Real Estate Market and Consumption: Macro and Micro Evidence of Japan

Kansaigaidai University

College of Foreign Studies

Kazuo Ogawa

Outline of the Talk

1. Research motivation
2. Purpose of this study
3. Literature survey: MPC estimates of housing wealth
4. Time series evidence
5. Panel data evidence
6. Concluding remarks

1. Research Motivation

➢ Excessive fluctuations of land price might have affected the performance of the Japanese economy in various channels.

Average annual GDP growth rate

- 5.5% during 1986-1990
- 1.0% during 1990-2018 (lost decades)

2. Purpose of This Study

➢ We investigate the extent to which a shock in the real estate market affected consumption spending.

• The correlation coefficient between the rate of change in residential land price and revaluation account of the household sector is 0.8472.

• An adverse shock in real estate market might have had large negative impact on consumption.

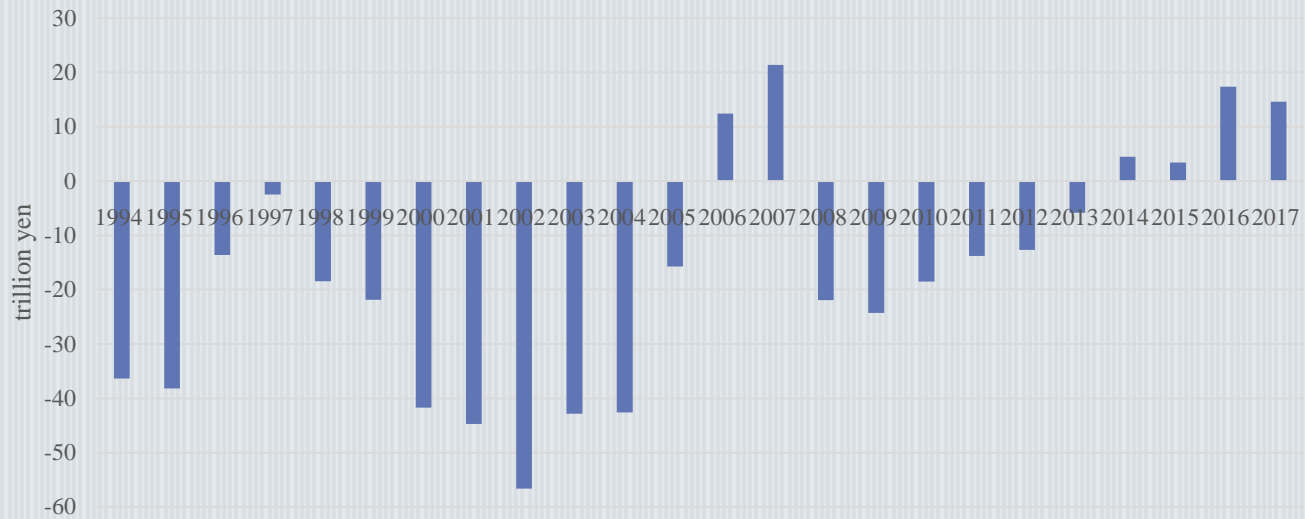Figure 1 Urban Land Price Index: Residential Land
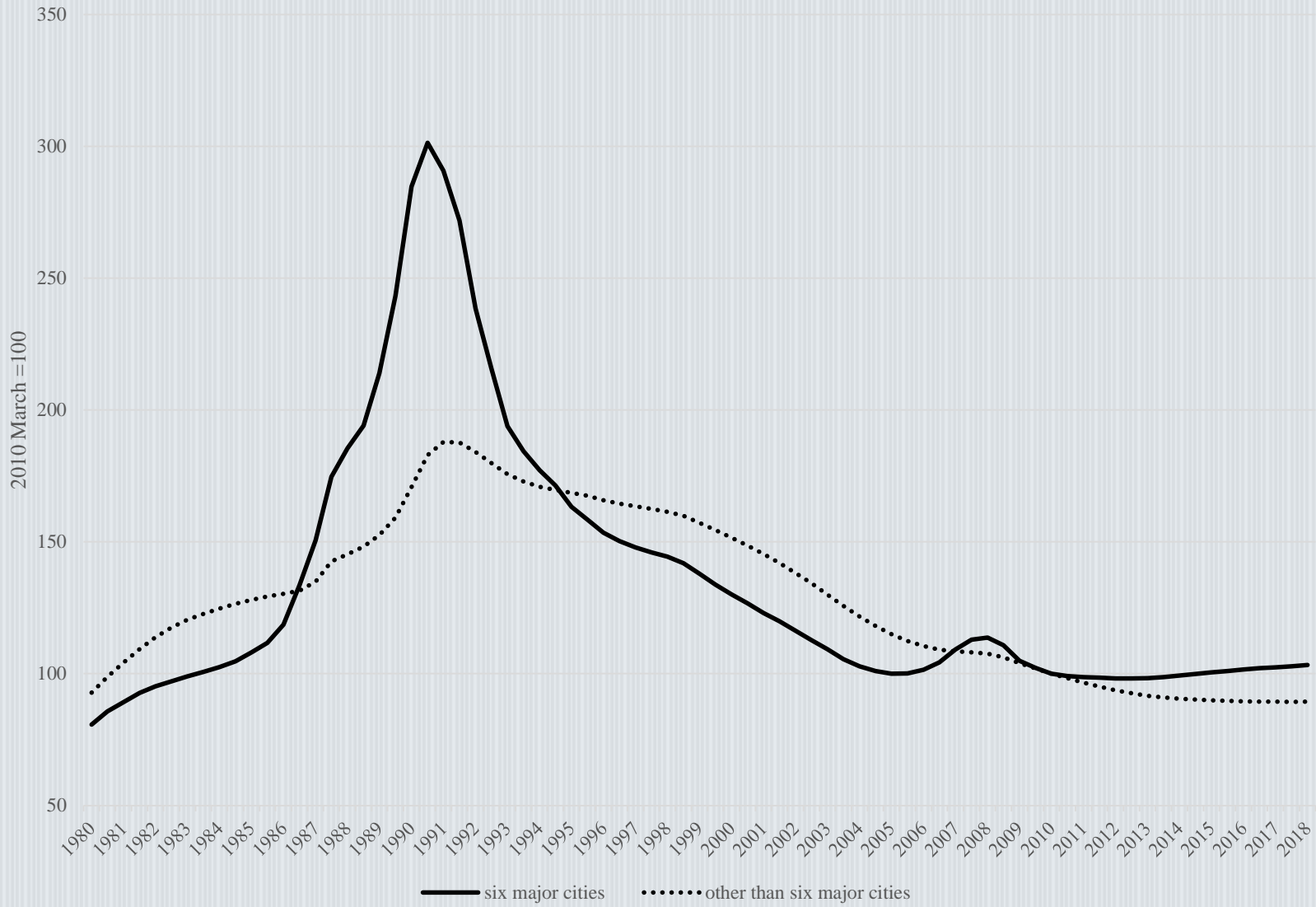
Data source: Japan Real Estate Institute, *Urban Land Price Index*.

