Aggregate and Distributional Impacts of Housing Policy: China's Experiment

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Motivation: general issues

▶ It has been widely acknowledged that booms and busts of a country's housing markets lie at the heart of its macroeconomy.

▶ Two important questions surrounding housing booms and busts remain unresolved.

  ▶ What's the role of credit conditions in housing booms and busts?

  ▶ What are the distributional consequences of housing booms and busts across households of different characteristics?

▶ In this paper, we take China's recent changes in housing policy as an experiment to address these two key issues.

China experiment

▶ China relaxed its LTV policies between 2014Q4 and 2016Q3
  ▶ 1st house: the minimum down payment ratio decreased from 30% to 25%.
  ▶ 2nd+ house: the minimum down payment ratio decreased from 60-70% to 30%.

▶ Mortgage credit and housing market booms
  ▶ The average annual newly issued mortgage amount is 30 percent higher than its counterpart during 2011Q1-2014Q3.
  ▶ The average annualized growth rate of housing prices for the 35 major cities in China reached 7.30% (2.32% during 2011Q1-2014Q3).

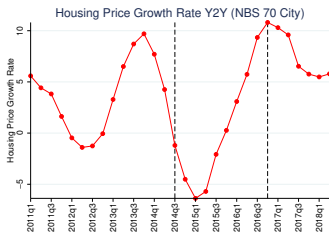▶ Consumption growth has been slowing down in the past two years.
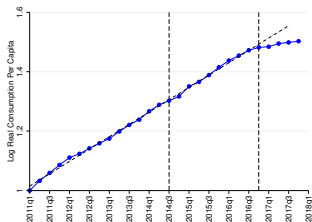
Average Loan-to-Value Ratio
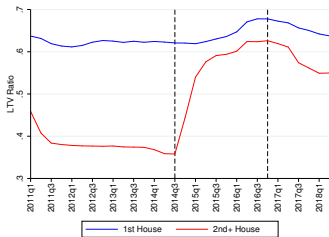
Total Mortgage Across Time

House Price

Housing Price Growth Rate Y2Y (NBS 70 City)
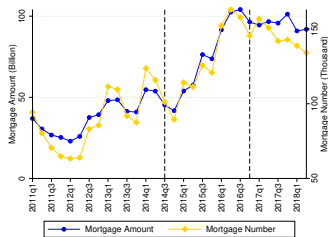
Real Consumption Per Capita (Log)

In this paper

We explore the aggregate and distributional impacts of this LTV policy relaxation on mortgage, housing demand, and household consumption.

Methodology

▶ Empirics: narrative approach with two micro-level data
  ▶ Loan-level mortgage origination data: explore the reallocation of mortgage debt across households of different ages and education levels following the policy change.
  ▶ Household finance survey data: (1) explore changes in consumption growth across age-education groups; (2) establish the empirical linkage between mortgage debt burden and consumption growth at household level.

▶ Theory: dynamic OLG economy with household heterogeneity
  ▶ calibrate it to match various aggregate and cross-sectional moments before the policy relaxation.
  ▶ quantify the effects of LTV policy changes on housing prices, mortgage and non-housing consumption at both aggregate and disaggregate levels.

Preview of the results

▶ Empirics: narrative approach with two micro-level data
  ▶ The recent housing boom reallocated mortgage credits towards the middle-aged, high-educated households, while squeezing out those to young households.
  ▶ The middle-aged, high-educated households are the main drivers of the slowdown in aggregate consumption growth.

▶ Theory: dynamic OLG economy with household heterogeneity
  ▶ An increase in max LTV ratio for 2nd houses involves a self-enforcing effect on housing demand via equilibrium housing prices.
  ▶ The relaxation of LTV policy accounts for about 47% (94%) of the observed increase in housing prices (mortgage credit), and 31% of the fall in consumption growth.

Literature

- ▶ Housing booms and busts
  - ▶ Empirics with micro data: Mian and Sufi (2009, 2011); Foote, Loewenstein and Willen (2016) and Adelino, Schoar and Severino (2017), Albanesi, De Giorgi and Nosal (2017)
  - ▶ quantitative housing theory: Landvoigt, Piazzesi and Schneider (2015), Favilukis, Ludvigson, and Van Nieuwerburgh (2017); Kiyotaki, Michaelides and Nikolov (2011), Kaplan, Mitman and Violante (2017)

- ▶ Effects of housing prices on consumption: focusing on housing wealth effects
  - ▶ Mian, Rao and Sufi (2013), Berger, Guerrieri, Lorenzoni and Vavra (2017), Beraja et. al (2018), Guren et. al (2018)

