THE EFFECTIVENESS OF HOUSING COLLATERAL TIGHTENING POLICY

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INTRODUCTION

Motivation

Effectiveness of macroprudential policy:

- Long-term: consensus on impact
- Challenges to identification of transmission channel:
  - Confounding macro factors
  - Measures usually proposed as *packages*
  - Supply vs. demand response
  - Selection vs. treatment effects
- Conventional view:

  High LTV borrowers are riskier and more likely to become delinquent
- Key question:

  Does collateral tightening attract the right type of borrowers?

Key results

1. Exploit collateral tightening policy intervention in market for *investor loans*
2. Consequence of the policy roll-out:
   - No change in loan take-up
   - Loans are *more* likely to become delinquent
3. Substantial shift in the composition of borrowers:
   - Lower credit quality and less liquid assets
   - Optimists: Take the risk of a liquidity crunch to bet on the housing market
4. Persistence of selection effect: 1 year.
5. External validation: aggregate effect on mortgage bankruptcy

Literature

- Collateral constraints: mortgage lending and credit card debt
  - Qi and Yang, 2009; Mian and Sufi, 2011; Fuster and Zafar, 2015; Agarwal et al., 2015, Corbae and Quintin, 2015; Agarwal and Qian, 2016
- Effectiveness of macroprudential policy
  - Akinci and Olmstead-Rumsey, 2015; Cerrutti, Claessens and Laeven, 2015; McDonald, 2015; Tressel and Zhang, 2016
- Liquidity channel of collateral policy:
  - Boz and Mendoza (2014); Wong, Ho and Tsang (2015)

DATA AND METHODOLOGY

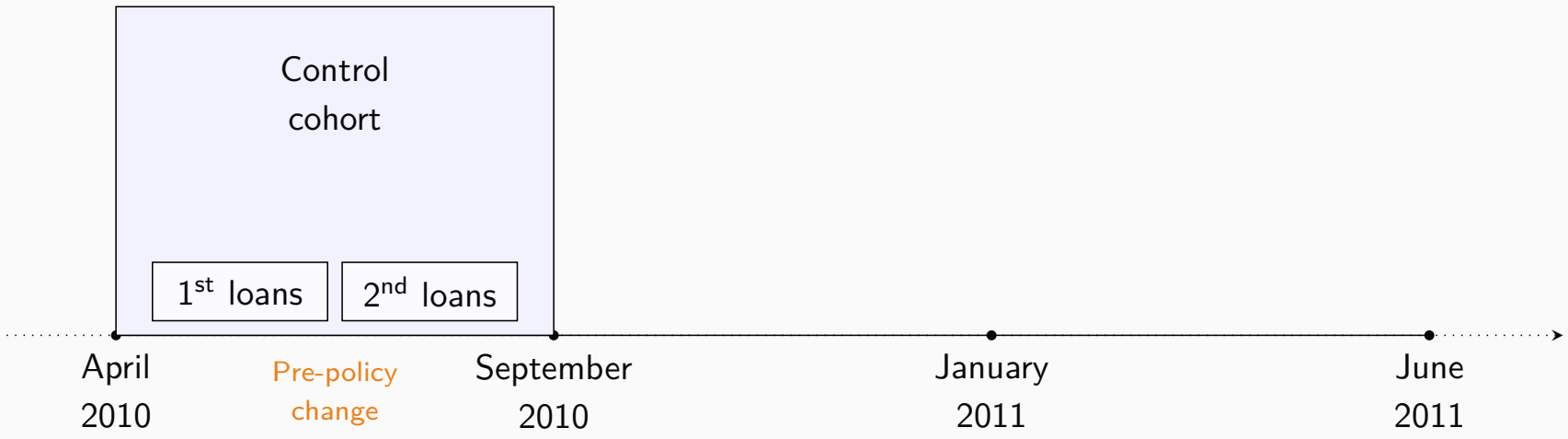
Data

1. Mortgage issuance and performance
   - Proprietary dataset from large Asian bank
   - LTV ratio, interest rate, penalties/delinquency
2. Demographic information about Singapore residents
3. Credit card payment and spending histories
4. Checking account balances
   - Proprietary datasets from the same bank
   - Sample: mortgage borrowers
5. Bankruptcy cases in Singapore
6. Residential real estate transactions
   - Distinguish *owner-occupiers* from *investors*

Policy change in Singapore

- *"For property buyers who already have one or more outstanding housing loans at the time of the new housing purchase:*
  1. *Increase the minimum cash payment from 5% to 10%.*
  2. *Decrease the Loan-to-Value (LTV) limit for housing loans granted by financial institutions from the current 80% to 70%."*
- *"The measures will take immediate effect on 30 August 2010."*
- **Note:** Second-loan market accounts for around 25% of outstanding loans in Singapore.

