The unintended consequences of credit: the impact of housing credit on personal bankruptcy

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Motivation

- It is important to understand the impact of credit on household finance decisions
  - In the US, research shows increasing the flow of credit is counterproductive, and rise of household debt is considered one of factors contributing to the Great recession (Mian and Sufi 2014)
  - Excessive household debt leads to foreclosures, causing individuals to spend less
- Personal bankruptcy is an extreme household finance decisions.
- Question: what's the impact of credit on personal bankruptcy?

Motivation

- Difficulties in the literature:
  - Lack of data
  - Lack of design
- We study the impact of housing credit on personal bankruptcy in Singapore
  - Merge individual level housing transaction data and individual level bankruptcy data
  - Apply Dif-in-Dif strategy: housing policy change

Main results

- Buying expensive/large houses after the increase in loan-to-value (LTV) ratio increases the likelihood of personal bankruptcy after buying the house.
- Possible Channels:
  - Composition Effect: Increase in LTV ratio encourages individuals to buy expensive houses that they could not afford before
  - Debt burden Effect: Increase in LTV ratio increase the burden of repayment
- Our results:
  - Composition effect is unlikely to be the main channel
  - Debt burden effect is likely to be the main channel
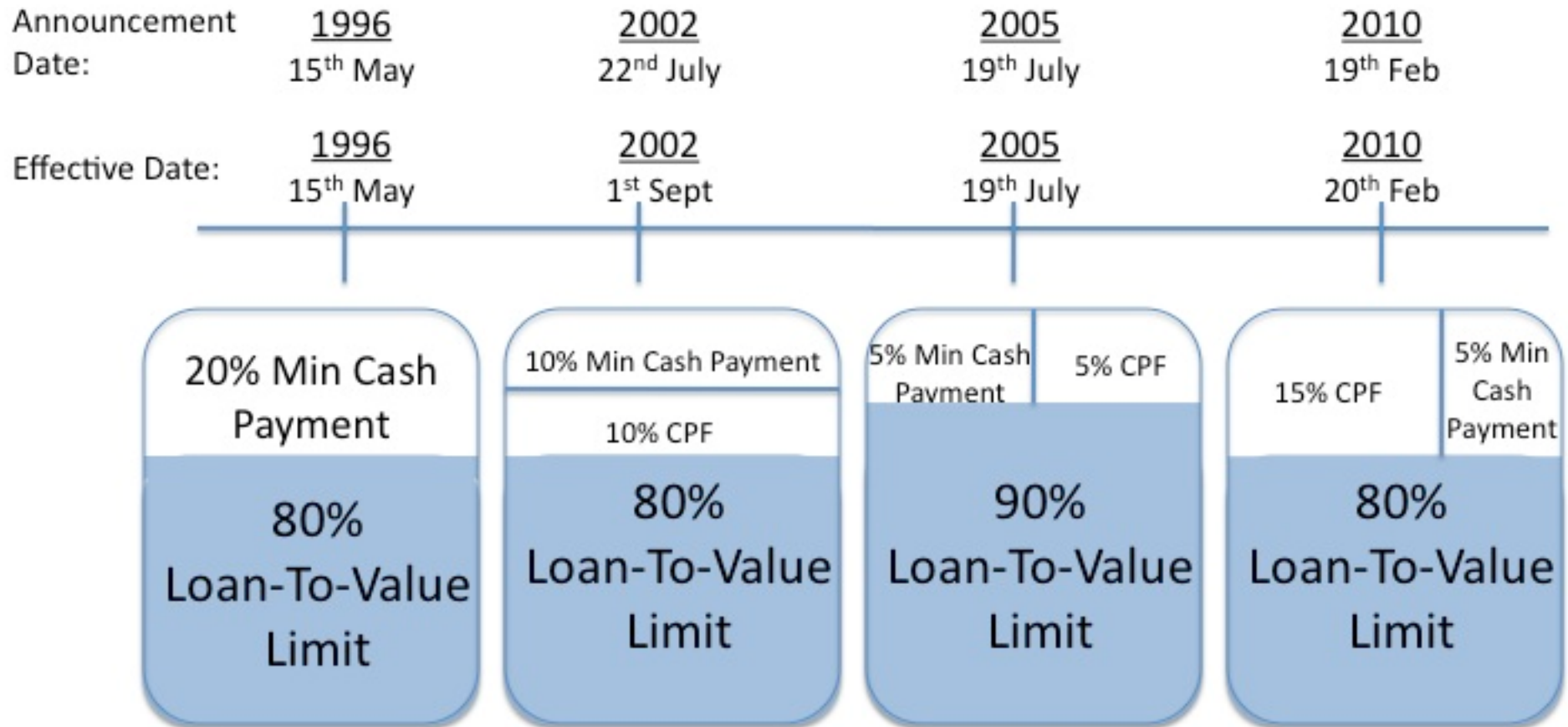
Contributions to Literature