- ▶ China's housing market
  - ▶ Empirics: Fang, Gu, Xiong, and Zhou (2016), Wei, Zhang and Liu (2017), Chen, Liu, Xiong and Zhou (2017), Gu, He and Qian (2018)
  - ▶ Theory: Zhao (2015), Chen and Wen (2017), Han, Han and Zhu (2018), Zhang (2018)

Roadmap of the remaining presentation

1. Institutional Facts

2. Data

3. Micro-level Evidence

4. Theory

Housing as store of values

- ▶ High concentration of wealth in housing among Chinese households
  - ▶ In 2013, housing comprised of 75.5% of households' wealth in urban China, as compared to about 40% for the U.S. households.
  - ▶ The share of financial assets in Chinese households' wealth is only 8.63%, compared with a value of 37.9% in the U.S.
- ▶ Speculative investment demand for housing
  - ▶ Around one fifth of urban Chinese households owned a non-primary house (CHFS 2013).
  - ▶ The average housing vacancy rates have been stably around 20% during 2011-2017.
  - ▶ The housing vacancy rate for non-primary houses is even higher, reaching 42.06% in 2017.

Rental market frictions

- ▶ The demand side
  - ▶ The children of a homeowner have priority access to the schooling where the purchased housing is located.
  - ▶ Tenants cannot safeguard their lawful rights and interests.
  - ▶ Housing becomes a prerequisite for male to marry a female.
- ▶ The supply side
  - ▶ China does not have credit score systems for individual households such as FICO, Equifax.
  - ▶ The average rent to price ratio for residential housing is too low: in first tier cities was around 2.4% in 2013, in contrast to a 3% benchmark deposit rate and a 6% benchmark lending rate during the same period.
- ▶ As a result, the home ownership rate in China was 86% (67% for young households) in 2013, compared with 65% in the U.S.

Mortgage loan

▶ Mortgage loans takes the largest share in consumer loans of Chinese households (69.4% in 2013), and medium and long-term (MLT) loans (87.4% in 2013).

▶ In China, all mortgage loan is for home purchase.
  ▶ no home equity line of credit
  ▶ no refinance
  ▶ The reverse mortgage market did not exist until 2014.

▶ The age of mortgage borrowers should be between 18-65 years of age.

▶ All mortgage loans are adjustable rate mortgage (ARM).

Housing policy

▶ The minimum down payment ratio for primary houses and second houses are the main tools used by the government to affect housing demand.

  ▶ In 2008, as part of the stimulus package, the minimum down payment ratio for the primary (second houses) dropped from 30% (40%) to 20%.
  ▶ The minimum down payment ratio for the second houses increased to 50% in January 2010 and to 60% in January 2011,
  ▶ During 2014Q4-2016Q3, a reduction in the minimum down payment ratio of second houses from 60-70% to 30%.
  ▶ Between 2016Q4 and 2017Q2, 44 cities and counties across China tightened their LTV policy, by increasing the minimum down payment ratio for the second (first) houses to 40% – 70% (30%).

Roadmap

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Proprietary Mortgage Origination Data

▶ All mortgage loans by one of the biggest commercial banks in China

▶ Outstanding mortgage loans held by this bank account for around 14% of total outstanding mortgage loans in China, roughly constant across time

▶ About 3.3 million mortgage loans for new, residential properties during 2011Q1 - 2018Q2, covering 70 major cities

▶ Detailed information
  ▶ Loans' characteristics: down payment, mortgage loan, maturity, mortgage interest rate, primary or non-primary house
  ▶ House price and size
  ▶ Home buyers' characteristics: age, gender, occupation, education, (reported) income, number of houses, city, zip code

China Household Finance Survey

▶ The most comprehensive household survey in China (Chinese version of CEX + SCF)

▶ Survey every other year, from 2011 to 2017 (e.g. in 2013,19,203 urban households).