Identification approach



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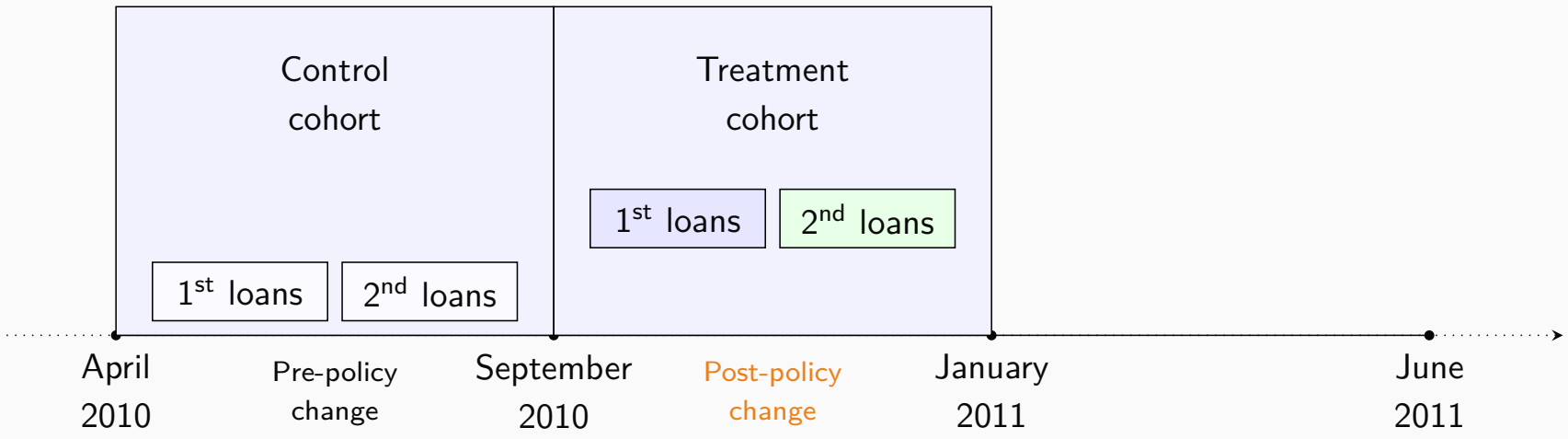

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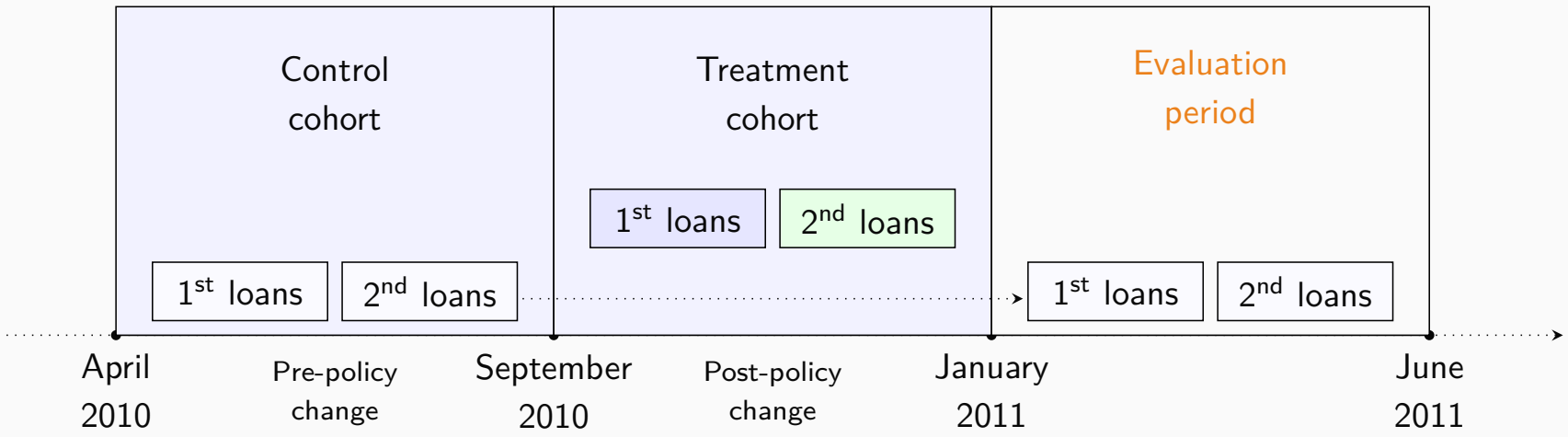