Figure 2 Land Wealth of Household Sector
(1) End-of-Period Market Value
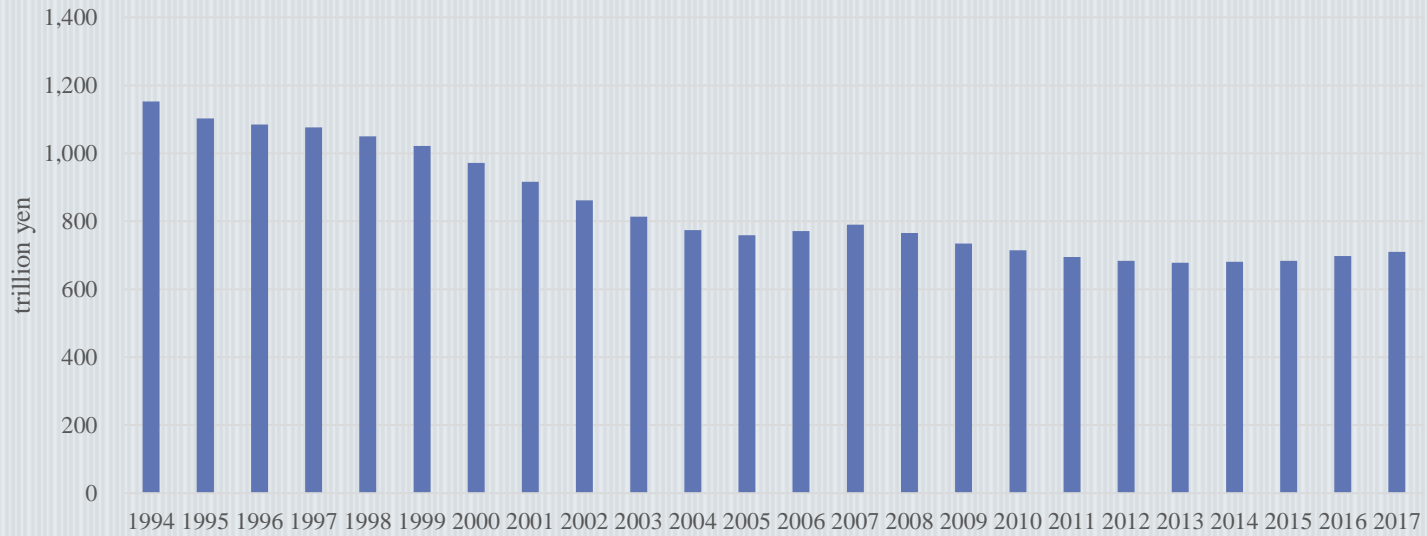
(2) Revaluation Accounts of Land Wealth of Household Sector

➢ Contribution of this study to the literature

1. We pin down the channel through which a shock in the real estate market is propagated to consumption spending.

- **Wealth effect channel**:

    A shock in land price affects consumption

    by changing tangible wealth under the LCY-PIH.

- **Collateral channel**:

    An adverse shock in land price has negative effects

    on the consumer's net worth, which raises the

    external finance premium and reduces borrowings

    and consumption.

For that purpose, we estimate VAR model including consumption and residential land price, using the quarterly data from 1980 to 2018.

2. We quantify the effects of a shock in land price on consumption, using the Japan Household Panel Survey (KHPS/JHPS) collected by the Panel Data Research Center at Keio University. The sample period covers nine years from 2009 to 2017.

➢ Preview of findings

1. Collateral channel was an important channel through which a shock in land price was transmitted to consumption. This is especially true for the period of 1980 to 2002, but not so for the period of 2003 to 2018.

2. Our estimates of the marginal propensity to consume (MPC) out of housing wealth are statistically significant and range from 0.0097 to 0.0146, consistent with the estimates of the previous studies.

3. We observe heterogeneous response of household consumption to housing wealth. Housing wealth has a significantly positive effect on consumption of young households, but not for old households. Our evidence shows that collateral channel is still at work for young households even after 2002.

3. Literature Survey: MPC estimates

	Data source	Sample period	MPC out of housing wealth
Ogawa et al. (1996)	Annual Report of Prefectural Accounts	1980, 1985 and 1990	NOT significant
Hori and Shimizutani (2004)	Japanese Panel Survey of Consumption	1993 - 1999	0.05 to 0.1, but NOT significant
Ogawa and Wan (2007)	National Survey of Family Income and Expenditure	1989, 1994 and 1999	0.0002 to 0.0003 (significant)

	Data source	Sample period	MPC out of housing wealth
Muellbauer and Murata (2011) Aron et al. (2012)	SNA aggregate data	1961 – 2008	Significantly *negative* !
Naoi (2014)	KHPS/JHPS	2004 - 2011	0.0065 to 00079 (significant)
Hori and Niizeki (2017)	Japanese Family Income and Expenditure Survey	1983 - 2012	0.0059 to 0.0082 (significant) Wealth effect channel is supported.

4. Time Series Evidence

➢ Estimation of VAR model to identify the channels through which a shock in the real estate market is propagated to a change in consumption.

• We estimate a 5-variate VAR model that consists of total consumption, disposable income, liquid wealth, consumer borrowings and residential land price.

