Household saving in different family types: evidence from Japanese micro data

by

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Research meeting at National Statistics Center and
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November 11, 2011

What the paper does

- Examines whether different family types in Japan have distinct age-saving profiles over the life cycle
- Uses 4 waves from the National Survey of Family Income and Expenditure (全国消費実態調査)
- Applies a semiparametric 'varying-coefficient model' (VCM) to estimate specific age-saving profiles for
  - singles without children
  - couples without children (such as DINKs)
  - couples with children
  - single parents with children
  - multi-generational households
- Applies the VCM to isolate the contribution of aged and retired household members to the total pool of household savings

Major findings

- Age-saving profiles are very different across family types
- Humped-shaped profiles of savings were most evident among households with children
- In contrast, households without children reached their peak saving rates much earlier
- Little evidence for negative savings among aged and retired household members

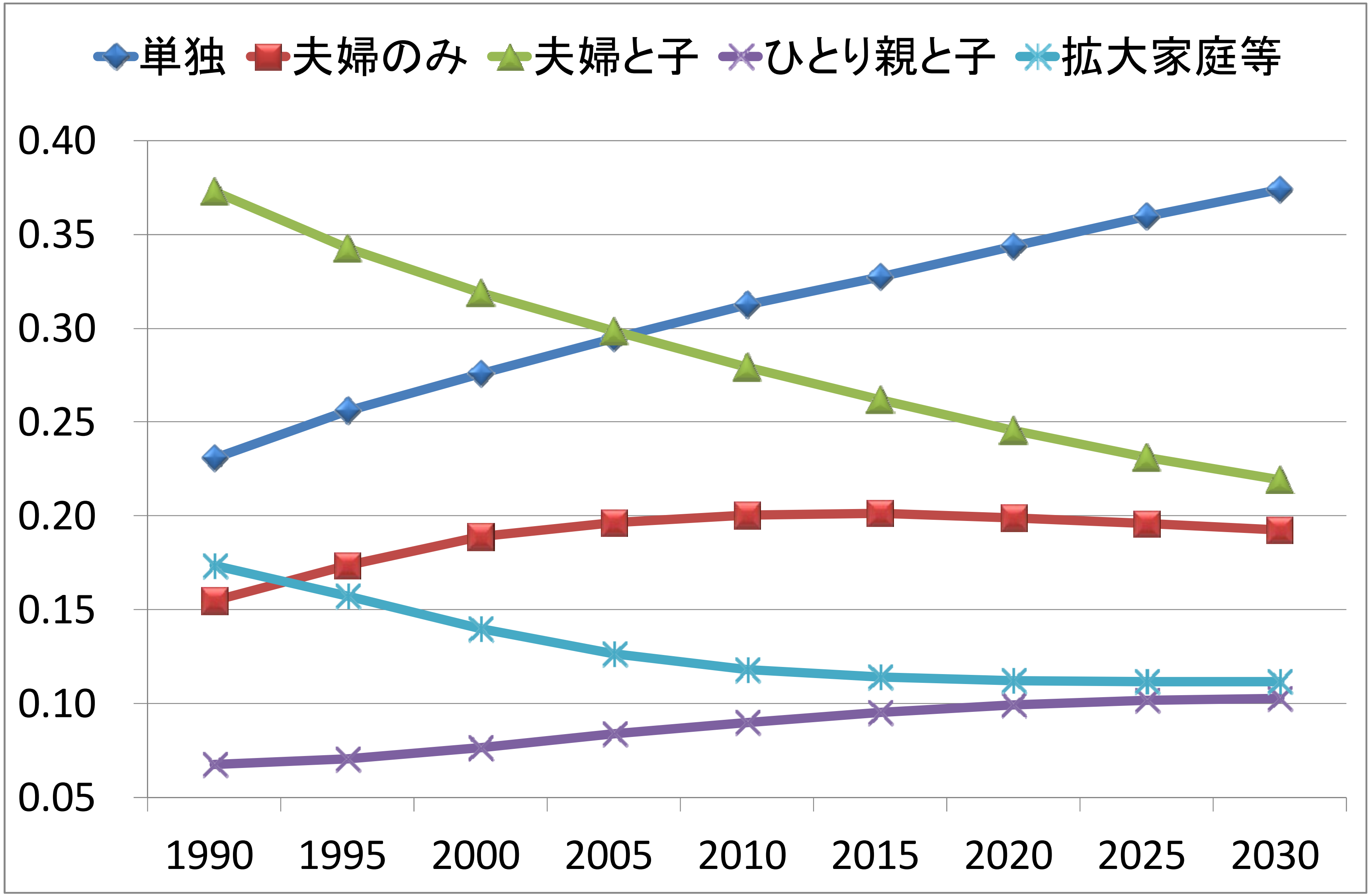
Neglect of family structure in the life-cycle hypothesis (LCH) of saving