- The expansion of credit has positive impact
  - improve individual welfare (Karlan and Zinman 2008)
  - insure against income fluctuation (Islam and Maitra 2010; Menon 2003)
- The negative consequences of credit are mainly about the effects of payday loan in the US
  - Increase personal bankruptcy rates (Skiba and Tobacman 2009)
  - Increase difficulty paying mortgage and rent (Melzer 2011)
  - Decline in job performance and retention (Carrell and Zinman 2013)
  - Increase in financially motivated crimes (Cuffe 2013)
- This paper study the negative impact of housing credit on personal bankruptcy in Singapore

Contributions to Literature

- Reasons for personal bankruptcy
  - Strategic motive: financial benefit from filing > cost of filing (Fay et al 2002)
  - Negative shock: medical or income shocks (Domowitz and Sartain 1999, Himmelstein et al 2009)
  - Access to high-interest payday loan (Skiba and Tobacman 2009)
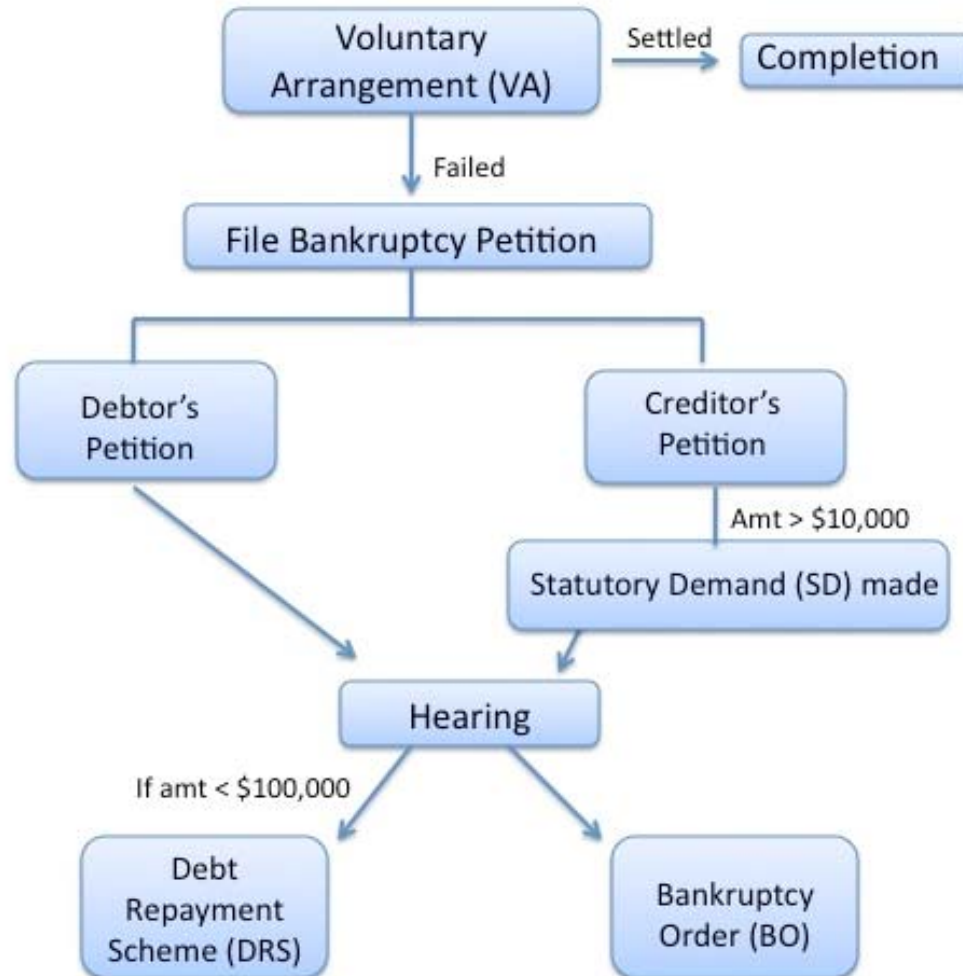- This paper identifies another reason: easy access to housing credit

Institutional Background

Key policy changes for private residential properties:

Announcement Date:
- 1996 15th May
- 2002 22nd July
- 2005 19th July
- 2010 19th Feb