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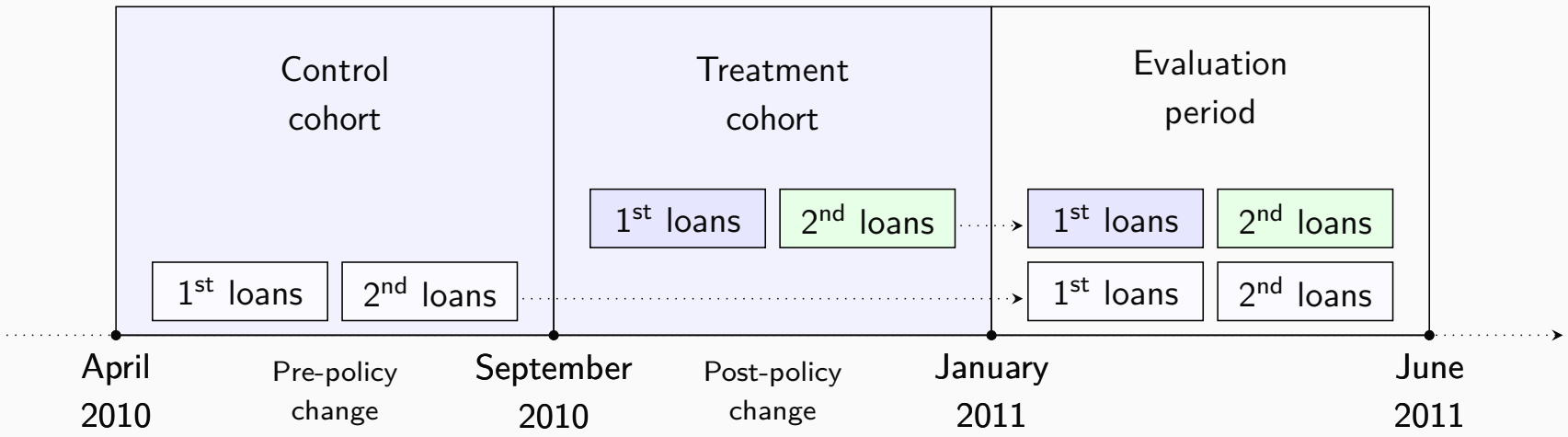

Methodology

- Benchmark estimated specification:

$$y_{i,t,n} = \tau_t + \underbrace{\xi X_{i,t,n}}_{\substack{\text{Loan and} \\ \text{borrower} \\ \text{characteristics}}} + \beta_1 1_{n=2} + \beta_2 1_{post} + \beta_4 \underbrace{1_{n=2}}_{\text{Second loan}} \underbrace{1_{post}}_{\substack{\text{Post-policy} \\ \text{borrower} \\ \text{cohort}}} + \varepsilon_{i,t,n}.$$

- Does the policy affect borrower behaviour?
- Are composition changes persistent?