- The LCH postulates that the major saving motive is for retirement
- In the stripped-down version of LCH, family structure is assumed away: individuals remain single, and raise no children
- Little evidence is currently available on savings in families that raise children (apart from simple linear effects from the number of children). We know little (a) whether the presence of children shifts the timing for retirement saving, or (b) whether children modify the shape of age-saving profiles
- Conventional controls for demographic effects include the number of adults and children (Paxson (1996), Attanasio et al. (1999) and Fernández-Villaverde and Krueger (2007)), but demographic effects are only linear

At present, traditional patterns of family life are getting more diverse

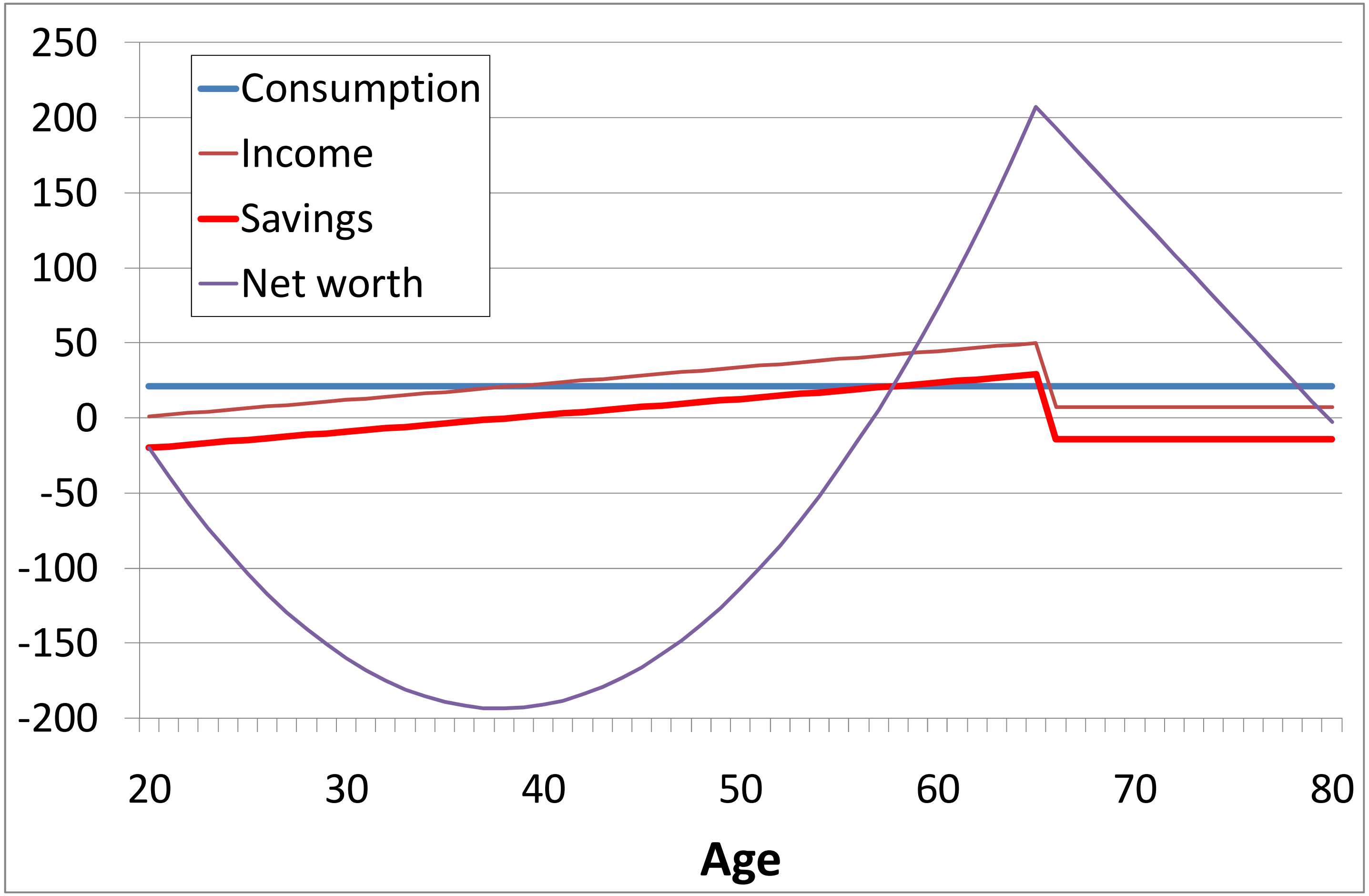
- Traditional family of a married couple and kids is no longer the major type in many countries
- According to the U.S. Census for 2010, married couples were only 45% of all households. The minority share was the first time in the history of U.S. Census
- More people decide to avoid traditional marriage, and prefer partnerships, or just stay single