Effective Date:
- 1996 15th May
- 2002 1st Sept
- 2005 19th July
- 2010 20th Feb

1996	2002	2005	2010
20% Min Cash Payment	10% Min Cash Payment / 10% CPF	5% Min Cash Payment / 5% CPF	15% CPF / 5% Min Cash Payment
80% Loan-To-Value Limit	80% Loan-To-Value Limit	90% Loan-To-Value Limit	80% Loan-To-Value Limit

Institutional Background

Personal Bankruptcy:

Institutional Background

Personal Bankruptcy:

- If an individual is declared bankrupt, all the assets will vest in the Official Assignee for the benefit of the creditors.
- Exemption:
  - Furniture, personal effects, limited tools of trade
  - Any private properties held by debtor on trust for any other person
  - HDB flats (where at least one of the owners is a Singapore Citizen)
  - Monies in their CPF account
  - Life insurance policies (expressed to be for their spouse or children benefit) and life insurance nominations
  - Any other properties that are excluded under any other written law as well as
  - Compensations awarded for legal actions in repeat of their personal injuries or wrongful act against them
- Bankrupt must make a monthly contribution to bankruptcy estate for the benefit of creditors until discharge
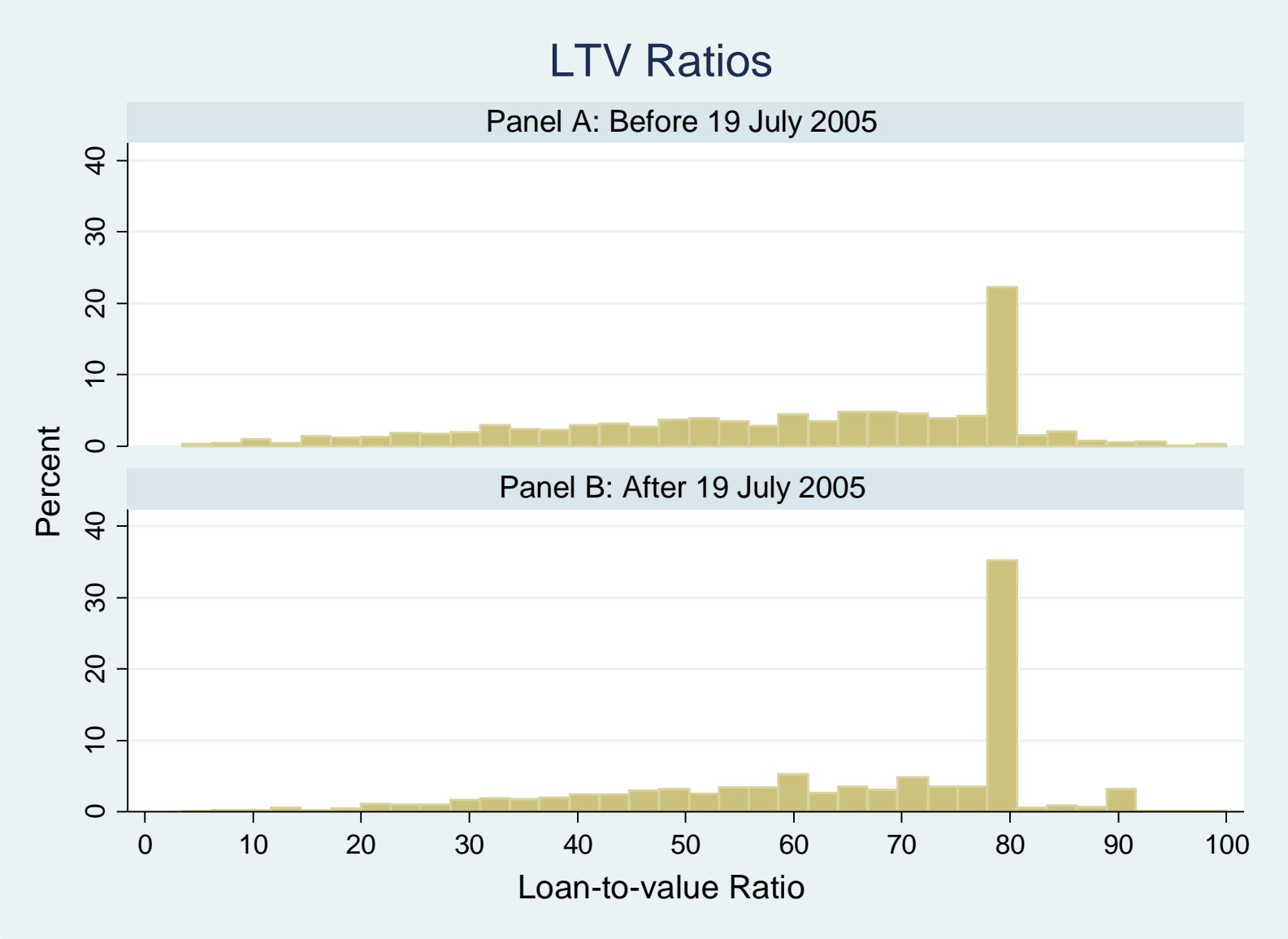- Closer to Chapter 13 in US