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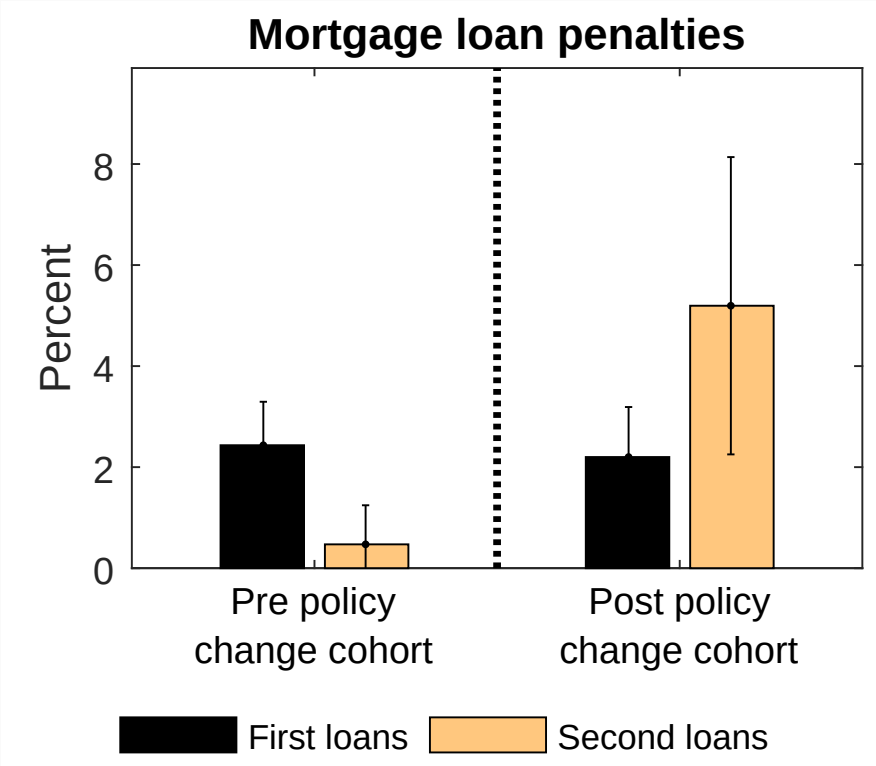
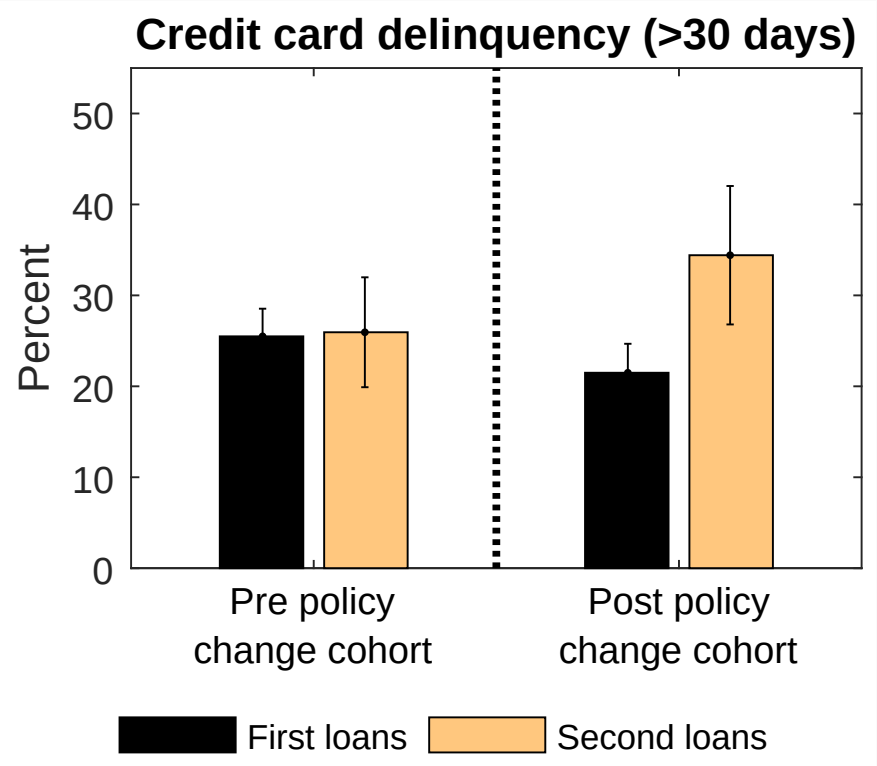
RESULTS

Policy effects across cohorts





Loan characteristics across loan cohorts

	Pre-policy cohort	
	1st loan	2nd loan
Loan and property characteristics		
LTV ratio *(percent)*	68.14	**66.97**
Mortgage interest rate spread *(percent)*	1.70	1.69
Private property *(share)*	0.46	0.62
Property value *('000s)*	$1,021.15	$1,489.06
Loan maturity *(years)*	25.06	24.44