➢ **Structure of 5-variate VAR model**

Test of collateral channnel

Shut-down of this channel

land price

consumer borrowing

wealth effect channel

consumption

liquid wealth

disposable Income
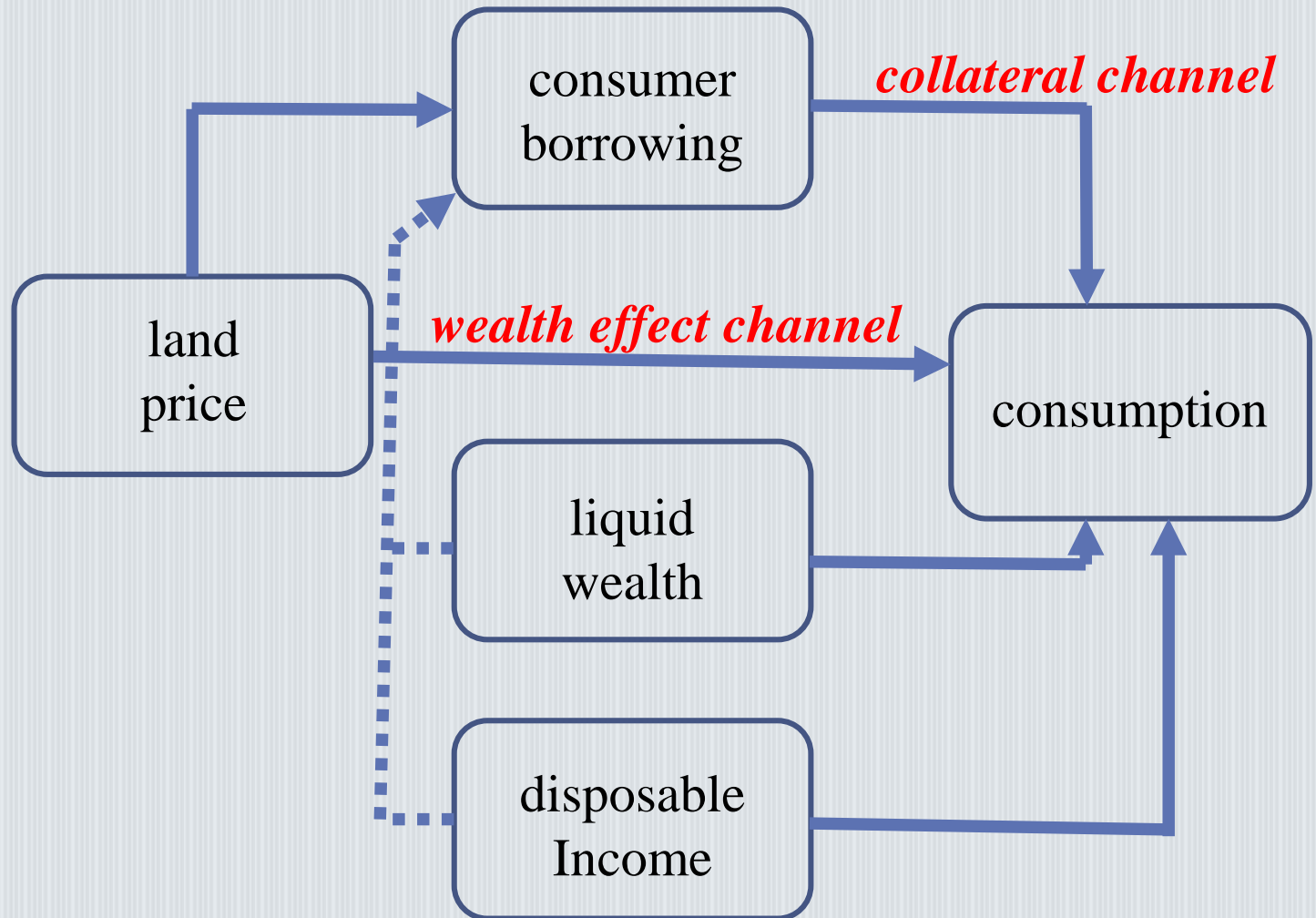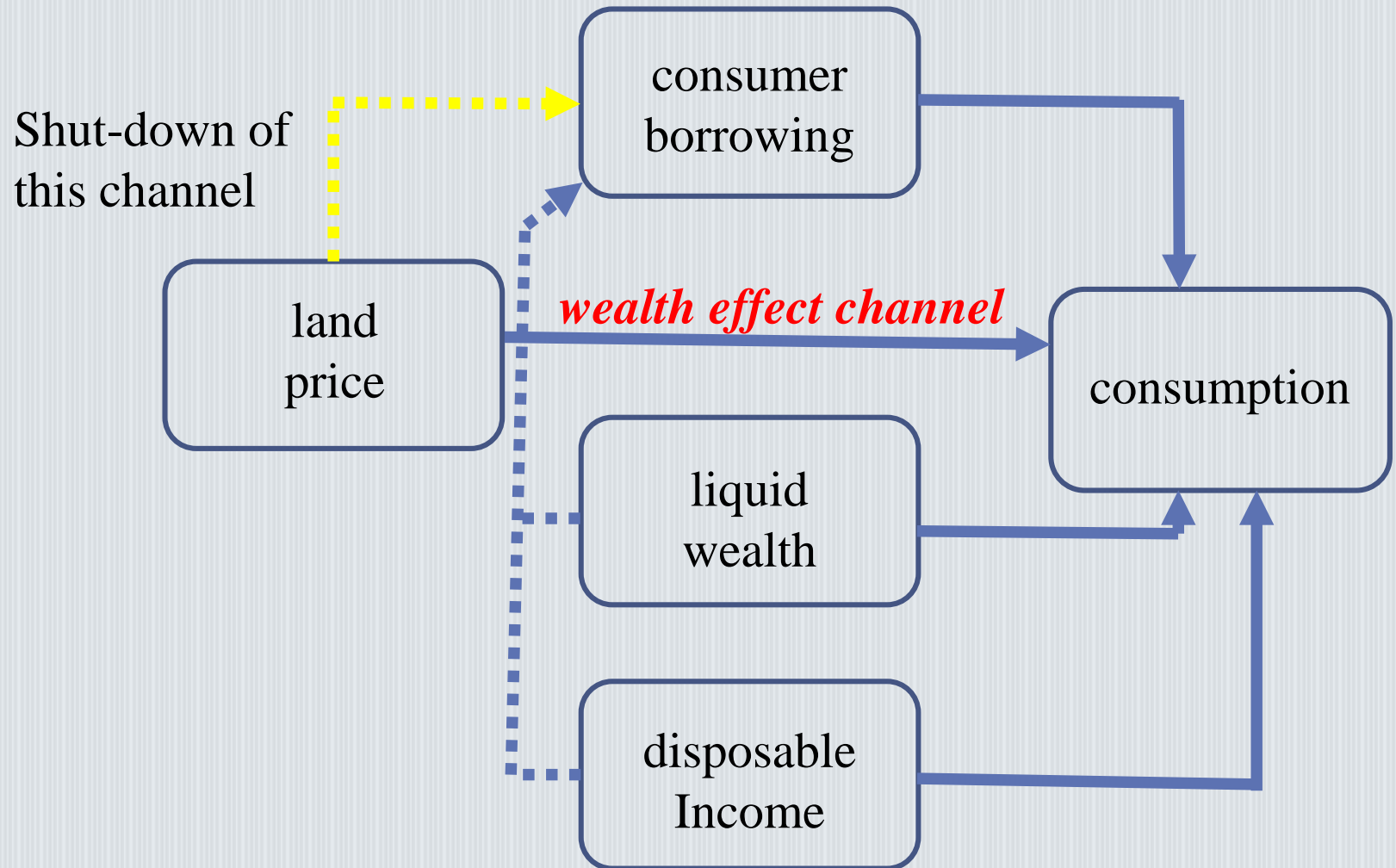
- Test of collateral channel by comparing two VAR models
- In one model we estimate full unconstrained 5-variate VAR model and in the other model channel from land price to consumer borrowing is shut down.
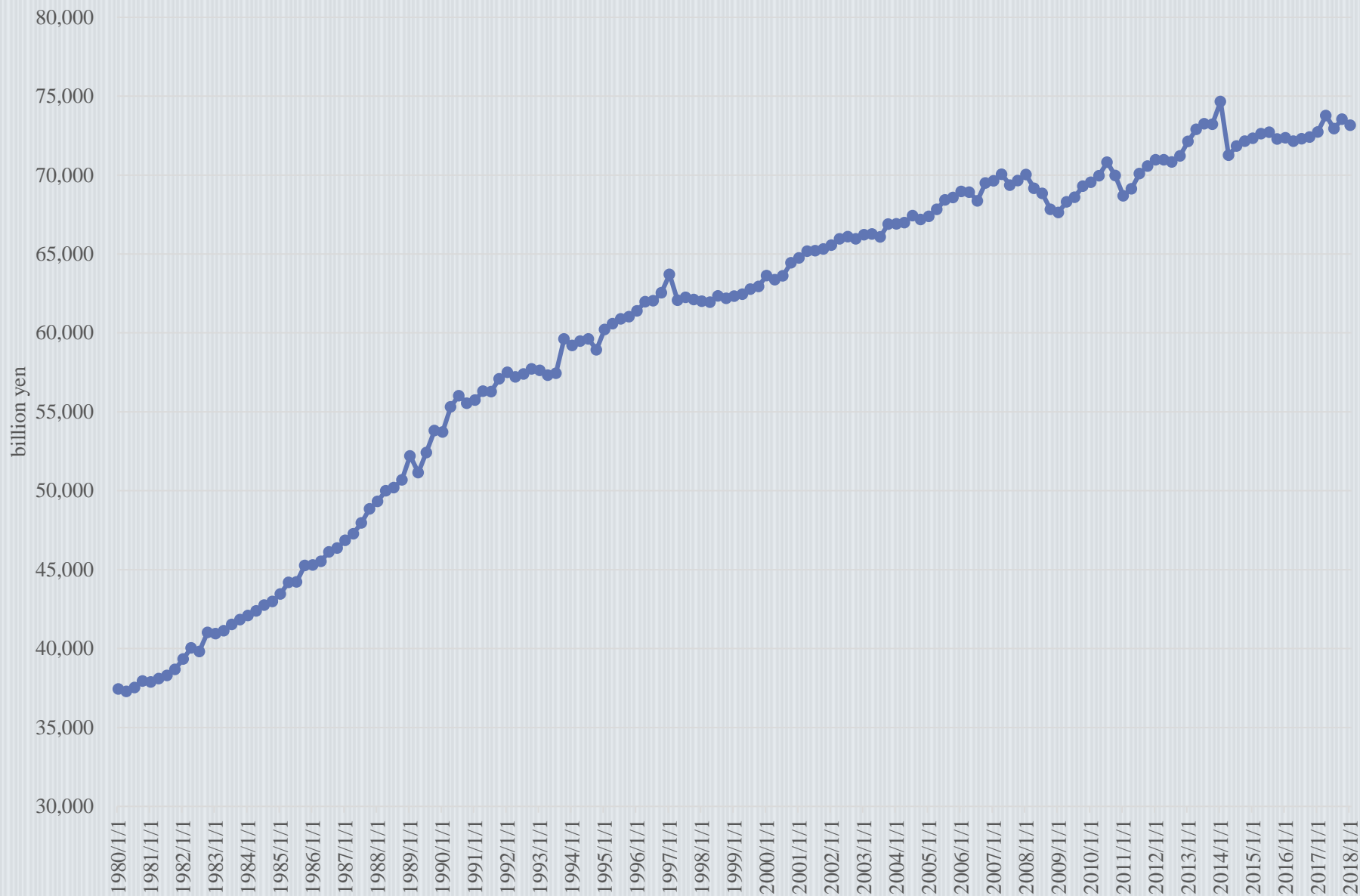- If the effect of land price on consumption is weakened in the constrained model, then *collateral channel* is at work.
- If the effect of land price on consumption remains unaltered, then *wealth effect channel* is at work.