What about Japan?



Source: *Household Projections for Japan (1995 –2030)*, National Institute of Population and Social Security Research.

Stylized view of life-cycle model of household saving



Baseline models for household saving

- For household i at time t, saving rate $sr_{i,t}$ is specified by a semi-parametric age-period-cohort (APC) model:

$$sr_{i,t} = \underbrace{f\left(age\right)}_{\substack{nonparametric\\ part}} + \underbrace{\alpha_c' D_c + \alpha_t' D_t + \beta' z_{i,t}}_{\substack{parametric\\ part}} + \varepsilon_{i,t}$$

$f(age)$	:	nonparametric effect from the age of household head
D_c	:	dummy variables for cohort effects (c = t – age)
D_t	:	dummy variables for time effects (i.e., macro shocks)
$z_{i,t}$	:	other factors of saving (education, gender, region of residence, employment status, etc.)

Why nonparametric effect for age?

- If age, cohort and period effects are specified as linear effects, this creates a simultaneity problem between three effects

calendar time t = year of birth of cohort c + age a

- One of effects is no longer independent
- For example, once we know the period effect from *t* and cohort effect from *c*, the age effect for *a* is automatically determined as a linear combination of *t* and *c*
- With the nonparametric specification, saving rate is a nonlinear function of age, which solves the simultaneity problem
- The choice which effect is nonparametric is arbitrary, and could not be tested: there is a perfect multicollinearity in the alternative hypothesis

Specification of Models 1-3

Model 1: only APC effects on the saving rate

Model 2: APC effects + basic demographic effects (number of adults, children)

Model 3: APC effects + full list of parametric effects (family type, type of contract, region, industry, gender of household head)

Data

- I used household data from the *National Survey of Family Income and Expenditure (NSFIE)*
- The survey collects data from about 50,000 households.
- Survey's data include demographic and economic characteristics of households, such as: household structure, detailed member's information, sources of income, consumption expenditures, financial assets and liabilities, etc.
- I used data from 4 waves of the NSFIE (1989, 1994, 1999, and 2004)