Empirical Strategy

- We apply differences-in-differences (DD) strategy to study the impact of LTV ratio increase in 2005 on personal bankruptcy rates

- We explore two sources of variations

  - Time variation: compare those who purchase houses before and after LTV ratio increase

  - Cross sectional variation in total housing price and dimensions: compare those who purchase less expensive (smaller) houses and those who purchase more expensive (larger) houses

Data

- Housing data: over 166,000 private property housing transactions in Singapore from 1995 to 2012
- Personal bankruptcy data: over 76,000 personal bankruptcy in Singapore from 1985 to 2012
- Lawsuit data: more than 532,000 lawsuits in Singapore from 1994 to 2012
- The features of these datasets:
  - Identifiers: merge to each other
  - Date of events: time line of different events
  - Various individual, housing characteristics
  - Limitation: no mortgage information
- Mortgage data: about 4000 mortgage loans originated between 1992 and 2012 from a large representative bank

First Stage

LTV Ratios

Panel A: Before 19 July 2005

Panel B: After 19 July 2005

First Stage: LTV and Instalment

Specification:			OLS Regression					
Policy Date		**July 19, 2005**				**September 1st, 2002**		
Sample:		**All Sample**				**Year 1996 - 2005**		
Dep. Var.:	**LTV**		**Monthly Instalment**		**LTV**		**Monthly Instalment**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Indicator for houses over 50th percentile of housing price × Indicator after policy	5.079***	4.4933***	799.381***	458.4969***	3.013	2.2380	-0.534	134.1389
	(1.259)	(1.051)	(163.705)	(136.927)	(2.384)	(2.176)	(179.908)	(148.970)
Obs.	3686	3686	3686	3686	1520	1520	1520	1520
Year, region and cohort fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Control variables for loan characteristics	N	Y	N	Y	N	Y	N	Y

Summary Statistics

	Single Property Buyers			Multiple Property Buyers
	Price below 50th Pct	**Price above 50th Pct**	**p-value (means)**	**All**
Male	0.49	0.49	0.31	0.53
Chinese	0.93	0.93	0.00	0.95
Condominiums	0.67	0.57	0.00	0.57
Private Apartments	0.26	0.12	0.00	0.22
Freehold	0.31	0.57	0.00	0.48
New Sale	0.51	0.56	0.00	0.53
Age at First Purchase (In Years)	40.20	42.28	0.00	40.91
Mean Price of Property Purchased (In SG$)	606792	1219679	0.00	997830
Mean Size of Property Purchased (In Sq. Metres)	109.25	188.13	0.00	157.53
Single Bankruptcies	0.0081	0.0077	0.55	0.0067
Multiple Bankruptcies	0.0008	0.0013	0.02	0.0009
Obs	56044	46916		39928

Baseline Estimates

- Estimation equation:

$$Y_i = \delta T_i + \beta T_i \cdot I_t^{post} + \sum_t \alpha_t I_t \cdot X_i + \sum_c \tau_c I_c + \sum_t \gamma_t I_t + \sum_r \varphi_r I_r + \varepsilon_{it}$$

- Outcome of interest, Y_i, is an indicator variable for whether an individual will be declared bankrupt after purchasing a house

- T_i is an indicator variable for the treatment index:
  - indicator variable for houses above the 50th percentile of housing prices
  - indicator variable for houses above the 50th percentile of housing dimensions

- I_t^{post} is an indicator variable that equals one if the house is bought after policy change.