Borrower characteristics

	Pre-policy cohort	
	1st loan	2nd loan
Borrower characteristics		
Average age *(years)*	41.19	**44.48**
Average income per year *('000s)*	$140.67	**$182.90**
Length of tenure with the bank *(years)*	14.73	**16.08**
Foreign national *(share)*	0.30	0.23
Male *(share)*	0.76	0.83
Married *(share)*	0.58	0.70
Professional occupations *(share)*	0.52	0.51
Administrative occupations *(share)*	0.21	0.28
Graduate and postgraduate education *(share)*	0.72	**0.83**

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Borrower risk profile

	Pre-policy cohort	
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Borrower risk profile		
Credit card debt	$469.60	**$589.19**
Delinquency *(>30 days, frequency)*	**0.25**	**0.26**
Behavioural credit score *(units)*	752.24	**762.61**

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Estimation of selection effect

$$y_{i,n} = \beta_1 + \beta_2 1_{n=2} + \beta_3 1_{post} + \underbrace{\beta_4 1_{n=2} 1_{post}}_{\text{Selection effect}} + \varepsilon_{i,n}$$

Loan and property characteristics	
LTV ratio *(percent)*	**-5.74*** **
Mortgage interest rate spread *(percent)*	**0.13***
Private property *(share)*	0.13**
Property value *('000s)*	-$23.75
Borrower characteristics	
Average age *(years)*	1.11
Average income per year *('000s)*	-$1.72
Length of tenure with the bank *(years)*	0.98
Foreign national *(share)*	-0.03
Administrative occupations *(share)*	0.00
Graduate and postgraduate education *(share)*	-0.03

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Borrower risk profile	
Credit card debt	$318.29
Delinquency *(>30 days, frequency)*	**0.12****
Behavioural credit score *(units)*	**-257.00***

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ECONOMIC MECHANISM

Within-cohort behavioral response

$$y_{i,t,n} = \delta_t + \alpha 1_{post} + \underbrace{\beta 1_{n=2}}_{\text{Characteristics}} + \underbrace{\gamma 1_{post} 1_{n=2}}_{\text{Selection effect}} + \underbrace{\tau 1_{post} 1_{n=2} 1_{obs}}_{\text{Treatment effect}} + \varepsilon_{i,t,n}.$$

		Checking account	Total spending	Dining out	Services	Durable goods
Characteristics	β	0.38***	0.25***	0.12***	0.13***	0.08***
Selection effect	γ	-0.08***	-0.14***	-0.11***	-0.06***	-0.03
Treatment effect	τ	-0.06	0.00	0.10	-0.01	-0.02