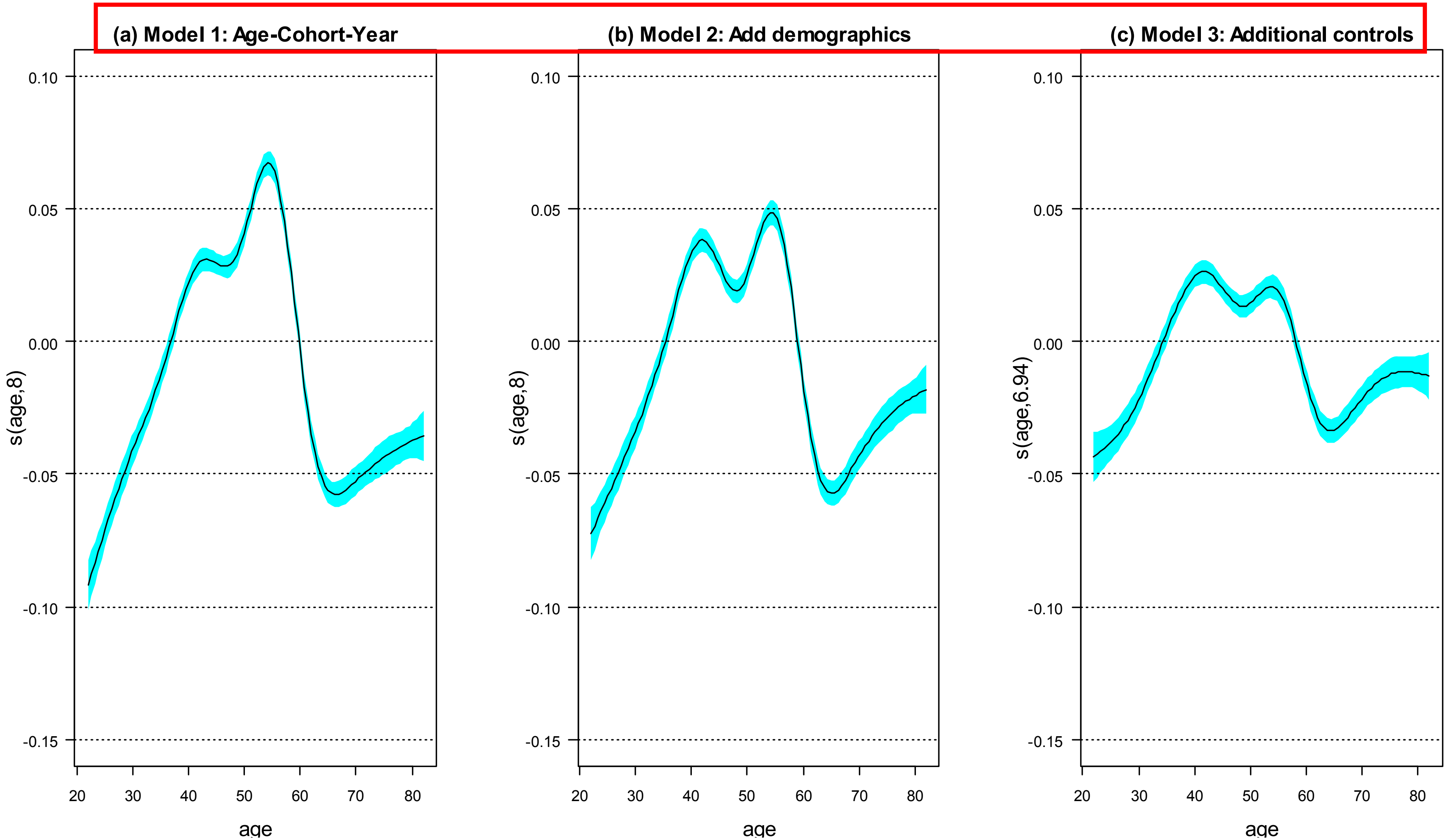
Table 2. Comparison of different data sources for family type shares.

	One-person household	Married couple	Married couple & child(ren)	Single parent & child(ren)	Multi-generation household
(a) NSFIE (published report)					
1989	6.8	18.4	47.1	2.6	25.0
1994	7.8	21.8	45.9	3.3	21.3
1999	8.1	25.6	43.5	3.6	19.2
2004	8.1	28.0	41.2	4.6	18.1
(b) NSFIE (analyzed dataset)					
1989	7.3	18.0	46.2	3.5	25.0
1994	7.9	21.4	45.8	3.6	21.3
1999	8.4	25.2	43.3	4.3	18.7
2004	8.5	27.9	40.9	5.1	17.6
(c) Population census					
1990	23.1	15.5	37.3	6.8	17.4
1995	25.6	17.4	34.2	7.1	15.7
2000	27.6	18.9	31.9	7.6	14.0
2005	29.5	19.6	29.9	8.4	12.7
(d) Difference (a) - (b)					
1989	-0.5	0.4	0.9	-0.9	0.0
1994	-0.2	0.4	0.1	-0.2	-0.1
1999	-0.3	0.4	0.2	-0.7	0.4
2004	-0.4	0.1	0.3	-0.5	0.5