Baseline Estimates

- Estimation equation:

$$Y_i = \delta T_i + \beta T_i \cdot I_t^{post} + \sum_t \alpha_t I_t \cdot X_i + \sum_c \tau_c I_c + \sum_t \gamma_t I_t + \sum_r \varphi_r I_r + \varepsilon_{it}$$
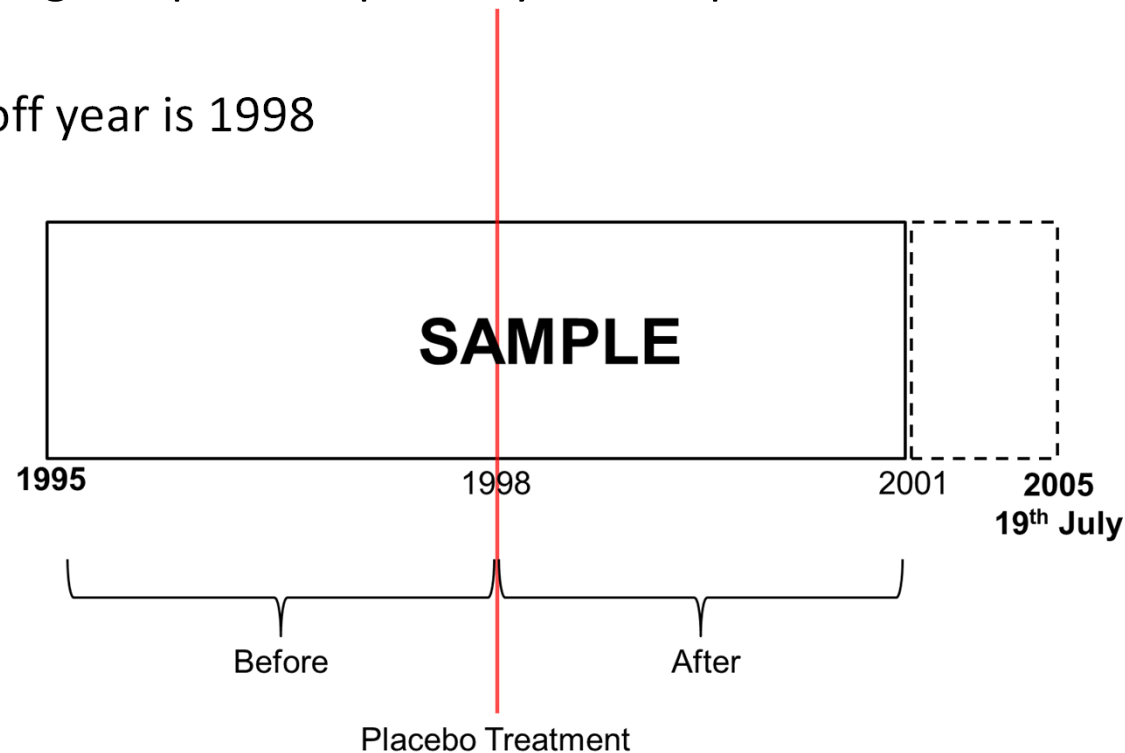
- X_i are control variables including the total price and dimensions of a house, whether the sale type is resale, whether it is a private property, whether the tenure is freehold
- $\sum_c I_C$ is cohort fixed effects
- $\sum_t I_t$ is year fixed effects
- $\sum_r I_r$ is region fixed effects
- Coefficient of interest, β, is the estimated impact of LTV ratio increase on personal bankruptcy rate.

Impact of LTV ratio increase on bankruptcy

Dep. Var.:	Personal Bankruptcies			
Sample:	All Samples			
Specification:	OLS Regression			
	(1)	(2)	(3)	(4)
Indicator for houses over 50th percentile of housing prices	-.0010 (.00064)	-.0015 (.00070)**		
Indicator for houses over 50th percentile of housing prices × Indicator after July 19, 2005	.0015 (.00071)**	.0020 (.00075)***		
Indicator for houses over 50th percentile of housing dimensions			.00013 (.00071)	-.00087 (.00063)
Indicator for houses over 50th percentile of housing dimensions × Indicator after July 19, 2005			.0011 (.00070)	.0018 (.00076)**
Obs.	102853	102853	102853	102853
Year, region and cohort fixed effects	Y	Y	Y	Y
Control × Year fixed effects	N	Y	N	Y

Rolling Estimates

- The identification of DD strategy replies on the common trend assumption
- We apply rolling estimates to check common trend assumption
- Similar to Placebo Estimates
    - 6 year rolling sample: compare 3-year samples before and after cutoff year is always
    - E.g. if cutoff year is 1998

Results for Rolling Estimates

Dep. Var.:	Individual bankruptcies								
Sample:	All Samples								
Specification:	OLS Regression								
Placebo cutoff time	1998	1999	2000	2001	2002	2003	2004	2005	July 19th 2005
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Treatment Index is Housing Price									
Indicator for houses over 50th percentile of Treatment Index ×	-.00066	.000074	-.0019	-.0013	.00099	-.00079	.00012	.0018	.0019
placebo cutoff year	(.0035)	(.0021)	(.0023)	(.0027)	(.0021)	(.0013)	(.0014)	(.00096)*	(.0011)***
Panel B: Treatment Index is Housing Dimensions									
Indicator for houses over 50th percentile of Treatment Index ×	-.0051	-.0022	-.0061	-.0027	-.0014	-.0019	-.00075	.0025	.0027
placebo cutoff year	(.0040)	(.0021)	(.0023)***	(.0027)	(.0019)	(.0013)	(.0015)	(.00099)**	(.0011)**
Obs.	13379	23785	38660	47220	55748	61452	63304	59019	59019
Year, region and cohort fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Control x Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y