▶ Overview of the questionnaire
  ▶ Asset and liabilities (non-financial assets, such as real estates, and financial assets)
  ▶ Expenditure (e.g. various categories of nondurables, travel expenses, health care and medical expenses, etc.)
  ▶ Demographic characteristics and labor market
  ▶ Others (Social and commercial insurance)

Table: Summary Statistics for Mortgage Origination Data

	2011Q1-2014Q3		2014Q4-2016Q3		2011Q1-2018Q2	
	Mean	SD	Mean	SD	Mean	SD
Panel A: Summary Statistics for Borrowers Buying the 1st Houses						
Age	34.50	9.02	34.68	8.81	34.50	8.98
Fraction of Borrowers with College and above Degree	0.47	0.50	0.59	0.49	0.56	0.50
House Size	102.68	31.12	104.79	30.13	104.91	30.72
House Value (Thousand RMB)	681.73	637.73	847.03	803.86	817.59	765.78
Mortgage Loan (Thousand RMB)	425.97	407.15	542.76	514.91	519.94	485.21
Monthly Mortgage Payment (RMB)	3302.99	2898.55	3738.55	3298.59	3656.74	3155.44
Loan-to-Value (LTV) Ratio	0.63	0.11	0.65	0.12	0.64	0.12
Mortgage Debt to (Annual) Income Ratio	4.00	1.44	4.20	1.69	4.20	1.63
Number of Borrowers	1,212,014		919,998		3,011,765	
Panel B: Summary Statistics for Borrowers Buying the 2nd or above Houses						
Age	38.60	7.69	39.37	7.73	38.81	7.80
Fraction of Borrowers with College and above Degree	0.62	0.49	0.72	0.45	0.71	0.45
House Size	115.09	42.46	117.02	42.62	115.18	41.56
House Value (Thousand RMB)	1100.55	1010.32	1313.86	1127.04	1288.71	1103.28
Mortgage Loan (Thousand RMB)	426.03	441.76	776.22	698.76	682.86	626.36
Monthly Mortgage Payment (RMB)	3938.15	3761.44	5491.67	4711.23	5017.41	4285.29
Loan-to-Value (LTV) Ratio	0.38	0.07	0.59	0.13	0.53	0.15
Mortgage Debt to (Annual) Income Ratio	2.54	1.28	3.42	1.80	3.14	1.71
Number of Borrowers	66,962		80,339		259,024	

Table: Summary Statistics for CHFS Data

	2013		2015		2017	
	Mean	SD	Mean	SD	Mean	SD
Age	50.34	14.98	52.15	14.93	54.41	14.94
Consumption (Thousand RMB)	50.62	51.16	55.39	57.60	54.28	53.29
Income (Thousand RMB)	75.28	94.83	81.21	103.59	98.83	112.84
Outstanding House Mortgage (Thousand RMB)	24.58	211.99	30.83	197.85	41.05	221.52
Net Wealth (Thousand RMB)	797.43	1249.87	1010.68	1527.13	1255.06	1896.83
Share of Housing Asset in Wealth (Percent)	75.46	44.67	76.06	41.23	72.71	42.24
Homeownership (Percent)	86.02	34.68	89.25	30.98	88.08	32.40
Number of Obs	19,203		25,635		27,279	

Roadmap

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Loan-to-Value Ratio for Primary and Secondary Houses
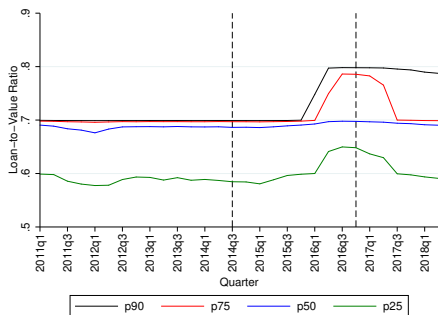

Loan-to-Value Ratio: 1st House
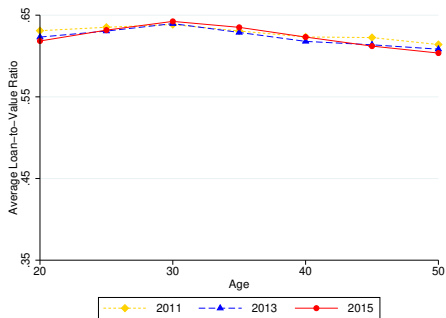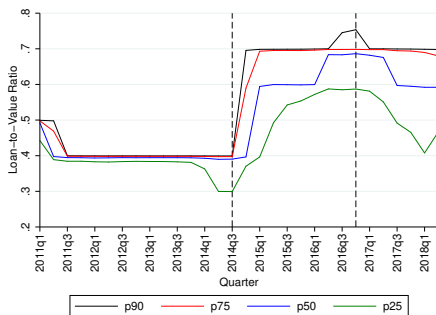
Loan-to-Value Ratio: 2nd+ House
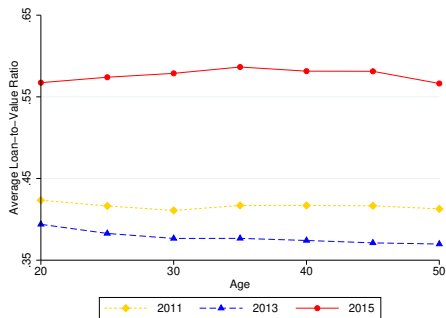
Loan-to-Value Ratio Distribution along Time
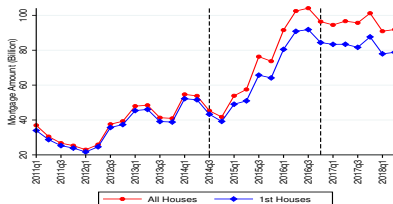