Table 1. Regression estimates with a general age effect on household savings

	Model 1		*Model 2*		*Model 3*	
	Coef.	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*
(1) Parametric effects						
Adults = 2			0.070	<0.001***	0.058	<0.001***
Adults = 3			0.096	<0.001***	0.060	<0.001***
Adults ≥ 4			0.091	<0.001***	0.042	<0.001***
Child = 1			-0.043	<0.001***	-0.036	<0.001***
Children = 2			-0.044	<0.001***	-0.042	<0.001***
Children ≥ 3			-0.054	<0.001***	-0.052	<0.001***
Age>65 & unempl. = 1			-0.004	0.010**	0.002	0.293
Age>65 & unempl. >= 2			-0.010	<0.001***	0.016	<0.001***
Family type 2: Couple only					-0.048	<0.001***
Family type 3: Couple & child(ren)					-0.040	<0.001***
Family type 4: Parent & child(ren)					-0.009	0.191
Family type 5: Non-nuclear					0.004	0.646
(2) Nonparametric effects						
	e.d.f.	p-val.	*e.d.f.*	p-val.	*e.d.f.*	p-val.
f(age)	8.00	<0.001***	8.00	<0.001***	6.94	<0.001***
(3) Goodness-of-fit statistics						
Deviance explained	0.045		0.062		0.112	
AIC score	102,485		99,404		90,368	
Sample size	168,058		168,058		168,058	

Nonparametric estimates of age effect in Models 1-3



Note: zero denotes the average saving rate over the life cycle

Varying coefficient model

- The model introduces interactions between nonparametric terms and categorical variables
- Consider a general semiparametric model

$$y = \theta' X + f(z) + \varepsilon$$

- Let d be a dummy variable with three categories, d_1, d_2, d_3
- The varying coefficient model is

$$y = \theta' X + f(z) + f(z)d_1 + f(z)d_2 + f(z)d_3 + \varepsilon$$

- We have a general nonparametric effect f(z), like in Models 1-3
- Importantly, $f(z)d_1$ denotes differences (differentials) from the general effect f(z) for members in first category
- The model has two more alternative specifications

Varying coefficient model (cont.)

- <u>Second specification</u>: the general nonparametric term is omitted, with each of $f(z)d_k$ (k=1,…,3) denoting category-specific nonparametric effects (no more differential effects). The null hypothesis is H_0: $f(z) = 0$, and it can be tested

$$y = \theta' X + f(z)d_1 + f(z)d_2 + f(z)d_3 + \varepsilon$$

- <u>Third specification</u>: one category is used as a benchmark (say, the first one). For the remaining categories, their specific nonparametric effects are compared with the benchmark category

$$y = \theta' X + \left\{ f(z)d_2 - \underline{f(z)d_1} \right\} + \left\{ f(z)d_3 - \underline{f(z)d_1} \right\} + \varepsilon$$

- Third specification is not a different model, but a different presentation of the second specification, to compare nonparametric effects between categories

Specifications of the varying-coefficient model

- Model 4: Uses <u>first</u> version, with general term f(age), and differentiated effects f(age)d_k for specific categories

