth should be taken into account when assessing the effects of such policy shocks on aggregate consumption. In addition, it may be necessary to take measures to mitigate the regressive nature of consumption taxes when considering a higher tax rate.[2]

Whether the rich do, indeed, save more is a less straightforward matter than one might at first think. Friedman's (1957) permanent income model of consumption predicts that those with a high current income save more, even if individuals' saving rate is unaffected by their lifetime wealth. Using microdata and econometric techniques not available to earlier generations of researchers, Dynan *et al.* (2004) investigated the old question to find that richer households in the United States save a larger fraction of their income. Studies on other countries following in their footsteps (Bozio *et al.*, 2013, for the UK; Alan *et al.*, 2014, for Canada; and Néstor, 2015, for Latin America) found similar evidence of a positive relationship between saving rates and various proxies for lifetime wealth. However, researchers have not yet reached a consensus on how to interpret these findings.

Against this background, the present paper, focusing on Japan, empirically examines whether richer households (households with higher lifetime wealth) save a larger portion of their income than poorer households do. While household saving rates in Japan used to be the highest in the world (Hayashi, 1986; Horioka, 1990), given Japan's rapidly ageing population they have been declining since the 1990s, as the lifecycle model would suggest. That

[1] We define lifetime wealth as the total human and physical wealth that is available over the lifecycle of a household.

[2] That being said, Kohara and Ohtake (2014) argue that the consumption tax in Japan may not be regressive, because household consumption in Japan is likely to follow the permanent income hypothesis.

being said, many think that older households in Japan, which continue to hold the bulk of household sector savings, are not dissaving enough, and the effective use of the savings of these households has been recognized as an important policy issue. Therefore, the topic of our study is of interest not only from an academic perspective, but also of considerable relevance for real policy-making in Japan.

The major difficulty in answering the question is that lifetime wealth cannot be directly observed in data and a reliable proxy for lifetime wealth/permanent income is rarely available. For example, while household income is often used as a proxy for household lifetime wealth, it is well known that estimates of the relationship between saving rates and lifetime wealth are biased upward when current income is used as a proxy for lifetime wealth.[3] To deal with this problem, the present study uses data from two household surveys for Japan, the *Family and Lifestyle Survey* (FLS) and the *Family Income and Expenditure Survey* (FIES), which contain useful information closely related to households' lifetime wealth and consumption, respectively. The FLS, which was designed by our research group to study household economic issues, provides information on households' *subjective lifetime earnings* as well as a wide range of household attributes vital for answering our question. The FIES, a nationally representative monthly survey, collects detailed information on, for example, household income, expenditure and asset holdings. Using these two data sets, we construct a number of proxies of lifetime wealth, including ones that are original to this study: *subjective lifetime earnings*, lagged consumption, household assets, and the prices households paid for goods they purchased ("purchase prices"). Employing these proxies, we then run median regressions of saving rates on these measures/predictors of lifetime wealth following the two stage estimation strategy by Dynan *et al*. (2004).

While the estimated relationships between saving rates and lifetime wealth are sensitive to the choice of proxy for lifetime wealth, the patterns observed for working age households in Japan are generally consistent with those reported for Western countries: we find significant positive correlations when we use education and/or the type of occupation (job) as our instruments,[4] while the correlations disappear when we use consumption-related measures as alternative instruments. The results based on our original instruments (lagged consumption, household assets and the purchase price measure) only provide marginal support for a positive relationship between saving rates and lifetime wealth for working age households. When we compare the relationships for younger and older households, the results suggest that the relationship between saving rates and lifetime wealth differs depending on the life stage of individual households. Older households with higher lifetime wealth appear to be dissaving to some extent, which is more or less consistent with the lifecycle-permanent income hypothesis (LC-PIH).

The paper is organized as follows. Section 2 describes the two data sets, the FLS and the FIES, which are used for the empirical analysis in this study. Next, Section 3 briefly explains our empirical methodology to identify the relationship between saving rates and households'

[3] For example, if current income contains positive measurement errors or transitory income, calculated saving rates become high. Thus, saving rates will be positively correlated with the current income, and the estimated slope will be biased upward (if current consumption is used as a proxy for lifetime wealth). For the same reason, the estimated slope will be biased downward if current consumption is used as a proxy for lifetime wealth.

[4] What we call "instruments" in this study may differ from "instrumental variables" in studies using instrumental variable estimation in the sense that we are not trying to identify causal relationships between saving rates and lifetime wealth. Our primary purpose is to compare saving rates across households with different levels of lifetime wealth, and our "instruments" are variables used as proxies for lifetime wealth.

lifetime wealth. Section 4 then presents the results, while Section 5 summarizes the findings and discusses their implications.

2. Data sources

To examine the relationship between saving rates and lifetime wealth, we utilize two Japanese household data sets, the FLS and the FIES, both of which contain unique and useful information regarding households' savings and lifetime wealth.

2.1 Family and Lifestyle Survey

The FLS is a registered consumer tester-based panel survey (conducted in December 2011, December 2012 and February 2014) designed by our research group to collect information on the economic activities of households and households' basic attributes.[5] The sample consists of approximately 3,000 testers. While the survey is not necessarily nationally representative, the FLS questionnaire covers a wide range of household attributes, such as family structure, educational background, jobs held in the past, household assets and liabilities, and inheritances, in addition to household annual income and expenditures. Among other things, the FLS asks survey households the following question about their expected lifetime wealth (or *subjective lifetime earnings*):

> Q. What do you think is the total amount of income you and your spouse will be able to earn over your lifetime? Please answer giving a rough estimate ("about X hundred million yen").
>
> Your lifetime earnings: About ___ hundred million yen.
> Your spouse's lifetime earnings: About ___ hundred million yen.
>
> For example, if you think you will work for 40 years earning about 5 million yen per year, and after retirement you will receive a pension of about 1 million yen per year for 20 years, then the answer would be about 220 million (= 5 × 40 + 1 × 20 million) yen.

One might expect answers to this crude question to be rather unreliable.[6] However, in the case of Japan, where employment tends to be quite stable and secure under the so-called "lifetime employment system", it is relatively easy for many employees to more or less accurately predict their lifetime earnings. To assess how reliable the subjective measure of lifetime wealth is, we run a simple regression to relate the *subjective lifetime earnings* and a variety of household attributes. The regression results, reported in Table 1, indicate that the answer to the question (i.e. *subjective lifetime earnings*) shows a reasonably high correlation with variables that are generally assumed to be related to lifetime wealth. That is, households that regard themselves as affluent, households with a well-educated head/spouse, and households whose head is or

[5] See Hori *et al.* (2013a) and Hori *et al.* (2013b) for details on the FLS and survey questionnaires.

[6] This is particularly the case if the household consists of a young, unmarried person who has to take into account the expected lifetime earnings of a future spouse. To check if our results are affected by such observations, we also conducted regressions using a sample consisting of married households only and find that our results remain essentially unchanged.