➢ Five variables

1. **Consumption**: real final consumption expenditure of households (ARNA)

2. **Disposable income**: real net disposable income of households (ARNA)

3. **Liquid wealth**: sum of cash currency, deposits, trust, securities investment trusts and securities (FOF)

4. **Consumer borrowing**: borrowing from private financial institutions (FOF)

5. **Residential land price**: urban land price index of residential land in six major cities
(Japan Real Estate Institute)

Final Consumption Expenditure

billion yen

80,000

75,000

70,000

65,000

60,000

55,000

50,000

45,000

40,000

35,000

30,000

1980/1/1 1981/1/1 1982/1/1 1983/1/1 1984/1/1 1985/1/1 1986/1/1 1987/1/1 1988/1/1 1989/1/1 1990/1/1 1991/1/1 1992/1/1 1993/1/1 1994/1/1 1995/1/1 1996/1/1 1997/1/1 1998/1/1 1999/1/1 2000/1/1 2001/1/1 2002/1/1 2003/1/1 2004/1/1 2005/1/1 2006/1/1 2007/1/1 2008/1/1 2009/1/1 2010/1/1 2011/1/1 2012/1/1 2013/1/1 2014/1/1 2015/1/1 2016/1/1 2017/1/1 2018/1/1

18

Disposable Income

billion yen

Liquid Wealth

(chart) trillion yen vs year (1980/1/1 – 2018/1/1)

Consumer Borrowing

trillion yen

y-axis: 50, 100, 150, 200, 250, 300

x-axis: 1980/1/1, 1981/1/1, 1982/1/1, 1983/1/1, 1984/1/1, 1985/1/1, 1986/1/1, 1987/1/1, 1988/1/1, 1989/1/1, 1990/1/1, 1991/1/1, 1992/1/1, 1993/1/1, 1994/1/1, 1995/1/1, 1996/1/1, 1997/1/1, 1998/1/1, 1999/1/1, 2000/1/1, 2001/1/1, 2002/1/1, 2003/1/1, 2004/1/1, 2005/1/1, 2006/1/1, 2007/1/1, 2008/1/1, 2009/1/1, 2010/1/1, 2011/1/1, 2012/1/1, 2013/1/1, 2014/1/1, 2015/1/1, 2016/1/1, 2017/1/1, 2018/1/1

➢Unit root test

Table 1

Results of ADF Unit Root Test and Phillips-Perron Test

	ADF test	Phillips-Perron Z_t test
level		
residential land price	-3.277*	-1.832
consumer borrowing	-1.796	-1.452
disposable income	-1.593	-1.452
liquid wealth	-3.008	-2.625
consumption	-0.970	-0.885
growth rate		
residential land price	-4.243***	-2.209
consumer borrowing	-3.530**	-3.051
disposable income	-3.779**	-8.590***
liquid wealth	-4.645***	-4.200***
consumption	-4.982***	-6.566***

Notes: Lag order is taken as two. A trend term is included in the regression.

*, **, *** : significant at the 10%, 5%, 1% level, respectively.

- Based on the unit root test, we estimate the VAR model in terms of growth rate of variables.

- The lag length is two.

- The order of five variables: residential land price, consumer borrowings, disposable income, liquid wealth and consumption

- Variance decomposition of consumption and consumer borrowing (Table 2, Table 3)

- Impulse response functions (Figure 3)

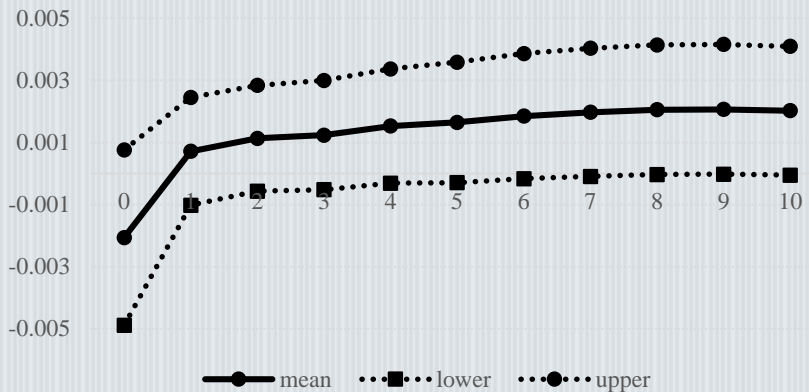Table 2 Variance Decomposition of Consumption: 1980:1 - 2018:1

year	consumption	residential land price	consumer borrowing	disposable income	liquid wealth
1	91.8%	2.9%	2.9%	1.6%	0.8%
2	85.1%	2.6%	2.5%	3.6%	6.2%
3	73.7%	2.8%	2.2%	11.5%	9.7%
4	65.9%	3.2%	2.8%	14.1%	14.0%
5	58.9%	3.7%	3.9%	16.5%	16.9%
6	54.3%	4.3%	5.3%	17.4%	18.7%
7	50.9%	5.2%	6.5%	18.0%	19.3%
8	48.6%	6.1%	7.5%	18.3%	19.4%
9	46.9%	7.2%	8.3%	18.5%	19.2%
10	45.5%	8.2%	8.9%	18.6%	18.8%