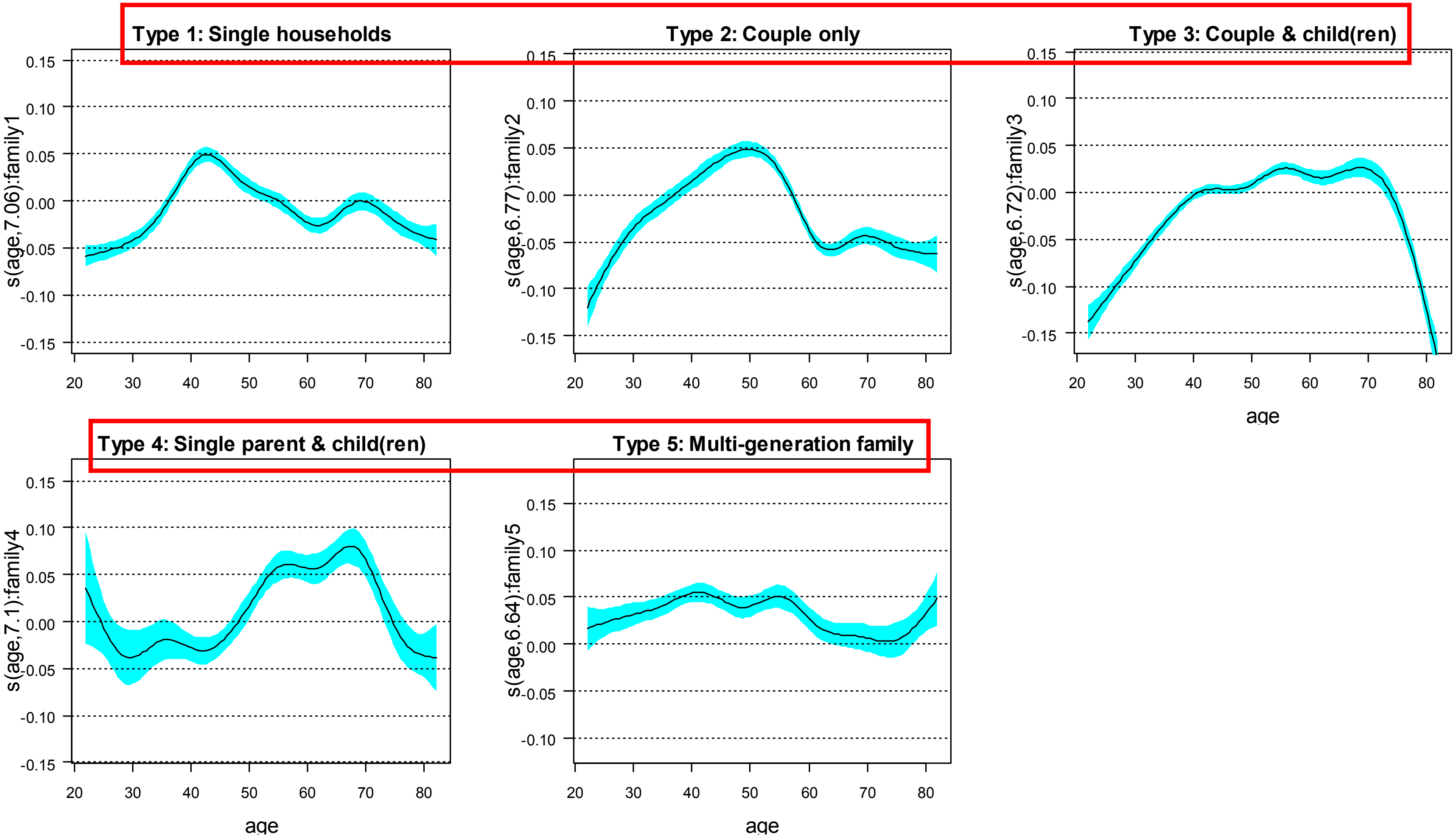
- Model 5: Uses <u>second</u> version with no general term f(age)

- Model 6: Same as Model 5, plus <u>third</u> version to estimate the effect of aged and retired household members (households with <u>no</u> such members are the benchmark category)