TABLE 1
Regression of the subjective lifetime earnings on possible determinants

Dependent variable: Household subjective lifetime income (log)	Coefficient		Standard error	Coefficient		Standard error
	(1)			(2)		
Annual income (log)	0.258	***	(0.016)			
Self-perception of economic affluence dummy (base: normal)						
Very affluent	0.128		(0.135)			
Affluent	0.208	***	(0.042)			
Slightly affluent	0.139	***	(0.023)			
Slightly poor	−0.125	***	(0.024)			
Poor	−0.163	***	(0.041)			
Very poor	−0.187	*	(0.098)			
Type of household head occupation dummy (base: full-time, 1,000 or more)						
Housewife/Househusband	−0.495	***	(0.063)	−0.685	***	(0.065)
Self-employed	−0.103	***	(0.032)	−0.212	***	(0.034)
Business manager	−0.023		(0.061)	0.047		(0.066)
Full-time, civil service	−0.052	*	(0.028)	−0.085	***	(0.031)
Part-time worker	−0.367	***	(0.046)	−0.589	***	(0.047)
Full-time, 29 or fewer	−0.150	***	(0.033)	−0.296	***	(0.035)
Full-time, 30–449	−0.114	***	(0.024)	−0.185	***	(0.026)
Full-time, 500–999	−0.095	***	(0.035)	−0.123	***	(0.038)
Other	−0.107	***	(0.041)	−0.250	***	(0.042)
Type of spouse occupation dummy (base: housewife/househusband)						
Single (no spouse)	−0.146	***	(0.038)	−0.197	***	(0.037)
Part-time worker	0.008		(0.028)	−0.014		(0.030)
Full-time worker	0.089	***	(0.020)	0.094	***	(0.021)
Household head educational attainment dummy (base: high school or less)						
Junior college	0.062	**	(0.027)	0.108	***	(0.029)
University (undergraduate)	0.120	***	(0.022)	0.206	***	(0.023)
Graduate school	0.227	***	(0.039)	0.346	***	(0.042)
Spouse educational attainment dummy (base: single (no spouse))						
High school or less	0.210	***	(0.033)	0.257	***	(0.030)
Junior college	0.155	***	(0.035)	0.252	***	(0.033)
University (undergraduate)	0.198	***	(0.038)	0.318	***	(0.037)
Graduate school	0.282	***	(0.086)	0.448	***	(0.094)
Number of observations	2,672			2,986		
Adjusted R^2	0.433			0.297		
Root mean squared error	0.422			0.481		

Notes: Coefficients are estimated using OLS. Standard errors are shown in parentheses. ***, ** and * indicate significance at the 1, 5 and 10% level, respectively.

was a full-time employee at a large firm or a full-time civil servant all tend to report higher lifetime wealth.

Based on these findings, we use *subjective lifetime earnings* as a predictor of lifetime wealth in our FLS-based analysis below. In addition, we also try Dynan's two-stage estimation with instruments by regressing *subjective lifetime earnings* on the instruments to deal with potential biases caused by temporary shocks and measurement errors, because *subjective lifetime earnings* may be influenced by current income. In order to check this, we regress the change in *subjective lifetime earnings* on the change in annual income. The regression results are provided in Table 2. The coefficient on the change in annual income is significant at the 10% level, indicating that *subjective lifetime earnings* still appear to be influenced by annual fluctuations in

TABLE 2
Regression of the change in lifetime earnings on the change in annual income

Dep.: ΔHousehold lifetime income	Coefficient	Standard error
ΔHousehold annual income	0.979 *	(0.586)
ΔSelf-perception of economic affluence dummy	−147.152	(231.014)

Notes: Coefficients are estimated using OLS. Standard errors are shown in parentheses. ***, ** and * indicate significance at the 1, 5 and 10% level, respectively. In addition to the explanatory variables above, the regression also includes household head age, age squared, age cubed and a constant.

current income and that we need to use instruments that are correlated with lifetime wealth but not with current income.

2.2 Family Income and Expenditure Survey

The FIES is a nationally representative monthly survey (based on the *Statistics Act*) that aims at providing comprehensive data on the income and expenditure of households in Japan. The survey covers approximately 9,000 households each month, and each household is surveyed for 6 months; one-sixth of the households are replaced by new households every month. As the monthly consumption data are compiled from a diary collected twice a month, the information can be assumed to be accurate and credible. While the FIES does not necessarily provide all the different types of information that we need (e.g. it does not provide information on household members' educational attainment), it does provide very detailed information on household income, expenditure, assets and family structure for a far larger sample than the FLS.

Among the information available from the FIES microdata, we use the prices of goods that households purchased and households' asset holdings to construct the instruments that are original to this study. If we assume that households that purchase more expensive items in a particular category of goods are well off, we can use such purchase price information to construct a predictor of households' lifetime wealth. Specifically, what we did is to collect purchase prices (for each individual household) on 175 goods from the FIES and use their arithmetic average as a predictor of households' lifetime wealth (see Appendix I for details of the construction of the purchase price proxy). In addition, we use the FIES microdata to construct data on households' net asset holdings as our second proxy of households' lifetime wealth, calculating net asset holdings as financial assets + real estate assets – liabilities.[7] We expect this variable measuring net asset holdings to be a good predictor of lifetime wealth especially for older households that have retired and no longer earn labour income.

Table 3 compares the summary statistics of the two different data sets; i.e. the FLS and the FIES. The median/mean values for the *subjective lifecycle earnings*, which are available only from the FLS, indicate that the average Japanese household expects a lifetime wealth of approximately 230 million yen. A notable difference can be observed in the standard deviation of saving rates in the FLS and the FIES. This is due to differences in the way the data are constructed: the saving rates based on the FLS are calculated from reported annual income and consumption,

[7] While the FIES provides information on households' financial assets and liabilities, it does not provide information on their real estate assets. Therefore, we matched information on whether households own their home as well as on the location and floor area of their home, which is available in the FIES, with land price information from the Chika-Koji (*Published Land Price Information System*) to estimate the value of individual households' real asset holdings. See Hamaaki *et al.* (2015) for details of the data estimation.

while those based on the FIES are obtained by aggregating more volatile monthly income and consumption data over 6 months. As for the other variables, the basic statistics for the two surveys look quite similar, despite differences in the survey design and sample size.

3. Empirical methodology

The objective of our study is to examine whether the saving rates of rich households with higher lifetime wealth are higher than those of poor households with lower lifetime wealth. Following Dynan *et al.* (2004), we assume that the relationship between saving rates and lifetime wealth is given by.

$$s_{i,t} \equiv \frac{Y_{i,t} - C_{i,t}}{Y_{i,t}} = f\left(Y^*_{i,t}\right) + X_{i,t}\beta + \varepsilon_{i,t}, \tag{1}$$

where $s_{i,t}$ is household i's saving rate in year t,[8] $Y_{i,t}$ is household's current income, $C_{i,t}$ is the household's current consumption,[9] $Y^*_{i,t}$ is the household's lifetime wealth and $X_{i,t}$ is a set of other determinants of saving behaviour (including the age of the household head). Note that we do not assume any causal relationship between $Y^*_{i,t}$ and $s_{i,t}$ in Equation (1). Our primary purpose is simply to determine if function $f(.)$ is increasing or decreasing in $Y^*_{i,t}$, because the correlation *per se* has strong policy implications (e.g. consumption taxes will be regressive if $f(.)$ is increasing in $Y^*_{i,t}$). To allow for the possibility that the saving rate, $s_{i,t}$, is nonlinear in lifetime wealth, we parameterize $f(.)$ using a set of dummy variables capturing the quintile of lifetime wealth to which each household belongs in its age group.