Table 3 Variance Decomposition of Consumer Borrowing: 1980:1 - 2018:1

year	consumption	residential land price	consumer borrowing	disposable income	liquid wealth
2	0.0%	1.6%	90.7%	0.9%	6.7%
3	0.0%	6.0%	81.5%	3.2%	9.2%
4	0.2%	12.4%	73.7%	4.6%	9.1%
5	0.2%	19.5%	66.3%	5.9%	8.1%
6	0.2%	25.8%	59.9%	6.8%	7.2%
7	0.2%	30.9%	54.8%	7.6%	6.5%
8	0.2%	34.6%	50.9%	8.2%	6.1%
9	0.2%	37.2%	48.1%	8.7%	5.8%
10	0.3%	38.9%	46.2%	9.1%	5.6%

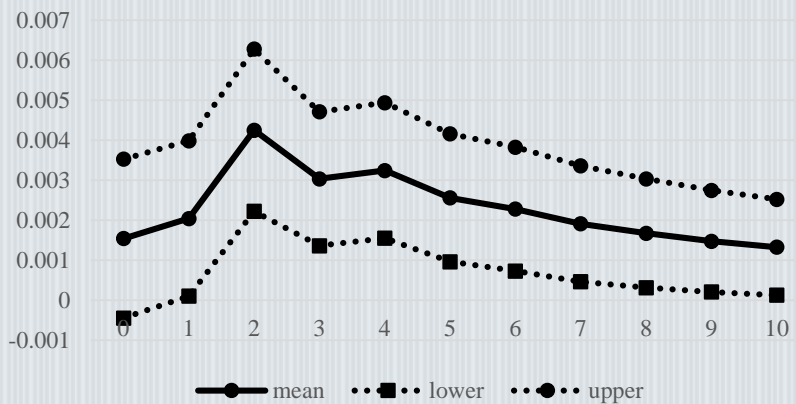# Figure 3 Impulse Response Functions: 1980:1-2018:1

(1) impulse (residential land price) response (consumption)

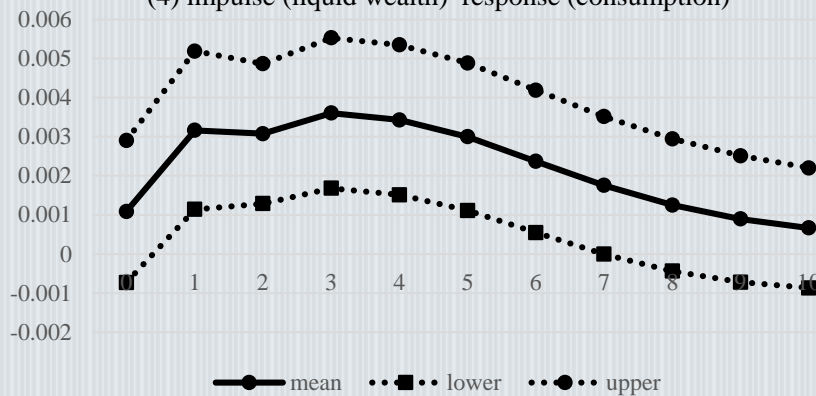(2) impulse (consumer borrowing) response (consumption)
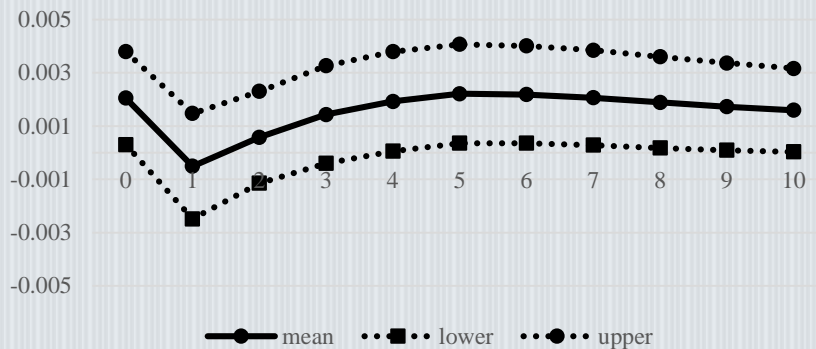
(3) impulse (disposable income) response (consumption)

(4) impulse (liquid wealth) response (consumption)
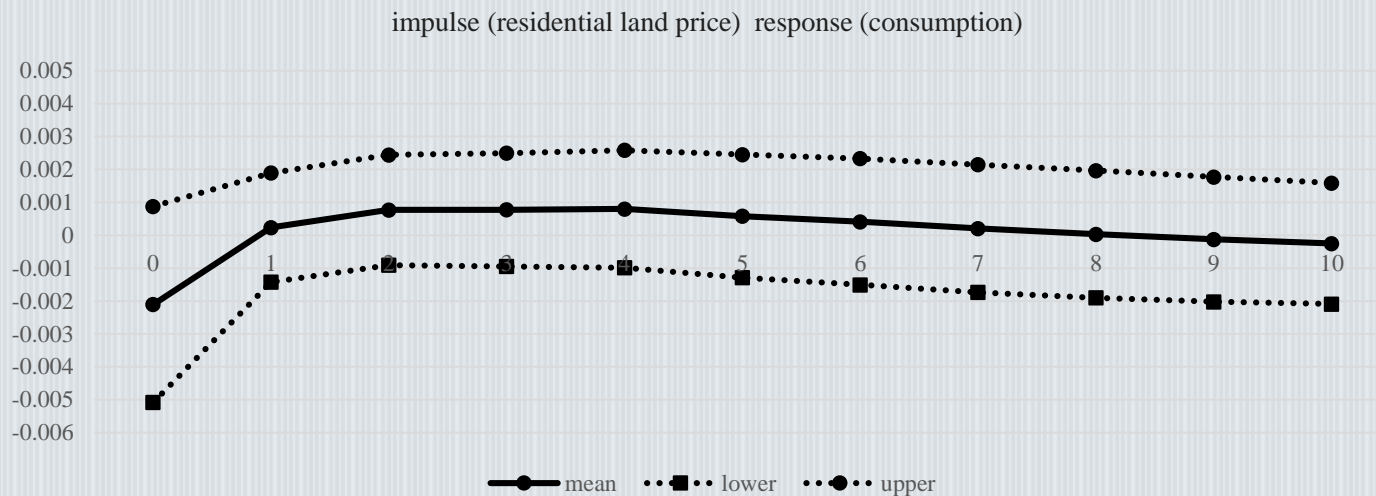
➤ Test of collateral channel

(1) Full 5-variate VAR model

(1) impulse (residential land price) response (consumption)