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Possible Channels

- We show that buying expensive/large houses after the increase in LTV ratio increases the likelihood of personal bankruptcy after buying the house.
  - The effect is not due to different trends
- What are possible channels?
- Composition Effect
  - Increase in LTV ratio encourages individuals to buy expensive houses that they could not afford before
- Debt burden Effect
  - Increase in LTV ratio increase the burden of repayment

Composition Effect

Key Policy changes:
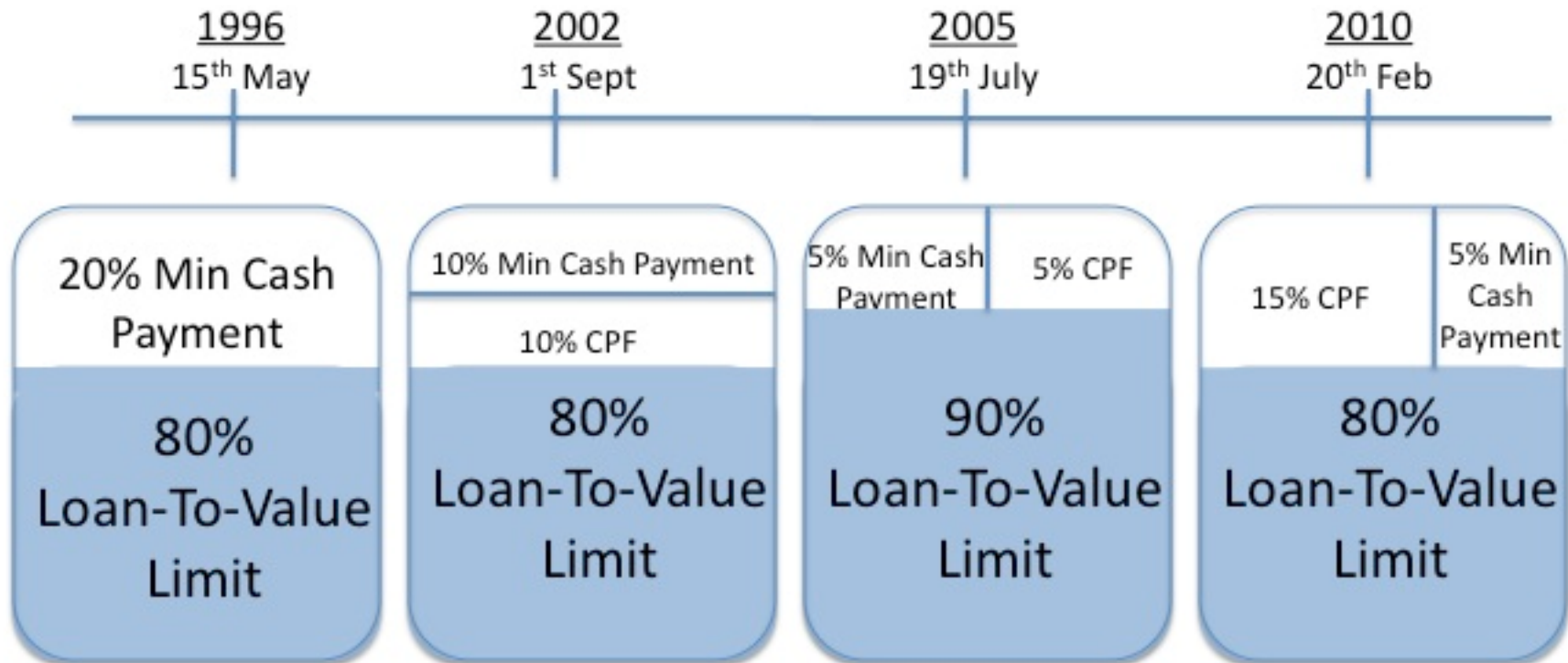
Composition Effect

- Sept 1st,2002 housing policy change
  - Min cash payment from 20% to 10% of housing value
  - CPF can be used for 10% of housing value
- Decrease in min cash payment requirement might encourage individuals to buy expensive houses
- However, total Loan burden not affected: 80% LTV ratio
- Test: Difference-in-Difference
  - Using 2002 housing policy change and 1996-2005 sample
  - Prediction: Decrease in min cash payment requirement increases personal bankruptcy