The key problem we face is that we cannot observe households' true lifetime wealth ($Y^*_{i,t}$). If we use current income as a proxy, the result will be biased upward, because either measurement errors or the smoothing of temporary income fluctuations will generate a positive relationship between saving rates and current income. If we use current consumption instead, the result will be biased downward due to transitory shocks to or measurement errors in current consumption. One of the biggest advantages of the FLS data is that it contains the *subjective lifetime earnings* measure mentioned in the previous section. Household heads also report their estimates of the fraction of income they have already earned so far of their *subjective lifetime earnings*. In addition, the FLS contains data on financial and real assets. Therefore, we can define the "*permanent income*" of household i ($P_{i,t}$) as follows:

$$P_{i,t} \equiv A_{i,t} + \sum_{j=t+1}^{T} Y_{i,j} \equiv A_{i,t} + (1-b)L_{i,t}, \tag{2}$$

where $A_{i,t}$ represents household i's net assets at time t, $\left\{Y_{i,j}\right\}_{j=t+1}^{T}$ its future income, $L_{i,t}$ its *subjective lifetime earnings*, and b the fraction of the lifetime earnings the household has already earned. We expect that we can mitigate the upward bias due to transitory income by using

[8] As shown in Equation (1), we define saving rates using current income and consumption so that the results are comparable to those in the previous literature. Therefore, the saving rates analysed in this paper contain only active savings, while passive savings such as capital gains are not included.

[9] To be precise, we use disposable income (total household income minus tax and social security payments) when we calculate the saving rates in our empirical analysis. Moreover, we include imputed rent in the income and consumption of homeowner households in the regressions.

TABLE 3
Summary statistics: Saving, income, assets etc.

	All sample households				Aged 60 or below				Aged 61 or above			
	Observations	Median	Mean	Standard deviation	Observations	Median	Mean	Standard deviation	Observations	Median	Mean	Standard deviation
Family and Lifestyle Survey, 2011, 2012												
Saving ratio	1,869	0.170	0.180	0.663	1,230	0.200	0.213	0.691	639	0.123	0.114	0.601
Disposable income	1,869	477	521	323	1,230	500	551	326	639	394	462	308
Consumption	1,869	360	392	179	1,230	400	409	184	639	350	361	165
Net assets	1,797	1,450	2,495	3,898	1,177	750	1,504	3,160	620	3,233	4,376	4,439
Financial assets	1,851	500	1,236	1,934	1,218	400	831	1,556	633	1,150	2,016	2,315
Real assets	1,819	1,360	1,953	3,011	1,190	1,000	1,562	2,444	629	1,750	2,693	3,756
Liabilities	1,846	0	703	1,550	1,213	175	895	1,585	633	0	336	1,410
Subjective lifecycle income	1,866	22,667	23,941	10,266	1,230	22,333	23,757	10,351	636	23,250	24,295	10,096
Lifecycle income: male	1,131	23,500	24,980	10,197	751	23,333	24,965	10,224	380	24,000	25,009	10,156
Lifecycle income: female	735	21,500	22,341	10,171	479	21,000	21,863	10,276	256	22,667	23,236	9,931
Household head age	1,869	50.00	51.50	14.01	1,230	43.00	43.11	8.87	639	67.00	67.60	5.28
Number of family members	1,846	3.00	3.11	1.35	1,215	3.00	3.34	1.36	602	2.00	2.67	1.21
Family Income and Expenditure Survey, from 2002–2012												
Saving ratio	101,349	0.173	−0.115	20.294	62,392	0.255	0.051	22.675	38,957	−0.004	−0.380	15.743
Disposable income	101,349	470	525	292	62,392	589	621	300	38,957	352	371	196
Consumption	101,349	396	440	210	62,392	425	469	218	38,957	357	393	186
Net assets	101,349	2,133	2,925	3,282	62,392	1,330	2,071	2,697	38,957	3,485	4,293	3,651
Financial assets	101,349	920	1,569	1,986	62,392	672	1,134	1,476	38,957	1,551	2,265	2,446
Real assets	101,349	1,454	1,792	2,052	62,392	1,295	1,587	1,936	38,957	1,635	2,121	2,186
Liabilities	101,349	0	436	945	62,392	20	650	1,086	38,957	0	93	495
Household head age	101,349	55.00	54.64	15.01	62,392	45.00	44.81	9.38	38,957	70.00	70.38	6.57
Number of family members	101,349	3.00	3.09	1.13	62,392	4.00	3.49	1.10	38,957	2.00	2.43	0.81

permanent income as defined above, while the regression reported in Table 2 implies that the *subjective lifetime earnings* still may be influenced by transitory income. Moreover, we need to rely on conventional income measures in our regressions with the FIES data, because the *subjective lifetime earnings* are available only in the FLS data. To deal with the endogeneity arising from transitory income and consumption, earlier studies (Dynan *et al*., 2004; Bozio *et al*., 2013; Alan *et al*., 2014) employed a two-stage estimation procedure using instruments correlated with lifetime wealth but uncorrelated with measurement errors and/or temporary income shocks, and we basically follow the same estimation strategy.[10]

More specifically, we first regress income measures (current income from the FIES/permanent income from the FLS) on the instrument ($Z_{i,t}$) and the age group dummies ($X_{i,t}$):

$$Y^*_{i,t} = Z_{i,t}\alpha + X_{i,t}\varphi + u_{i,t}.$$

We then use the predicted value ($\hat{Y}^*_{i,t}$) as a proxy for lifetime wealth, assign households to the predicted lifetime wealth quintiles for each 5-year age category, and construct the quintile dummies. In the second stage, we estimate Equation (1) using quantile (median) regression.[11]

A key aspect of our empirical strategy obviously is the choice of instrument/predictor for lifetime wealth. Instruments must be correlated with true lifetime wealth but not with temporary components of current income or current income measurement errors. Given the data available from the two data sets, we try the following six instruments: (1) lagged income (used in the regressions based on the FLS data as well as those based on the FIES data); (2) educational attainment and the longest job held (FLS) or the current job (FIES); (3) consumption (FLS) or nondurable consumption (FIES); (4) lagged consumption (FLS); (5) purchase prices households paid when purchasing certain goods; and (6) households' net asset holdings (FLS and FIES). Lagged consumption, purchase prices and assets are instruments that have not been used in other studies so far and are introduced as new proxies of lifetime wealth here.[12]

Using lagged income should help to mitigate the problems caused by transitory income and measurement errors, although lagged income is not a perfect instrument when the transitory component of earnings shows some persistence. To eliminate the effect of transitory income, previous studies used educational attainment and the type of occupation (job). The educational attainment (as well as the type of occupation (job)) of household members is typically fixed over the lifecycle and, therefore, correlated with lifetime wealth and uncorrelated with transitory shocks or measurement errors, so that we use these instruments as well. However, educational attainment (and the type of occupation (job)) may also be correlated with

[10] The advantage of the two-stage estimation procedure over direct regression on the variables that were used as instruments is that the estimated slopes can be compared across different instruments. Moreover, employing the two-stage estimation approach allows us to include more than one variable as instruments.

[11] When $Z_{i,t}$ is a consumption-related instrument, we also include dummy variables indicating the starting month of the survey to allow for consumption seasonality.