(2) Shutdown of land price to consumer borrowing channel

impulse (residential land price) response (consumption)
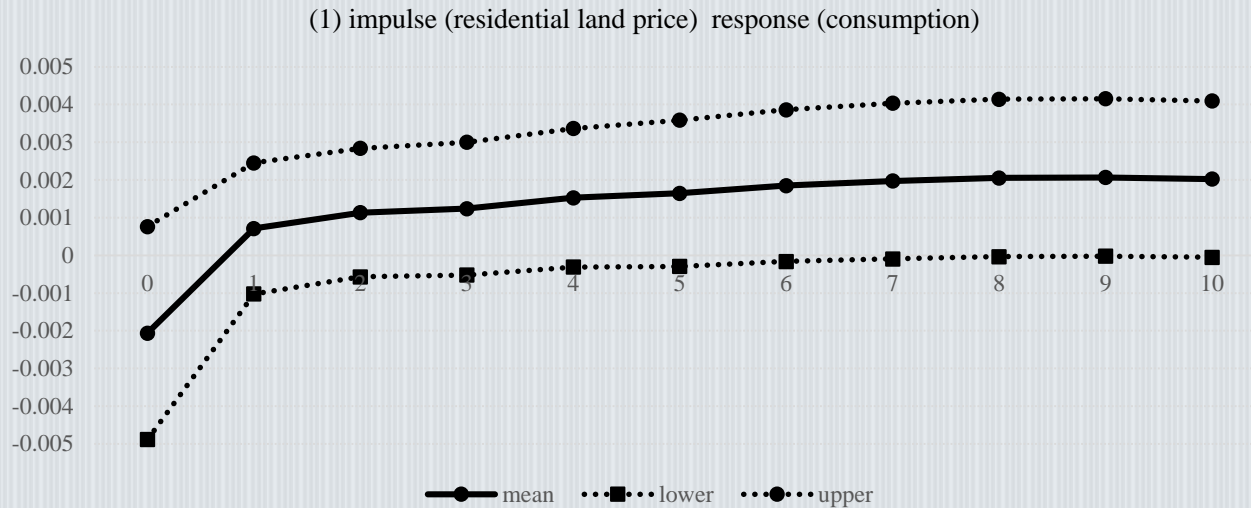
5-variate VAR model for 1980:1-2002:4

Table 4 Variance Decomposition of Consumption: 1980:1 - 2002:4

year	consumption	residential land price	consumer borrowing	disposable income	liquid wealth
1	82.0%	2.0%	15.8%	0.1%	0.1%
2	82.2%	2.7%	14.6%	0.1%	0.4%
3	77.3%	3.8%	14.6%	3.3%	1.0%
4	72.2%	5.6%	15.0%	3.6%	3.6%
5	65.8%	8.0%	14.9%	4.8%	6.4%
6	60.3%	10.5%	15.1%	5.1%	9.0%
7	55.5%	13.0%	15.0%	5.5%	11.0%
8	51.6%	15.2%	14.9%	5.7%	12.5%
9	48.4%	17.2%	14.9%	5.9%	13.6%
10	45.8%	18.8%	14.8%	6.0%	14.5%

Table 5 Variance Decomposition of Consumer Borrowing: 1980:1 - 2002:4

year	consumption	residential land price	consumer borrowing	disposable income	liquid wealth
2	0.2%	11.1%	75.5%	0.2%	13.1%
3	1.0%	24.7%	55.4%	2.2%	16.7%
4	0.8%	35.1%	43.4%	2.8%	17.9%
5	0.7%	42.8%	34.8%	3.5%	18.1%
6	0.7%	47.7%	29.3%	4.1%	18.2%
7	0.7%	50.4%	25.8%	4.7%	18.4%
8	0.7%	51.7%	23.7%	5.2%	18.8%
9	0.7%	52.0%	22.5%	5.6%	19.2%
10	0.8%	51.6%	21.9%	6.0%	19.6%

➤ Test of collateral channel

(1) Full 5-variate VAR model

impulse (residential land price) response (consumption)

(2) Shutdown of land price to consumer borrowing chaneel

impulse (residential land price) response (consumption)
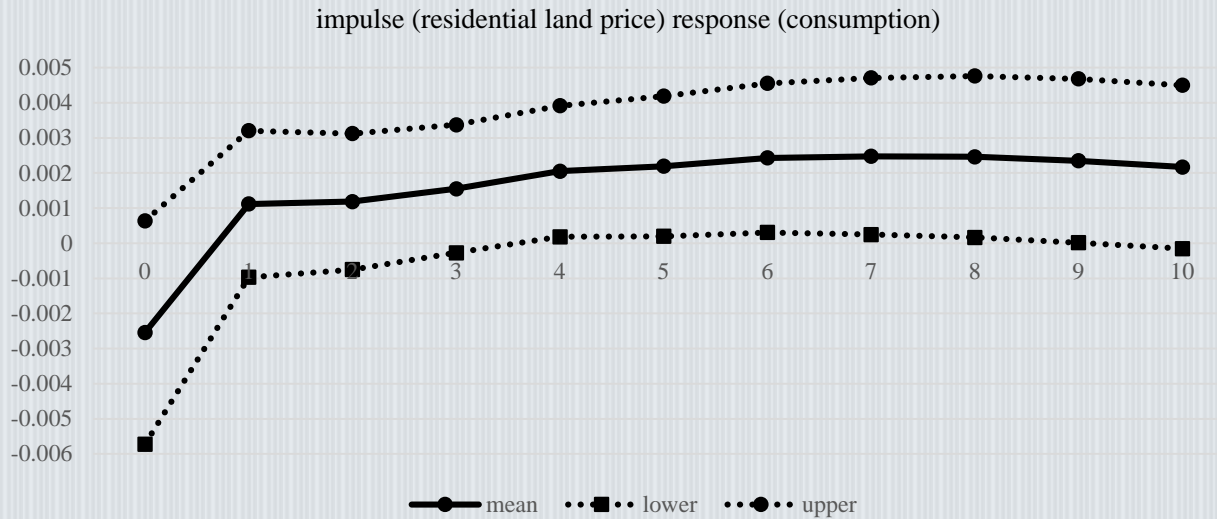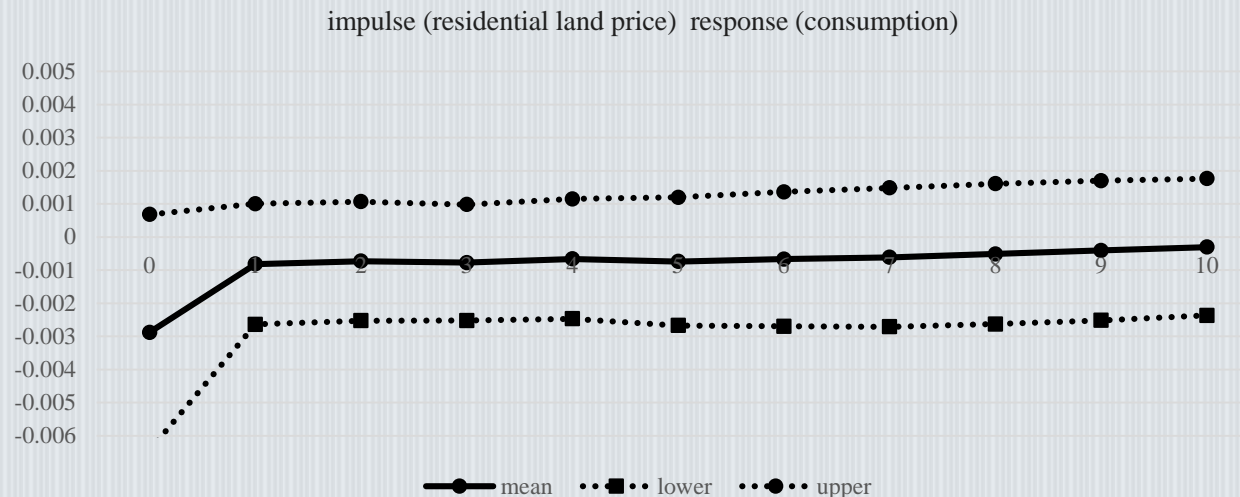
➢5-variate VAR model for 2003:1 – 2018:1