LTV Ratio Distribution: 1st House
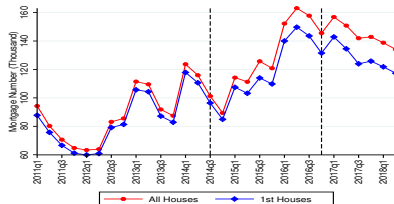
LTV Ratio Distribution: 2nd+ House

Dynamics of Mortgage Debt and Debt Burden

Mortgage Origination Amount

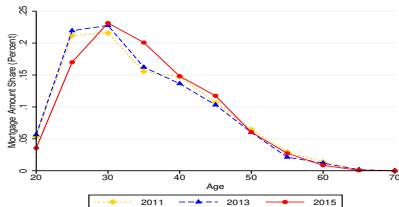Mortgage Origination Number

Mortgage Debt to Income Ratio

House Value to Income Ratio

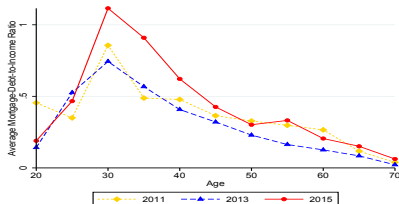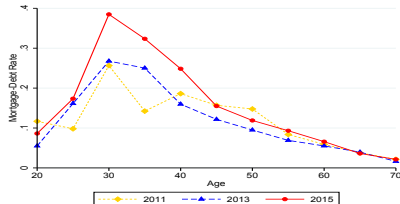# Age Profile of Mortgage Debt

Mortgage Amount

Mortgage Origination Number

Average Outstanding DTI

Mortgage Debt Rate

Mortgage Share across Age-Education Groups

Mortgage Amount Share in 2013

	High School and Below	College and Above
Age < 30	11.77	25.60
30 ≤ Age < 50	27.04	29.91
Age ≥ 50	3.63	2.05

Mortgage Number Share in 2013

	High School and Below	College and Above
Age < 30	13.41	22.73
30 ≤ Age < 50	33.98	24.15
Age ≥ 50	4.09	1.64

Mortgage Share Change by Age and Education

Mortgage Amount Share Change between 2013 and 2015

	High School and Below	College and Above
Age < 30	-4.13	-2.58
30 ≤ Age < 50	-6.66	13.45
Age ≥ 50	-0.90	0.82

Mortgage Number Share Change between 2013 and 2015

	High School and Below	College and Above
Age < 30	-2.66	-0.09
30 ≤ Age < 50	-5.60	8.12
Age ≥ 50	-0.37	0.60

Mortgage Share Change by Age and Education: 1st House

Mortgage Amount Share Change between 2013 and 2015: 1st House

	High School and Below	College and Above
Age < 30	-3.79	-1.17
30 ≤ Age < 50	-6.47	11.86
Age ≥ 50	-0.98	0.56

Mortgage Number Share Change between 2013 and 2015: 1st House

	High School and Below	College and Above
Age < 30	-2.46	0.52
30 ≤ Age < 50	-5.36	7.30
Age ≥ 50	-0.42	0.42

Consumption Growth

Table: (per capita) Consumption and Income Growth Rate (Percent)

	2013-2015	2015-2017	Difference
Consumption	3.97	3.11	-0.86*
Income	6.51	10.31	3.80***

Significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Consumption Growth Rate by Age and Education

Table: Changes in Consumption Growth between 2015-2017 and 2013-2015 by Age and Education

	Consumption		Income	
	Low Edu	High Edu	Low Edu	High Edu
Age < 30	1.39	0.04	2.99	0.24
$30 \leq$ Age < 50	-1.40	-3.59***	1.19	5.15***
Age ≥ 50	-0.09	1.35	6.27***	7.76***

Significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Regression of Consumption Growth on Mortgage Debt

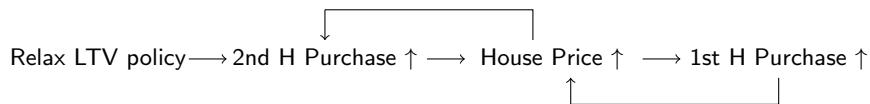Table: The Effects of Mortgage Debt on Consumption Growth

Consumption Growth Rate	(1)	(2)
Mortgage debt dummy	-5.31***	
Mortgage debt to income ratio		-0.55**
Income growth rate	0.13***	0.18***
Controls	Y	Y
City-Time Fixed Effects	Y	Y
N	28457	2739
R^2	0.07	0.17

Controls include age, age squared, education dummies, and family size growth rate. Significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Roadmap

1. Institutional Facts

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Main Mechanism

Relax LTV policy $\longrightarrow$ 2nd H Purchase $\uparrow$ $\longrightarrow$ House Price $\uparrow$ $\longrightarrow$ 1st H Purchase $\uparrow$

Aggregate Impacts of Relaxation of LTV Policy

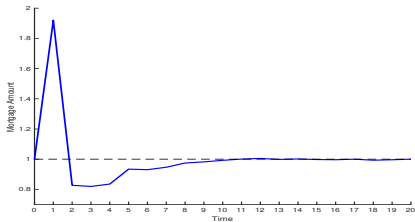Table: Aggregate Impacts on Housing Prices, Mortgage and Consumption

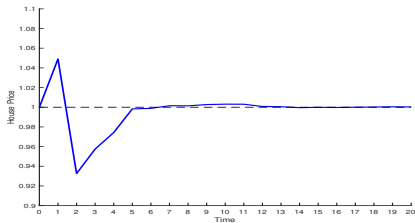|	Model	Data
House price	2.36%	4.98%
Mortgage amount	28.55%	30.38%
Mortgage number	16.82%	17.13%
Consumption	-0.28%	-0.89%

Transition Path: Aggregate
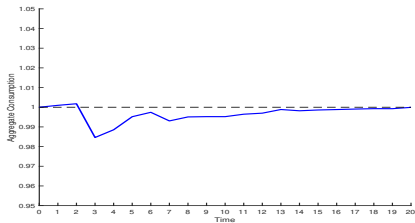

House Demand
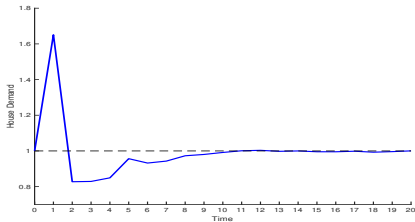
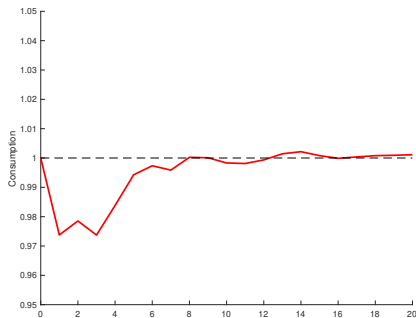Mortgage Origination Amount
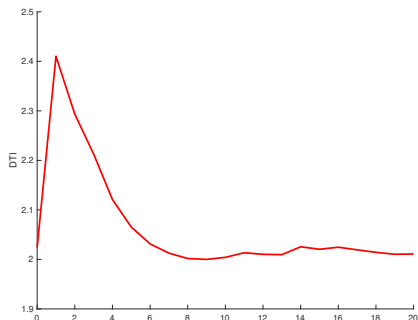
House Price

Aggregate Consumption

Transition Path: Middle-aged High-educated

Consumption: Middle-aged High-educated

Debt-to-income Ratio: Middle-aged High-educated

Concluding Remarks

▶ We find empirically that a relaxation of LTV policy has significant aggregate and distributional impacts:
  ▶ stimulate the mortgage loan by middle-aged high-educated households at the sacrifice of young households.
  ▶ slowdown consumption growth of middle-aged, high-educated household (wealthy hand to mouth).

▶ We build a dynamic OLG equilibrium model with household heterogeneity to account for the empirical findings.
  ▶ Our theory highlights a novel channel for changes in credit conditions to affect housing demand via equilibrium housing prices.
  ▶ The relaxation of LTV policy can explain about 47% (94%) of the increase in housing prices (mortgage credit) during the boom.