[12] In addition to the six instruments above, we also tried various instruments based on the shares of specific items in total expenditure, such as the share spent on food (i.e. Engel's coefficient) and the share spent on luxury items. However, we found that the slopes are all negative. We suspect that such expenditure share-based proxies are not free from negative biases due to transitory expenditure, as in the case of the current consumption, especially when the observation period of a survey is not long enough. Because this seems to be the same problem as in the regression with consumption as an instrument, we decided not to report the results based on these expenditure share-based instruments.

unobserved taste variables such as "patience" that may influence both saving rates and lifetime wealth. Regarding the influence of unobserved tastes on the positive relationship between saving rates and educational attainment (and the type of occupation (job)), Alan *et al*. (2014) therefore argue that instruments such as educational attainment and the type of occupation (job) may not be valid, because an observed correlation does not necessarily imply a causal relationship. However, because any correlation (regardless of the causal relationship) would have strong policy implications such as with regard to the regressiveness of consumption taxes, using these instruments can still provide important insights.

Of the instruments used here, (nondurable) consumption is probably the instrument that most closely takes the permanent income hypothesis at face value, but the estimated relationship between saving rates and consumption-proxied lifetime wealth may be biased downward, because saving rates are negatively correlated with transitory components of consumption. To deal with this problem, we use two more consumption-related instruments: lagged consumption (from the FLS) and the purchase price measure (from the FIES) gauging consumption patterns. We expect lagged consumption, data for which we can construct from the FLS, to mitigate the negative bias that arises when using current consumption.[13] Next, the FIES contains detailed information for each household on the quantity of certain goods[14] purchased and the expenditure on all of the goods purchased. We use this information to calculate the purchase price for each type of good purchased by a household and construct the variable q_{ij}, which indicates which quintile the purchase price of good j paid by household i belongs to. Then, we define the purchase price measure as the average of q_{ij} across the goods purchased by household i.

If the LC-PIH holds, consumption is a perfect measure of permanent income. However, we are not certain whether the consumption measure is free from transitory expenditures and measurement errors. Another prediction of the LC-PIH that may be useful to our study is that households accumulate assets in preparation for their retirement, and, therefore, we assume that the asset holdings of older households provide a relatively good approximation of their permanent income. Consequently, we use households' net assets as another instrument.[15] We think that the regressions using assets as a proxy may be particularly important with regard to older households, because for such households (especially when they are retired) current and lagged income as well as educational attainment and job type may not be good proxies for their lifetime wealth.

4. Results

4.1 Saving rates and current income

We start by simply regressing the saving rate on current income without instruments to reconfirm that saving rates are, indeed, positively correlated with current income. To compare the saving–income relationship for households at different life stages, we run separate regressions for households with heads aged 20–60 and for those with heads over 60. If households smooth

[13] Unfortunately, because the FIES covers individual households only for a period of 6 months, we cannot construct lagged consumption using the FIES data.

[14] Because several items, such as "travel", are uncountable, quantity information is not available for all purchases.

[15] We define net assets as financial assets plus real assets minus liabilities. Real assets consist only of housing because the FIES does not provide any information on the stock of durable goods or non-residential housing.

TABLE 4
Median regressions of saving rate on current income quintiles

	Households with head aged between 20 and 60	Households with head aged 61 or above
Family and Lifestyle Survey, 2011, 2012		
Quintile 1	0.0000 (0.0263)	−0.0705 (0.0292)
Quintile 2	0.1014***,††† (0.0384)	0.0000***,† (0.0322)
Quintile 3	0.1505*** (0.0356)	0.1070***,††† (0.0336)
Quintile 4	0.2109***,† (0.0299)	0.1454*** (0.0345)
Quintile 5	0.3588***,††† (0.0303)	0.3579***,††† (0.0455)
Sample size	1,230	639
Pseudo R^2	0.0933	0.1197
Coefficient on annual income/1,000,000 (yen)	0.0381*** (0.0039)	0.0444*** (0.0046)
Family Income and Expenditure Survey, 2002–2012		
Quintile 1	0.0572 (0.0045)	−0.7322 (0.0176)
Quintile 2	0.2424***,††† (0.0037)	−0.0620***,††† (0.0057)
Quintile 3	0.3068***,†† (0.0039)	0.0688***,††† (0.0046)
Quintile 4	0.3515***,††† (0.0035)	0.1356***,††† (0.0043)
Quintile 5	0.4174***,††† (0.0034)	0.2484***,††† (0.0047)
Sample size	60,263	41,086
Pseudo R^2	0.0521	0.0651
Coefficient on income/1,000,000 (yen)	0.0429*** (0.0005)	0.1217*** (0.0020)

Notes: The coefficients are from median regressions. Bootstrapped standard errors are shown in parentheses. ***, ** and * indicate significance at the 1, 5 and 10% level, respectively. †††,†† and † indicate that the coefficient is significantly greater than that for the previous quintile, on the basis of a two-sided 1, 5 and 10% test, respectively. The regressions also include dummy variables for 5-year age brackets and, in the case of the regressions based on the FIES data, for the starting month of the survey.

consumption over their lifecycle and save money in preparation for retirement, saving behaviour should differ across life stages. Especially for older households that are already in their dissaving stage, one would expect wealthier households with larger assets to spend more (save less), because they have more funds to draw down.

Because we are interested in the slope of the relationship between saving rates and lifetime wealth, we test the null hypothesis that, for quintiles higher than the bottom one, the coefficient on the dummy for a quintile is equal to the coefficient for the bottom quintile (i.e. the poorest group).[16] In addition, we test if the coefficient on the dummy for a higher quintile is equal to the coefficient on the dummy for the quintile immediately below. The results of the median regressions are shown in Table 4. Numbers in parentheses are bootstrapped standard errors. The asterisks ***/**/* indicate that the coefficient is significantly different from that for the bottom quintile on the basis of a two-sided 1/5/10% test, while †††/††/† indicate that the coefficient is significantly different from that for the previous quintile on the basis of a two-sided 1/5/10% test. Both in the FLS and in the FIES we find a clear positive correlation between saving rates and current income for working age households. The coefficients from separate linear regressions (instead of the quintile-based regression) indicate that saving rates rise by approximately 3–4 percentage points when current income increases by 1 million yen (approximately US$9,100). Although the estimated saving rates are lower, we observe a similar positive correlation for older households as well.

[16] To be more precise, the coefficient for the bottom quintile is the constant term, because the regression includes a constant term and dummy variables for the second to the fifth quintile.

TABLE 5
Median regressions of saving rate on permanent income quintiles

	Family and Lifestyle Survey, 2011, 2012	
	Households with head aged between 20 and 60	Households with head aged 61 or above
Permanent income		
Quintile 1	0.1083 (0.0426)	0.0474 (0.0227)
Quintile 2	0.1602 (0.0385)	0.1156 (0.0325)
Quintile 3	0.1648 (0.0356)	0.1065 (0.0309)
Quintile 4	0.2308***,†† (0.0340)	0.1669*** (0.0312)
Quintile 5	0.3202***,††† (0.0398)	0.2463*** (0.0446)
Sample size	1,230	639
Pseudo R^2	0.0361	0.0325
Coefficient on permanent income/10,000,000 (yen)	0.0109*** (0.0015)	0.0163*** (0.0015)

Notes: See the footnotes for Table 4.

4.2 Saving rates and permanent income

Replacing current income with our *permanent income* (defined by Equation 2) does not change the basic findings (see Table 5), although use of the latter measure appears to make the slopes less steep. The coefficients from the linear regressions indicate that saving rates rise by 0.8 percentage points when the *permanent income* of a household increase by 10 million yen (US$91,000) for households with younger heads. However, the observed correlation could be biased upwards, because the *subjective lifetime earnings* still may be influenced by current economic conditions as is suggested by the regression results in Table 2. Thus, we use permanent income (from the FLS) as the regressand in the first stage of the two-stage estimation procedure, and try various instruments in the following subsections.