Table 6   Variance Decomposition of Consumption: 2003:1 - 2018:1

year	consumption	residential land price	consumer borrowing	disposable income	liquid wealth
1	93.5%	0.5%	0.4%	5.0%	0.5%
2	74.9%	0.7%	3.6%	13.6%	7.3%
3	61.0%	0.8%	4.3%	22.5%	11.4%
4	57.9%	2.6%	4.2%	23.2%	12.1%
5	58.3%	3.7%	4.0%	22.3%	11.6%
6	58.2%	3.9%	4.0%	22.2%	11.7%
7	57.3%	3.9%	3.9%	22.7%	12.1%
8	56.1%	4.7%	3.9%	23.0%	12.4%
9	55.0%	6.2%	3.8%	22.8%	12.3%
10	54.0%	7.9%	3.7%	22.4%	12.1%

Table 7 Variance Decomposition of Consumer Borrowing: 2003:1 - 2018:1

year	consumption	residential land price	consumer borrowing	disposable income	liquid wealth
2	0.0%	0.4%	94.8%	1.8%	3.0%
3	0.5%	0.3%	92.7%	2.1%	4.3%
4	0.5%	0.3%	92.6%	2.5%	4.1%
5	0.5%	0.3%	91.7%	2.5%	5.0%
6	0.6%	0.4%	89.6%	2.5%	6.9%
7	0.8%	0.5%	88.0%	2.4%	8.3%
8	0.9%	0.7%	87.3%	2.4%	8.7%
9	1.1%	1.1%	86.8%	2.4%	8.6%
10	1.1%	1.8%	85.9%	2.5%	8.7%

➤ Test of collateral channel

(1) Full 5-variate VAR model

impulse (residential land price) response (consumption)

(2) Shutdown of land price to consumer borrowing channel
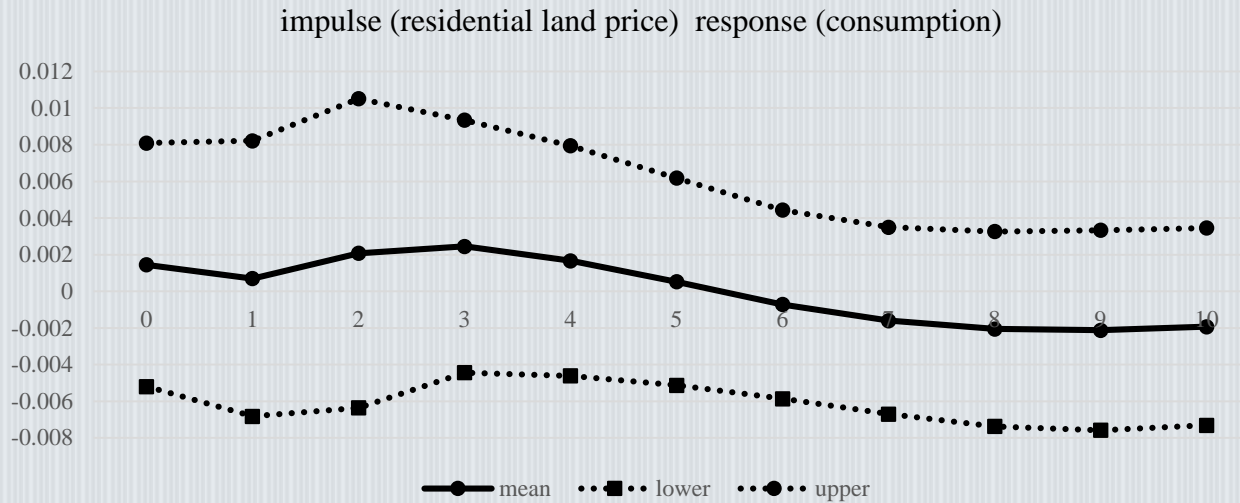
impulse (residential land price) response (consumption)
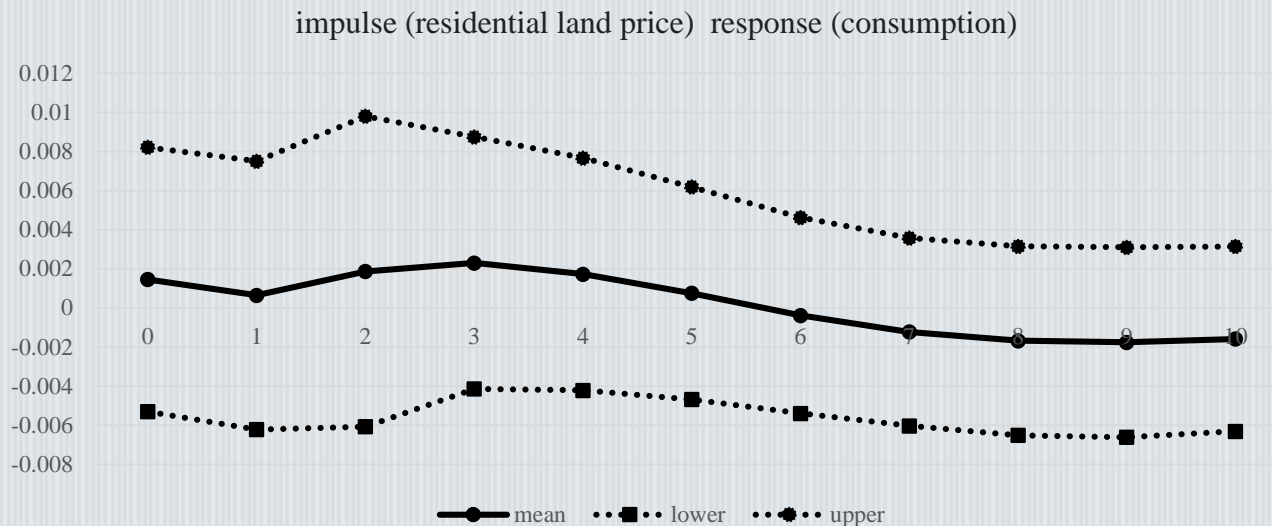
➢ Our evidence of variance decomposition analysis and impulse response functions shows that collateral channel plays an important role in propagating a shock in residential land price to consumption in the former subsample: 1980:1 – 2002:4.

5. Panel Data Evidence

➢ We estimates the effects of a change in housing wealth on consumption, using panel data of the KHPS/JHPS for the period of 2009 to 2017.

• The KHPS has been implemented every year since 2004 on 4,000 households nationwide. An additional survey on a cohort of about 1,400 households started from 2007. The JHPS is a new survey targeting 4,000 male and female subjects nationwide in parallel with the KHPS.

- The KHPS/JHPS record the self-reported market value of land plot and residential building.

- The total number of households who report the market value of their house and land plot as well as their housing loan outstanding is 8,396.