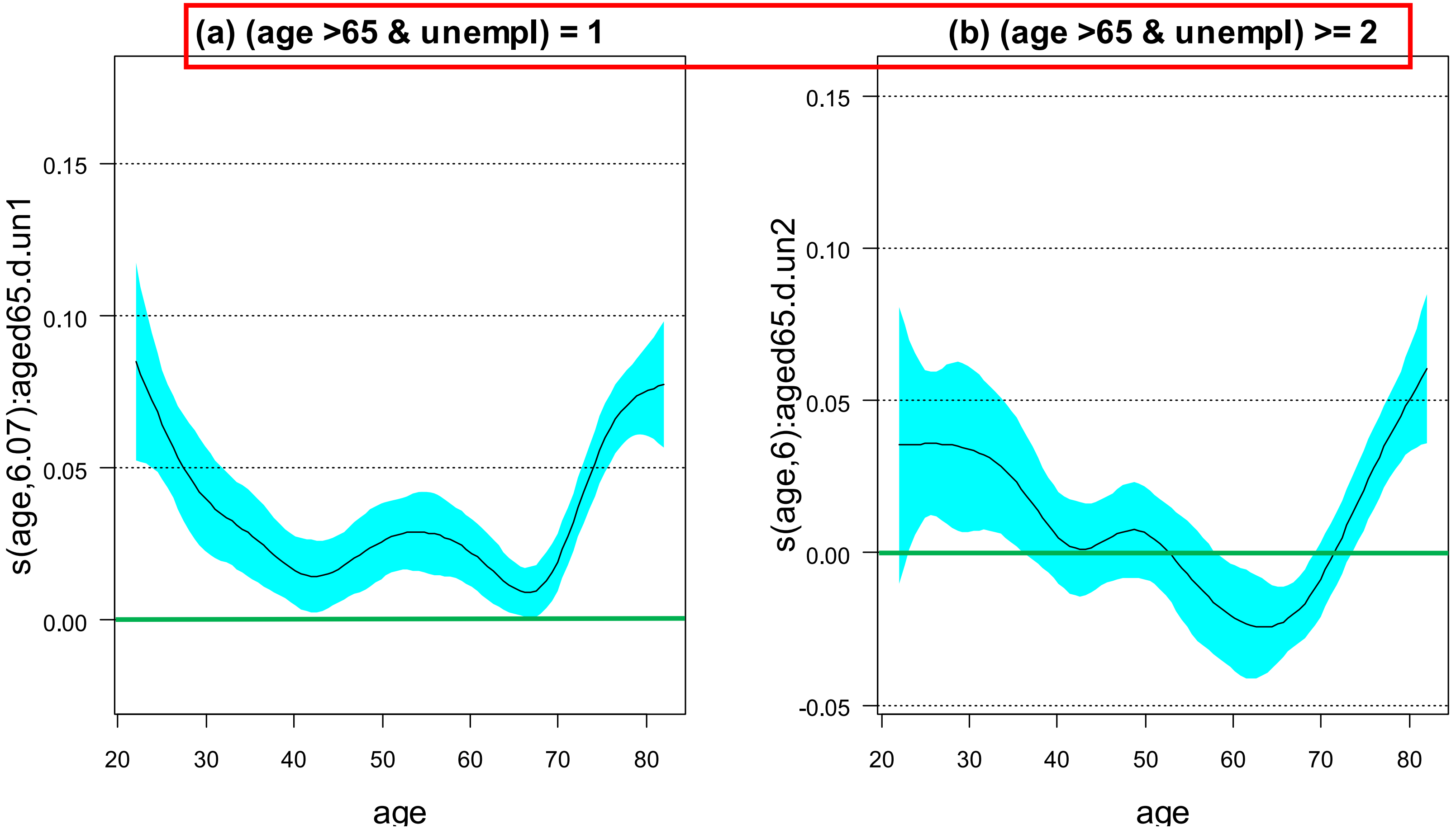
Table 2. Regression estimates with differentiated age effects on household saving