4.3 Results based on a variety of instruments

To deal with the bias caused by transitory shocks to and measurement errors in income, we now turn to the two-stage estimation procedure with instruments. Earlier studies for other countries suggest that the estimated relationship between saving rates and households' lifetime wealth is sensitive to the choice of instrument to proxy lifetime wealth. Broadly speaking, researchers have found a strong positive relationship between saving rates and households' lifetime wealth when using education as an instrument. In contrast, when researchers use household expenditure-related variables as instruments, they found only a weakly positive or no relationship. In the following subsection, we report the results based on our six different instruments in turn, using line charts (Figs 1 to 6) to provide a graphic illustration of the correlation between estimated saving rates and lifetime wealth. To confirm that the selected instruments are not weak, we also calculate the first-stage *F*-statistics.[17] These are shown at the bottom of the respective chart.[18]

[17] The given instruments are considered weak if the first stage *F*-statistics are less than 10 (see Staiger and Stock, 1997; Stock and Yogo, 2005).

[18] Please see tables 6a to 6e in the discussion paper version of this paper on the ESRI website (http://www.esri.go.jp/jp/archive/e_dis/e_dis322/e_dis322.pdf) for details of the regression results with instruments.

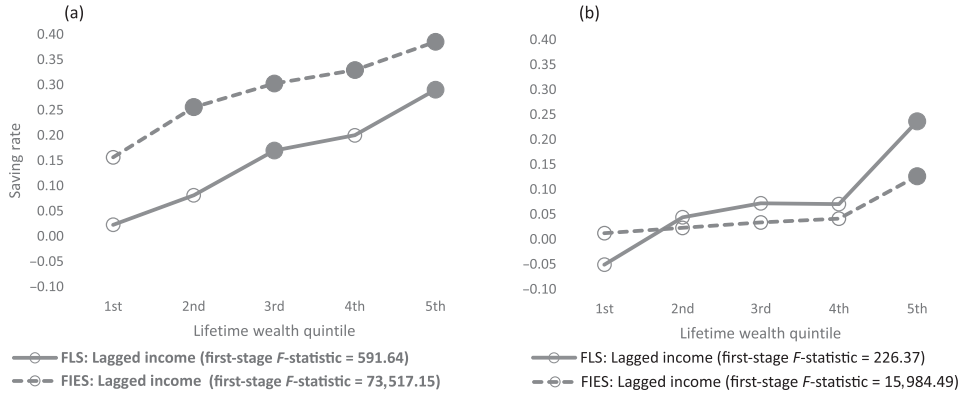

FIGURE 1. Lifetime wealth quintiles (proxied by lagged income) and saving rate: (a) households with head aged between 20 and 60 and (b) households with head aged 61 or above

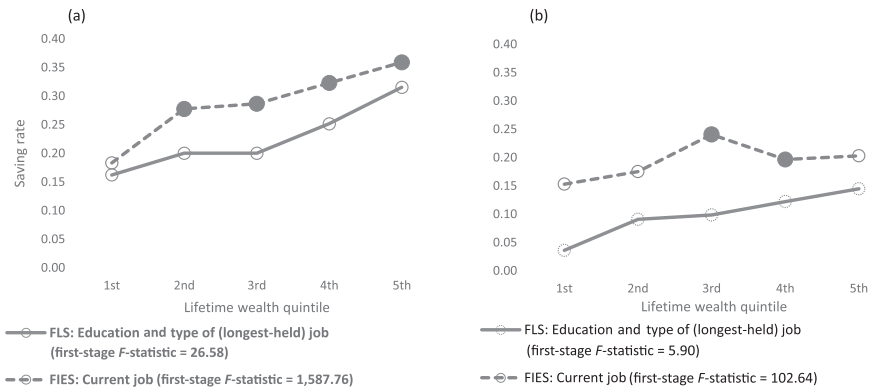

FIGURE 2. Lifetime wealth quintiles (proxied by education and type of occupation) and saving rate: (a) households with head aged between 20 and 60 and (b) households with head aged 61 or above

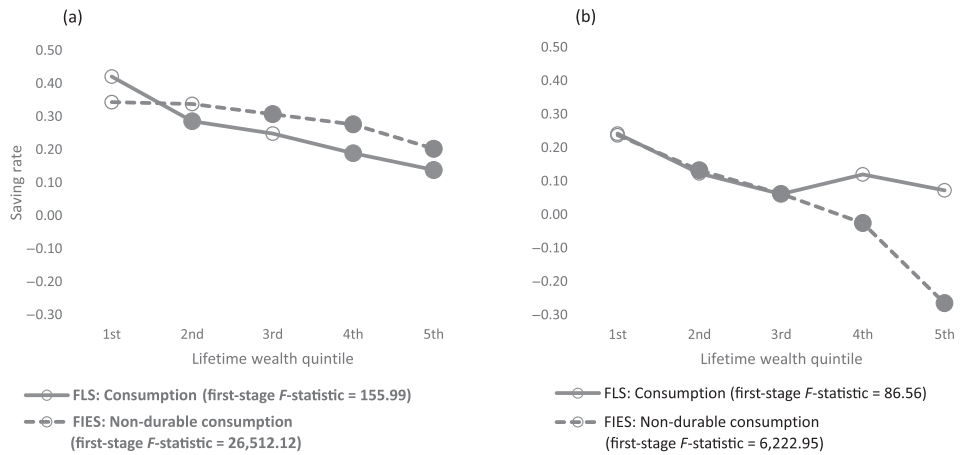

FIGURE 3. Lifetime wealth quintiles (proxied by consumption) and saving rate: (a) households with head aged between 20 and 60 and (b) households with head aged 61 or above

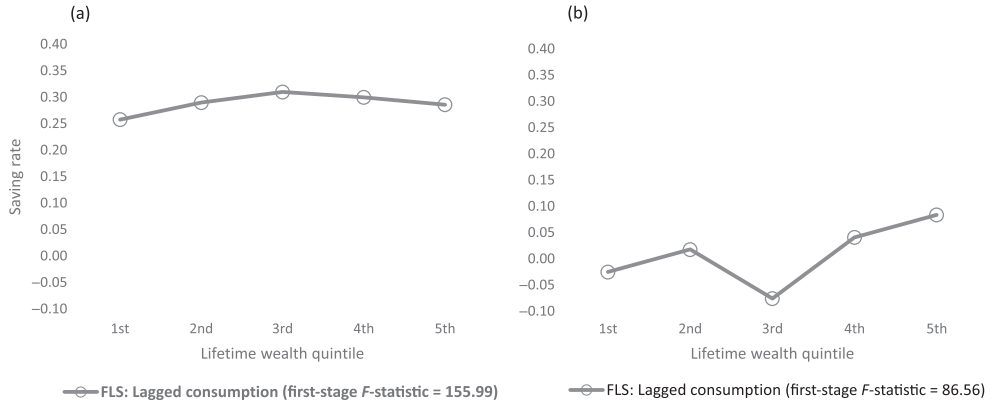

FIGURE 4. Lifetime wealth quintiles (proxied by lagged consumption) and saving rate: (a) households with head aged between 20 and 60 and (b) households with head aged 61 or above