➢ We estimate the LCY-PIH-type consumption function with two wealth variables: liquid financial wealth and housing wealth.

➤ The consumption function to be estimated is

$$\left(\frac{C}{Y}\right)_{it} = \alpha_0 + \alpha_1 \left(\frac{1}{Y}\right)_{it} + \alpha_2 \left(\frac{LW}{Y}\right)_{it} + \alpha_3 \left(\frac{HW}{Y}\right)_{it} + \sum_{j=1}^{n} \beta_j Z_{jt} + u_{it}$$

C_{it} : real total consumption expenditure of household i in January of year t multiplied by 12

Y_{it} : real after-tax annual income of the household in the *previous year t-1*

LW_{it} : real liquid wealth, sum of deposits and securities

HW_{it}: real net housing wealth, sum of the self-reported market value of housing and land plot minus mortgage loan balance

Z_{jt}: household attributes:

1. household size
2. working status of no paid work, self-employed, professional, work without any employee relationship and non-regular wage worker
3. year dummies

u_{it}: disturbance term

We discard the households whose consumption-income ratio, liquidity-wealth-income ratio and housing-stock-income ratio are smaller than the 1th percentile or greater than the 99th percentile.

- ➢ The total number of households used for estimation is 7,481.

- ➢ Descriptive statistics (Table 8)
- • The self-reported market value of land plot and housing is 15.0 million yen and 10.1 million yen.
- • The mortgage loan balance is 16.9 million yen.
- • The proportion of households who have negative equity is 31.0%.

Table 8 Descriptive Statistics of Major Variables in Panel Data Set

item	mean	median	standard deviation
age	48.2	47	11.15
household size	3.8	4	1.29
market value of housing (ten thousand yen)	1009.9	900	808.47
market value of plot (ten thousand yen)	1502.4	1000	1431.90
mortgage loan balance (ten thousand yen)	1689.5	1500	1280.85
market value of liquid assets (ten thousand yen)	555.5	300	1085.58
after-tax annual income (ten thousand yen)	602.1	550	308.71
annual consumption expenditure (ten thousand yen)	387.9	330	296.60
proportion of respondents who have spouse (%)	89.7		
proportion of respondents who performed paid work (%)	82.7		
self-employed (%)	7.5		
professional (%)	1.0		
worker at family business (%)	2.4		
working at home, consigned worker or subcontractor (%)	2.2		
wage worker (%)	70.5		
full-time, regular employee (%)	46.6		
non-regular employee (%)	23.3		
proportion of respondents who have negative equity (%)	31.0		
proportion of respondents who have no liquid wealth (%)	19.7		

Data source: The Panel Data Research Center at Keio University, *the Japan Household Panel Survey.*

➤ We estimate consumption function under two different statistical models.
1. panel regression
2. panel IV regression

➤ We also consider the case where the MPC out of liquid financial wealth differs between liquidity-constrained households and unconstrained ones.

➤ Estimation results for the whole sample (Table 9-1) The MPC out of housing wealth is significant, irrespective of specification, ranging from 0.0097 to 0.0119.

Table 9-1 Estimation Results of Consumption Function by Panel Data

	Whole sample			
	panel regression	panel regression (IV)	panel regression	panel regression (IV)
1/income	233.9554***	216.2932***	233.8587***	216.3534***
	(51.61)	(53.26)	(51.65)	(53.27)
liquid wealth/income	0.0319***	0.01784**		
	(4.89)	(2.12)		
liquid wealth/income (unconstrained households)			0.0096	0.0131
			(1.11)	(1.16)
liquid wealth/income (constrained households)			0.0510***	0.0281**
			(6.26)	(2.20)
housing wealth/income	0.0117***	0.0100***	0.0119***	0.0097**
	(4.06)	(2.59)	(4.13)	(2.50)
constant	0.1140***	0.1033***	0.1263***	0.1053***
	(2.84)	(3.43)	(3.14)	(3.46)
R-squared	0.3362	0.3857	0.3934	0.3860
Sargan statistics†		8.684 (0.12)		8.631 (0.12)
stochastic model	fixed effect	random effect	fixed effect	random effect

➢Estimation results for young households (household head is below 50 years old) and old households (Table 9-2 and 9-3)

➢Conjecture by Campbell and Cocco (2007) and Hori and Niizeki (2017)

• Under the LCY-PIH the response of consumption to housing wealth is larger for *older households* since older households have shorter remaining life horizons over which to annuitize housing wealth.

Table 9-2 Estimation Results of Consumption Function by Panel Data: Younger Households

	Younger household			
	panel regression	panel regression (IV)	panel regression	panel regression (IV)
1/income	238.0735***	222.5142***	236.7256***	221.7525***
	(48.58)	(50.08)	(48.23)	(50.23)
liquid wealth/income	0.0119	0.0202		
	(1.14)	(1.37)		
liquid wealth/income (unconstrained households)			-0.0174	0.0040
			(-1.28)	(0.23)
liquid wealth/income (constrained households)			0.0452***	0.0531**
			(3.16)	(2.19)
housing wealth/income	0.0143***	0.0111*	0.0146***	0.0100*
	(3.83)	(1.93)	(3.92)	(1.89)
constant	0.1656***	0.1203***	0.1808***	0.1251***
	(2.99)	(3.22)	(3.26)	(3.36)
R-squared	0.4062	0.4823	0.4079	0.4813
Sargan statistics†		7.910 (0.16)		7.918 (0.16)
stochastic model	fixed effect	random effect	fixed effect	random effect

Table 9-3 Estimation Results of Consumption Function by Panel Data: Older Households

	Older household			
	panel regression	panel regression (IV)	panel regression	panel regression (IV)
1/income	225.3602***	207.4953***	226.7929***	207.2576***
	(23.55)	(26.38)	(23.66)	(26.38)
liquid wealth/income	0.0418***	0.0150		
	(4.46)	(1.41)		
liquid wealth/income (unconstrained households)			0.0240*	0.0068
			(1.89)	(0.47)
liquid wealth/income (constrained households)			0.0548***	0.0312*
			(4.89)	(1.94)
housing wealth/income	0.0070	0.0089	0.0070	0.0083
	(1.44)	(1.50)	(1.45)	(1.40)
constant	0.1088	0.1484***	0.1180*	0.1529***
	(1.64)	(2.94)	(1.77)	(3.01)
R-squared	0.2501	0.2966	0.2520	0.2982
Sargan statistics†		11.77 (0.04)		11.54 (0.04)
stochastic model	fixed effect	random effect	fixed effect	random effect

- ➢ Our estimation results do not support their conjecture.
- The housing wealth exerts a significantly positive effect on consumption for younger households, irrespective of model specification. In contrast the response of consumption to housing wealth is insignificant for older households in panel regression.
- Housing wealth still plays a collateral role in mitigating borrowing constraints for young households. Weak response of consumption to housing wealth for older households might suggest that housing wealth is viewed as a bequest by older household.

6. Concluding Remarks

➢ Macro evidence: Collateral channel played an important role in propagating a shock in land price to consumption by way of consumer borrowings from 1980 to 2002, but not from 2003 to 2018.

➢ Micro evidence: The housing wealth had a significantly positive effect on consumption for younger households, but the effect of housing wealth on consumption was insignificant for older households.

➢ It is important to take account of *household heterogeneity* in evaluating the response of household consumption to a shock in real estate market.