Effect heterogeneity

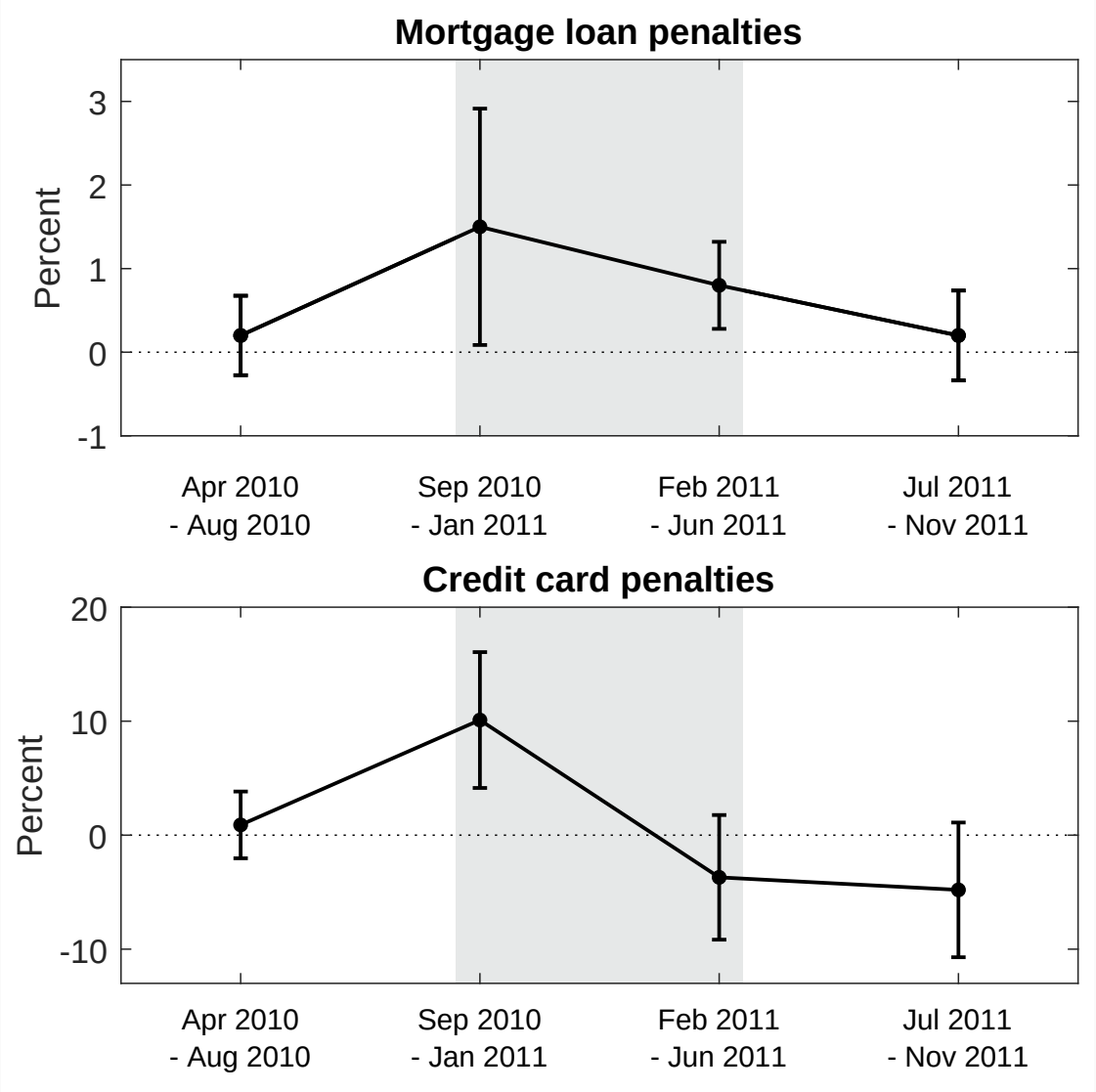
Dependent variable:	Unconditional	Conditional	
Mortgage loan penalties		Pre-policy house prices	Post-policy house prices
Pre-policy control cohort	-0.001	-0.005	-0.003
Post-policy treatment cohort	0.029***	0.003	0.014
District-level house prices		0.003	0.003
Pre-policy cohort (interaction)		0.011	-0.008
Post-policy (interaction)		0.049***	-0.026***
Behavioural score		-0.008***	-0.008***
Pre-policy (interaction)		0.003	0.002
Post-policy cohort (interaction)		-0.047***	-0.052***
Time fixed effects	Yes	Yes	Yes
Borrower characteristics	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes
Number of observations	16,705	16,516	16,516
Adjusted R^2	0.005	0.037	0.037

Within-Borrower Spillovers

$$1_{p_{i,t,n}>0} = \mu_i + \beta X_{i,t,n} + \delta_1 1_{n=1, t\in[\text{Sep 2010, Jan 2011}]} + \delta_2 1_{n=2} + \varepsilon_{i,t},$$

	Mortgage loan penalties
First loan (Post-policy)	0.037*
	(0.020)
Second loan (Post-policy)	0.023*
	(0.013)
Borrower controls	Yes
Borrower fixed effects	Yes
Number of observations	276
Adjusted R^2	0.261

Persistence of cohort effects



EXTERNAL VALIDATION

Alternative dataset: mortgage bankruptcies

$$1_{investor,i,t} = \sum_{j=1}^{5} \gamma_j 1_{cohort=j} + \varepsilon_{i,t},$$

	Mortgage bankruptcy
Apr 2010 - Aug 2010	0.07
	(0.13)
Sep 2010 - Jan 2011	0.15
	(0.12)
Feb 2011 - Jun 2011	0.19*
	(0.10)
Jul 2011 - Nov 2011	0.01
	(0.15)
No. of obs.	94
Adjusted R^2	0.008

CONCLUSIONS

Conclusions

1. Change in composition of borrowers suggests that the collateral tightening policy elicits a supply response towards relatively riskier individuals:
   - More optimistic and choose to take the risk of a liquidity crunch to bet on the housing market
   - Overestimate the possibility to repay and don't adjust consumption behaviour
2. This phenomenon can alter the transmission mechanism that policy makers usually assume, delay and deteriorate the effectiveness of ad-hoc measures meant to deter speculation in the housing market

Loan origination volumes