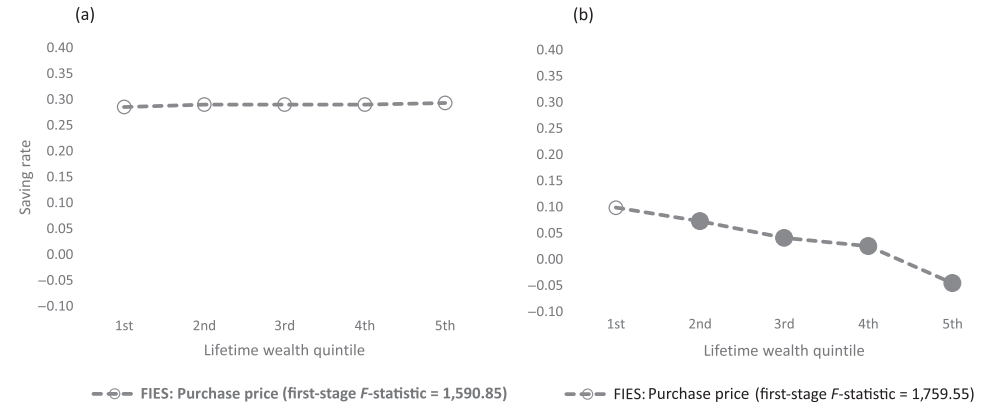

FIGURE 5. Lifetime wealth quintiles (proxied by purchase price) and saving rate: (a) households with head aged between 20 and 60 and (b) households with head aged 61 or above

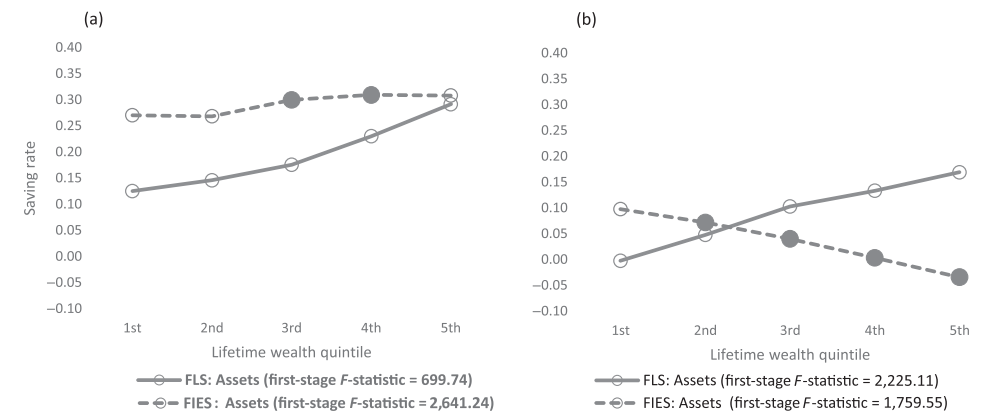

FIGURE 6. Lifetime wealth quintiles (proxied by assets) and saving rate: (a) households with head aged between 20 and 60 and (b) households with head aged 61 or above

Instrument 1: Lagged income

If the positive correlation between saving rates and lifetime wealth is generated by transitory income, we can eliminate the upward bias by using lagged income. The results using lagged income as our instrument are presented in Figure 1.[19] While the estimated slopes still indicate that there is a positive correlation between saving rates and lifetime wealth quintiles, both in the permanent income-based FLS regressions and in the current income-based FIES regressions, the slopes with instruments are flatter than those without instruments (reported in Tables 4 and 5). While the slopes estimated for older households (Fig. 1b) are flatter than those for working age households (Fig. 1b), saving rates are still higher for households with higher lagged income.

Instrument 2: Education and the longest-held job

If the temporary component of income has some persistence, 1-year lagged income may not be a satisfactory instrument for households' lifetime wealth. Therefore, we use the household head's education level and type of occupation, for which we use the (longest-held) job, and which we assume are closely related to lifetime wealth and constant over time. The results of the median instrumental variable regressions using educational attainment and/or job types as instruments are reported in Figure 2. We use a combination of educational attainment and the longest-held job as our instruments for regressions with the FLS data. For regressions with the FIES data, we limit our sample to worker households and use the type of job currently held as our instrument, because the FIES does not provide information on educational attainment or previous jobs.

The results for households with a working age head aged 20–60 (Fig. 2a) indicate that saving rates still are significantly higher for richer households, although the slope is flatter than those reported in Tables 4 and 5, in which no instruments are used. The shallower slope with instruments suggests that the upward bias caused by transitory income is mitigated. Furthermore, for older households (Fig. 2b), the positive correlation that we obtained in the regressions without instruments has more or less disappeared in the two-stage regressions using educational attainment and the type of occupation (job) as instruments.[20]

Instrument 3: (Nondurable) Consumption

According to the LC-PIH, although consumption is vulnerable to temporary shocks, it should be a more direct measure of permanent income than income or assets. While earlier studies use *nondurable* consumption as an instrument to mitigate the bias from transitory consumption, here we use *total* consumption for the regression with the FLS data, because the FLS unfortunately does not provide information on durable consumption. On the other hand, for the FIES regressions, we can use nondurable consumption.

The regression results are reported in Figure 3. Regardless of the data set used, we obtain a negative correlation between saving rates and lifetime wealth when these are proxied using the consumption measures. However, in light of the positive correlations obtained for most of the

[19] Filled markers in the charts indicate that the saving rate of the specified quintile is significantly different from that of the previous quintile on the basis of a two-sided test at the 10% level.

[20] Note that, for the FIES-based regression using the type of occupation (job) as an instrument, older households are not necessarily representative and their saving rates should be higher than those in other regressions with older households, because retired households are dropped from the sample used for this regression using the job type as an instrument.

other instruments, it seems reasonable to assume that the negative correlation here is produced by the negative correlation between saving rates and transitory components of consumption.

Instrument 4: Lagged consumption

To eliminate the influence of transitory components and measurement errors in consumption, employing the FLS data we try using lagged consumption as an alternative instrument (see Fig. 4). The correlations turn, albeit marginally, positive again, supporting our assumption that the negative correlations in Figure 3 are the result of the negative bias associated with transitory consumption.

Instrument 5: Purchase prices

Next, we look at the results when using the purchase price measure as a proxy for households' lifetime wealth.

The results are reported in Figure 5. The estimated slope for working age households is more or less flat. However, the coefficient from the linear regression indicates that saving rates rise marginally when household lifetime wealth increases. A clear negative correlation between saving rates and lifetime wealth is observed for older households.

Instrument 6: Assets

Because income as well as the type of occupation (job) may simply be poor measures of lifetime wealth for retired households, we also try assets held by households as an alternative instrument for households' lifetime wealth. Because it can be assumed that older households have completed most of their wage-earning period, assets held by older households should be a very good proxy for their lifetime wealth.

The regression results using assets as an instrument are reported in Figure 6.[21] They show that for younger households, saving rates are increasing in households' affluence in both data sets, although the estimated slopes look flatter than those without instruments (reported in Tables 4 and 5) or those with non-consumption-based instruments (Figs 1 and 2). Turning to older households (Fig. 6b), saving rates as expected generally look lower than those of younger households. What is more interesting, however, is that in the FIES saving rates for older households are decreasing in households' lifetime wealth and the slope is significantly different from zero, suggesting that older households with larger assets are dissaving, in line with the prediction of the lifecycle model as well as some earlier studies on the saving behaviour of the aged in Japan (see Horioka, 2010).[22]

[21] When we include imputed rent in disposable income, the results using assets as an instrument may be biased downward, because possible measurement errors in assets affect both the dependent variable and the instrument. To see whether this issue materially affects our results, we also run regressions using saving rates without the adjustment for imputed rent, but find that the effect of imputed rent is negligible.