	Model 4		*Model 5*		*Model 6*	
	Coef.	*p-val.*	*Coef.*	*p-val.*	*Coef.*	*p-val.*
(1) Parametric effects						
Adults = 2	0.030	0.004***	0.030	0.004***	0.030	0.005***
Adults = 3	0.015	0.172	0.015	0.175	0.014	0.192
Adults ≥ 4	0.000	0.986	0.000	0.995	-0.001	0.916
Child = 1	-0.020	<0.001***	-0.020	<0.001***	-0.020	<0.001***
Children = 2	-0.028	<0.001***	-0.028	<0.001***	-0.028	<0.001***
Children ≥ 3	-0.040	<0.001***	-0.040	<0.001***	-0.041	<0.001***
Age>65 & unempl. = 1	0.010	<0.001***	0.011	<0.001***	0.027	<0.001**
Age>65 & unempl. >= 2	0.032	<0.001***	0.033	<0.001***	0.005	0.017**
Family type 2: Couple only	-0.006	0.559	-0.006	0.556	-0.006	0.548
Family type 3: Couple & child(ren)	-0.010	0.377	-0.010	0.380	-0.009	0.408
Family type 4: Parent & child(ren)	0.011	0.220	0.011	0.214	0.012	0.179
Family type 5: Non-nuclear	0.034	0.002***	0.034	0.002***	0.035	0.002***
(2) Nonparametric effects						
	e.d.f.	p-val.	*e.d.f.*	p-val.	*e.d.f.*	p-val.
f(age)	3.610	0.737				
f(age):Family 1 (Single)	6.530	0.001***	7.260	<0.001***	7.060	<0.001***
f(age):Family 2 (Couple only)	6.250	<0.001***	6.980	<0.001***	6.770	<0.001***
f(age):Family 3 (Couple & child(ren))	5.690	0.001**	6.800	<0.001***	6.720	<0.001***
f(age):Family 4 (Parent & child(ren))	7.020	<0.001***	7.120	<0.001***	7.100	<0.001***
f(age):Family 5 (Non-nuclear)	6.570	<0.001***	7.010	<0.001***	6.640	<0.001***
f(age):(age>65 & unempl) = 1					6.070	<0.001***
f(age):(age>65 & unempl) >= 2					6.000	<0.001***

Age effects for different family types in Model 6



Age effects for households with aged and retired household members

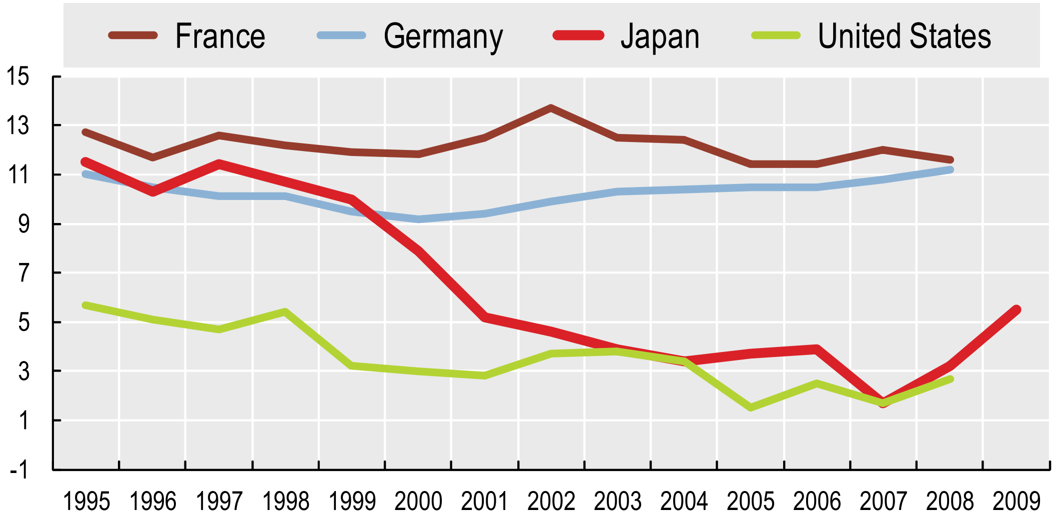


Major findings

- Different types of households had vastly different age-saving profiles, with little evidence of a common saving pattern across family types
- There was little evidence that households save for the old age, as postulated by the life-cycle hypothesis of savings
- The best correspondence with the life-cycle theory of savings was for couples with children, with a clear decline in the saving rate for aged households
- When households were differentiated by the number of aged and retired members, the presence of such members almost never had negative effect on household savings, thus providing little support to the central prediction of the LCH of saving

Work to be done

Household net saving rates
As a percentage of household disposable income



Source: **OECD Factbook 2010; National Accounts of Japan**

- Age-saving profiles by household types $f(age)d_k$ (k=1,…5) can be used to estimate the effect of changing demographic (i.e., household) structure on saving rate
- <u>Preliminary results</u>: demographic changes and population ageing had <u>negligible</u> effect on Japan's saving rate in the past. Their contribution is likely to be minor in the future too

Thank you for listening!