Composition Effect

Dep. Var.:	Individual bankruptcies							
Specification:	OLS Regression							
Sample:	Year 1996 - 2005				Year 2000 - 2005			
Treatment Index	Housing Prices		Housing Dimension		Housing Prices		Housing Dimension	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Indicator for houses over 50th percentile of treatment index ×	.00050	-.000013	-.00055	-.0016	.00034	.000024	-.00031	-.0010
Indicator after September 1st 2002	(.0011)	(.0013)	(.0010)	(.0011)	(.0012)	(.0013)	(.0011)	(.0012)
Obs.	63352	63352	63352	63352	57003	57003	57003	57003
Log likelihood								
Year, region and cohort fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Control x Year fixed effects	N	Y	N	Y	N	Y	N	Y

The results presented in this table uses data from 15th May 1996 to 20th February 2010. The dependent variable is whether an individual will be going bankrupt (after buying a house). Columns 1 to 8 present the results from performing an ordinary least squares regression. Indicator for houses over 50th percentile of housing prices takes 1 if the price of a house is above the 50th percentile of housing prices in Singapore. Indicator for houses over 50th percentile of housing dimensions takes 1 if the size of a house is above the 50th percentile of housing dimensions in Singapore. Standard errors are clustered by 82 postal sectors. Robust clustered errors are reported in parantheses. * indicates significance at the 10% level. ** indicates signficance at the 5% level. *** indicates significance at the 1% level. The results shown in the even columns (Column 2,4,6,8) are obtained after adding in controls and year fixed effects. The result of the cofficient for the interaction term is close to zero which indicates that the composition effect is not large enough.

Debt Burden Effect

- Increase in LTV ratio increase the burden of repayment
- Data: more than 532,000 lawsuits in Singapore from 1994 to 2012
- Test 1: Difference-in-Difference
  - Using 2005 housing policy change and 1996-2010 sample
  - Prediction: It might increase the likelihood that the individual is a defendant in a lawsuit due to credit reason
- Falsification 1:
  - It will not change the likelihood that the individual is a plaintiff in a lawsuit due to credit reason
  - Check common trend: placebo test

Debt Burden Effect

Specification:	OLS Regression			
Sample:	All Samples			
Treatment Index	Housing Prices		Housing Dimension	
	(1)	(2)	(3)	(4)
Panel A: If a person is a defendant in a law suit due to Credit				
Indicator of housing over 50th percentile of treatment index x Indicator after July 19th 2005	.0020 (.0011)*	.0015 (.0012)	.0020 (.0011)*	.0022 (.0011)**
Obs.	134315	134315	134315	134315
Panel B: If a person is a plaintiff in a law suit due to Credit				
Indicator of housing over 50th percentile of treatment index x Indicator after July 19th 2005	.00014 (.00018)	.000087 (.00022)	.00012 (.00021)	.00011 (.00024)
Obs.	136417	136417	136417	136417
Log likelihood				
Year, region and cohort fixed effects	Y	Y	Y	Y
Control x Year fixed effects	N	Y	N	Y

The results presented in this table uses data from 15th May 1996 to 20th February 2010. The dependent variable is whether an individual (after buying a house) is a defendant or plantiff in the reasons listed above. For Panel A, it is equal to 1 if it's a defendant in the lawsuit or 0 otherwise. For Panel B, it is equal to 1 if it's a plantiff in the lawsuit or 0 otherwise. Robust clustered errors are reported in parantheses.* indicates significance at the 10% level. ** indicates signficance at the 5% level. *** indicates significance at the 1% level.

Debt Burden Effect

- Test 2:
  - For those who are defendants in a credit related lawsuit, the impact of buying expensive house after LTV ratio increase on personal bankruptcy is greater than those who are not defendants in a credit related lawsuit
  - Prediction: the coefficient of triple interaction is positive and significant
- Falsification 2:
  - The coefficient of triple interaction will be zero if the individual is a plaintiff in a credit related lawsuit

Debt Burden Effect

Estimation equation:

$$Y_i = \delta_1 T_i + \delta_2 C_i + \delta_3 T_i \cdot C_i + \delta_4 C_i \cdot I_t^{post} + \beta_1 T_i \cdot I_t^{post} + \beta_2 T_i \cdot C_i \cdot I_t^{post}$$

$$+ \sum_t \alpha_t I_t \cdot X_i + \sum_c \tau_c I_c + \sum_t \gamma_t I_t + \sum_r \varphi_r I_r + \varepsilon_{it}$$

C_i is an indicator variable that equals one if individual i is a defendant in a credit related lawsuit

β_1 measures the impact of LTV ratio increase on personal bankruptcy for those who are not defendants in a credit related lawsuit.