[22] According to our estimates, even though richer households tend to save less, among older households, only the richest appear to dissave, implying that many households do not use up their assets and leave a bequest. Therefore, another question that is worth studying is how saving rates are related to the bequest motive. One of our data sets (FLS) fortunately asks a question about the intention to leave a bequest, and we observe that those who intend to leave a bequest tend to save more. However, the estimated relationships between saving rates and lifetime wealth do not change substantially if we control for the bequest motive in the second stage of our regressions.

5. Conclusion

To empirically examine whether the rich in Japan save a higher share of their lifetime wealth, we regressed household saving rates on a variety of measures of households' lifetime wealth. While the estimated relationships between saving rates and households' lifetime wealth are sensitive to the choice of lifetime wealth measure, the patterns observed for working age households in Japan are generally consistent with those reported for Western countries.

In earlier studies, the finding of a positive correlation when education is used but of a negative correlation when consumption measures are used has given rise to conflicting interpretations. However, if we take these results at face value, a possible explanation is as follows. The positive correlations between saving rates and household lifetime wealth when education and type of occupation are used as instruments probably (and at least partly) reflect the fact that there is an unobserved household characteristic such as "patience" that affects both saving rates and lifetime wealth. That is, "patient" individuals may tend to both save more and go to university and get a better job. In that case, the rich save more not because they are rich, but because they place higher value on future consumption and this preference is also reflected in the fact that they have attended university.[23] On the other hand, the negative correlations when consumption-related instruments are used probably reflect the negative bias associated with transitory consumption. The results based on the proxies that we newly introduced in this paper, namely, *permanent income* as well as information on purchase prices and asset holdings, appear to provide, albeit marginal, support for a positive relationship. Furthermore, we find that the saving–income relationship differs depending on the life stage of individual households. Specifically, the results of the regressions with the purchase price measure and with household assets suggest that older households with higher lifetime wealth appear to be dissaving to some extent.[24] Given that no previous studies have found evidence of a negative correlation between saving rates and lifetime wealth for older households, our results based on the FIES data, which can be considered to be highly accurate and credible, possibly provide the first empirical evidence in support of the LC-PIH; namely, that those who save more when they are young seem to spend more when they get older.

To sum up, our results suggest that for working age households in Japan there is, indeed, a positive relationship between saving rates and lifetime wealth. However, the observed positive correlation is only marginal and does not necessarily mean that there is a causal relationship between households' lifetime wealth and their saving rate; instead, it is likely that the correlation results from the fact that some households have certain characteristics that both lead them to save more and enable them to earn more over their lifetime (e.g. by attaining more education). Moreover, while the positive correlation for younger households that we found seems to contradict the representative agent-based lifecycle model of consumption (with homothetic preferences), our second finding that older households with larger assets are dissaving seems to be compatible with lifecycle models with heterogeneous agents.

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[23] In order to see if the correlation between saving rates and lifetime wealth (proxied by education and type of occupation) is driven by unobservable household characteristics, we tried to add a "patience" measure to our FLS data-based regressions using educational attainment and type of occupation as instruments (see Appendix II). We found that the estimated slope does become slightly flatter for younger household heads, although for older households it changes in the opposite direction.

[24] While the slope for older households is positive in the regression with lagged income as an instrument, it turns negative if we run the median regression only with retired households.

Economists, in their professional capacity, often refuse to recognize a relationship unless there is a clear-cut causal structure underlying such a relationship. However, in the case of the issue examined here, the existence of such a relationship, as mentioned in the Introduction, has important macroeconomic implications, whatever the reasons for the relationship are.

Acknowledgements

The first draft of this paper was presented at the ESRI International Conference titled "For Sustainable Growth of Japan's Economy" in Tokyo on 1 August 2014. The paper was also presented at the 2015 Spring Meeting of the Japanese Economic Association in Niigata on 23 May 2015. We are grateful to Gary Hansen and Atsuko Ueda, the discussants at the respective conferences, for their valuable comments. We would also like to thank Junya Hamaaki, Keiko Murata and other ESRI colleagues for their support, Ralph Paprzycki for his English editing service, and anonymous referees for valuable comments. Special thanks go to the Statistics Bureau of Japan for providing us with the microdata from the *Family Income and Expenditure Survey* (FIES). The views expressed in this paper are those of the authors and do not represent those of the institutions the authors belong to.

Appendix I: Construction of the purchase price measure

The FIES data provide information on the quantity of and the expenditure on each good purchased for each household. Taking advantage of this rich information, we developed a new proxy of household lifetime wealth that represents the "rank" of the goods purchased by households. We constructed our purchase price measure in the following way. First, we calculated the price of the goods purchased by a household by dividing the expenditure on those goods by the quantity purchased for goods for which information on expenditure and quantity purchased are available.[25] Second, we calculate the quintiles of the price of the goods. Third, we construct a variable q_{ij} indicating which quintile (from 1, the lowest, to 5, the highest) the price of good j purchased by household i belongs to for each good purchased by each household.

Finally, we define the purchase price proxy as follows:

$$Q_i \equiv \frac{1}{n_i}\sum_j q_{ij,}$$

where n_{i} is the number of goods that are purchased by household i and for which price information is available. Q_i, therefore, is the average of q_{ij} across the goods purchased by household i.

Figure A1 shows the distribution of the constructed purchase price measure proxy. As can be seen, the distribution has a symmetric bell shape around 3.

[25] There are many goods and services for which quantities are not reported in the FIES microdata. For example, while we have information on the expenditure on travel, the quantity is not reported. Quantity information is available for a total 178 out of the 420 goods/services reported in the FIES. In addition, we excluded cars and rents for public housing and issued houses.

FIGURE A1. Distribution of the purchase price measure

List of 175 goods/services used to calculate the purchase price measure

Foods (113): rice, white bread, other bread, non-dried "udon" & "soba", dried "udon" & "soba", instant noodles, other noodles, wheat flour, mochi, (rice-cakes), other cereals, tuna fish, horse mackerel, sardines, bonito, flounder, salmon, mackerel, saury, sea bream, yellow-tail, cuttlefish, octopus, shrimps & lobsters, crabs, other raw fish, short-necked clams, fresh water clams, oysters, other shellfish, salted salmon, salted pollack roe, dried young sardines, dried horse mackerel, dried small sardines, other salted & dried fish, bonito fillets & fish flakes, beef, pork, chicken, other raw meat, ham, sausages, bacon, fresh milk, powdered milk, butter, cheese, eggs, cabbage, spinach, Chinese cabbage, welsh onions, lettuce, broccoli, bean sprouts, sweet potatoes, white potatoes, taros, radishes, carrots, burdocks, onions, lotus roots, bamboo shoots, other root vegetables, string beans, pumpkins, cucumbers, eggplants, tomatoes, green peppers, fresh Japanese mushrooms, other mushrooms, other fresh vegetables, dried Japanese mushrooms, wakame (seaweed), dried tangle, bean curd, umeboshi, pickled plums, pickled radishes, pickled Chinese cabbage, tangle prepared in soy sauce, apples, mandarin oranges, other citrus fruits, pears, grapes, persimmons, peaches, watermelons, melons, strawberries, bananas, other fruits, edible oil, margarine, salt, soy sauce, miso (soybean paste), sugar, vinegar, worcester sauce, tomato ketchup, mayonnaise & mayonnaise flavor seasoning, jam, instant curry mix, green tea, black tea, sake, shochu (distilled spirits), beer, whisky, wine.

Housing (2): private rents for dwelling, "tatami" reupholstering.

Fuel, light & water charges (3): electricity, liquefied propane, kerosene.

Furniture & household utensils (13): electric cooking appliances, refrigerators, vacuum cleaners, washing machines, sewing machines, air conditioners, stoves & fan heaters, chest of drawers, beds, quilts, sheets, bowls & dishes, pans & kettles.

Clothing & footwear (34): women's "kimono", women's "obi", men's suits, men's jackets, men's slacks, men's coats, boys' school uniforms, ready-made women's dresses, skirts, women's slacks, women's coats, girls' school uniforms, children's dresses, babies' clothing, men's business shirts, other men's shirts, men's sweaters, women's blouses, other women's

shirts, women's sweaters, children's shirts, children's sweaters, hats & caps, neckties, gloves, men's socks, women's stockings, women's socks, children's socks & stockings, men's shoes, women's shoes, canvas shoes, children's shoes, sandals.

Transportation & communication (1): gasoline.

Culture & recreation (3): TV sets, portable equipment for recording & play-back of sound & pictures, video recorders & players.

Other consumption expenditures (6): charges for barbers' services, permanent wave charges, umbrellas, handbags, knapsacks & other bags for students, suitcases.

Appendix II: Saving rates and household characteristics

In our analysis, we find a positive correlation between saving rates and lifetime wealth when this is proxied by education and type of occupation. Even if we focus on education only, we still observe a positive correlation (see Figure B1). This pattern has been widely observed in previous studies, but reduced-form estimation results do not tell us why. One possibility is that the positive correlation between saving rates and education levels reflects unobserved household characteristics/preferences such as patience or time preferences.

The FLS data contain a question on how much money a respondent would be willing to pay for a bond paying back 100,000 yen a month. We can use this information to measure the patience/time preference of individual households: households that provide a higher value can be regarded as more patient. Figure B2 shows that patient working age household heads tend to have attained higher education, while for households with older heads no clear link between educational attainment and patience can be observed.

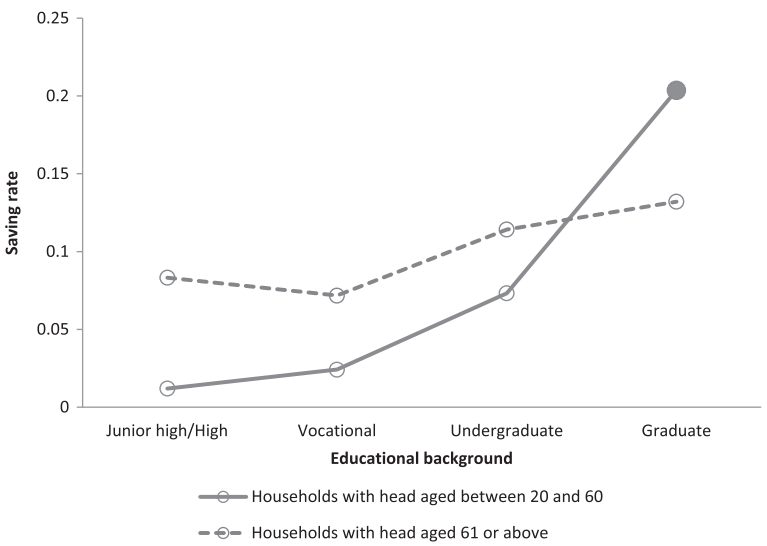

FIGURE B1. Saving rate by educational background

In order to assess to what extent the positive correlation between educational attainment and saving rates can be explained by unobserved characteristics, we add the patience measure to our regression with education as an instrument. Figure B3 shows that the positive correlation between saving rates and lifetime wealth for households with working age heads becomes slightly smaller when we add the measure of patience. However, for households with older heads, the patience measure does not enter the regression significantly, and the positive correlation between saving rates and lifetime wealth becomes even larger when we add the measure of patience.

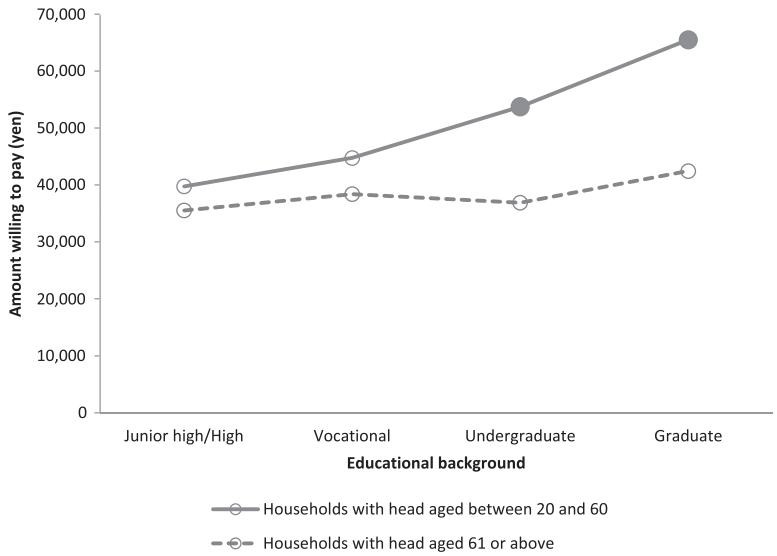

FIGURE B2. Amount willing to pay by educational background

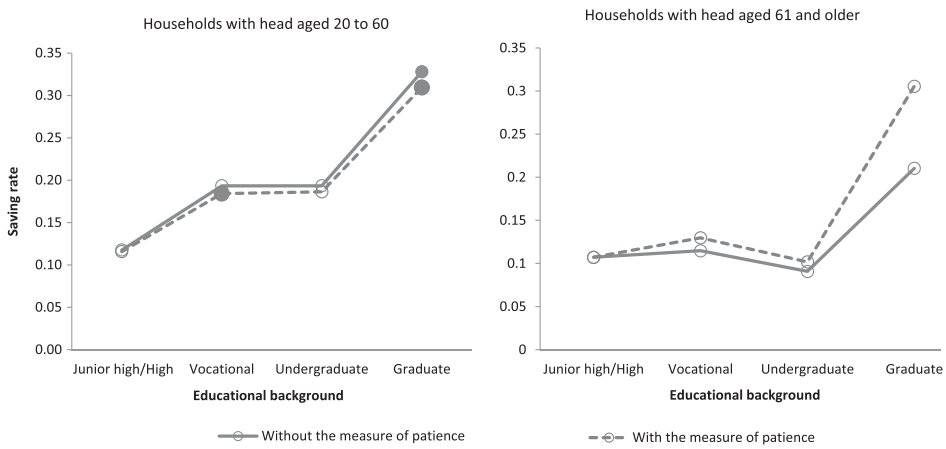

FIGURE B3. Saving rate by educational background controlling for patience

Final version accepted 17 April 2016.

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