β_2 measures the different impact of LTV ratio increase on personal bankruptcy between those who are not defendants in a credit related lawsuit and who are not

Debt Burden Effect

Dep. Var.:	Personal Bankruptcies			
Specification:	OLS Regression			
Sample:	All Samples			
Treatment Index	Housing Prices		Housing Dimensions	
	(1)	(2)	(3)	(4)
Panel A: If a person is a defendant in a credit-related lawsuit				
Indicator for houses over 50th percentile of treatment index × Indicator after July 19, 2005	-.00087	-.000056	.00011	.00075
	(.00048)*	(.00054)	(.00046)	(.00058)
Indicator for credit-related lawsuits × Indicator for houses over 50th percentile of treatment index × Indicator after July 19, 2005	.11	.11	.084	.084
	(.053)**	(.053)**	(.049)*	(.049)*
Obs.	134315	134315	134315	134315
Panel B: If a person is a plaintiff in a credit-related lawsuit				
Indicator for houses over 50th percentile of treatment index × Indicator after July 19, 2005	.000044	.0000045	.00006	.000059
	(.000080)	(.00010)	(.000081)	(.000097)
Indicator for credit-related lawsuits × Indicator for houses over 50th percentile of treatment index × Indicator after July 19, 2005	-.000051	.00023	-.000010	.00020
	(.000080)	(.00023)	(.000071)	(.00021)
Obs.	136417	136417	136417	136417
Year, region and cohort fixed effects	Y	Y	Y	Y
Control × Year fixed effects	N	Y	N	Y

Selection on irresponsible buyers

Sample:	All Samples			
Specification:	OLS Regression			
Treatment Index	Housing Prices		Housing Dimensions	
	(1)	(2)	(3)	(4)

Panel A : Dependent Variable is bankruptcy before buying house

Indicator for houses over 50th percentile of Treatment Index ×	.00037	.00041	.00055	.00049
Indicator after July 19, 2005	(.00084)	(.00090)	(.00081)	(.00086)
Obs.	102853	102853	102853	102853

Panel B : Dependent Variable is a defendant involved in a credit-related lawsuit

Indicator for houses over 50th percentile of Treatment Index ×	.00029	.0012	.00010	.00058
Indicator after July 19, 2005	(.00090)	(.00092)	(.00077)	(.00084)
Obs.	151956	151956	151956	151956

Panel C : Dependent Variable is male

Indicator for houses over 50th percentile of Treatment Index ×	-.0033	-.000053	.0034	.0067
Indicator after July 19, 2005	(.0057)	(.0044)	(.0059)	(.0051)
Obs.	102853	102853	102853	102853

Panel D : Dependent Variable is whether is Chinese

Indicator for houses over 50th percentile of Treatment Index ×	.0070	.0016	.011	.0062
Indicator after July 19, 2005	(.0045)	(.0044)	(.0055)**	(.0049)
Obs.	102853	102853	102853	102853

Panel E : Dependent Variable is cohort

Indicator for houses over 50th percentile of Treatment Index ×	-.014	-.022	-.037	-.043
Indicator after July 19, 2005	(.033)	(.031)	(.028)	(.029)

Possible Channels

- Composition effect is unlikely to be the main channel
  - The effect of 2002 policy change is close to zero
- Debt burden effect is likely to be the main channel
  - First stage: those who buy expensive houses after the policy change in 2005 have higher LTV and monthly instalment
  - Buying expensive houses after the increase in LTV ratio increases the likelihood that the individual is a defendant in a credit related lawsuits.
  - For those who are defendants in a credit related lawsuit, the impact of buying expensive house after LTV ratio increase on personal bankruptcy is greater than those who are not defendants in a credit related lawsuit
- There is no evidence about selection on irresponsible buyers

Conclusion

- We apply DD strategy to study the impact of LTV ratio increase on housing buyers' personal bankruptcy rate.
- Buying expensive/large houses after the increase in LTV ratio increases the likelihood of personal bankruptcy after buying the house.
- Possible Channels:
  - Composition Effect: Increase in LTV ratio encourages individuals to buy expensive houses that they could not afford before
  - Debt burden Effect: Increase in LTV ratio increase the burden of repayment
- Our results:
  - Composition effect is unlikely to be the main channel
  - Debt burden effect is likely to be the main channel