



光华管理学院
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Real Estate Boom and Misallocation of Capital in China

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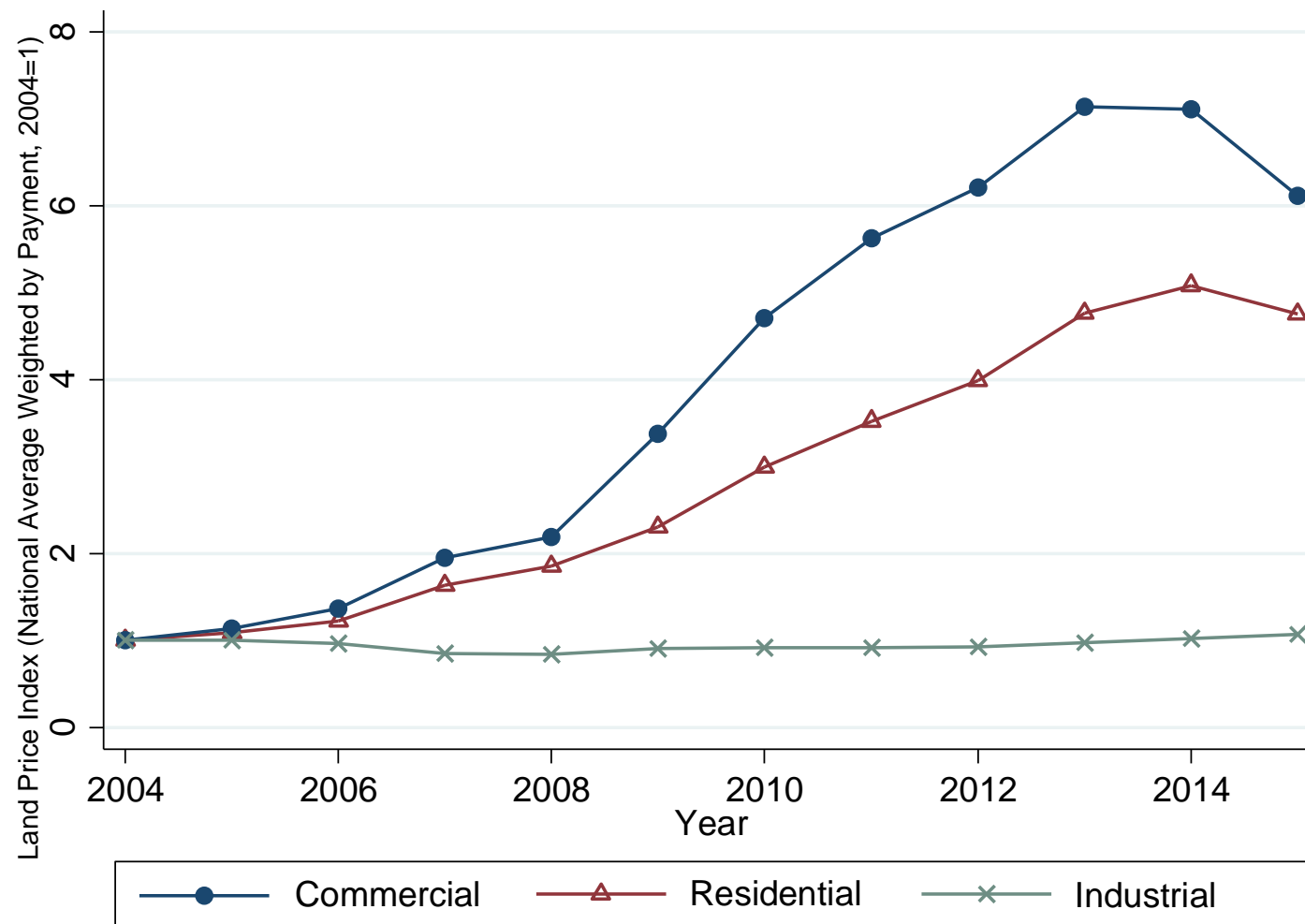
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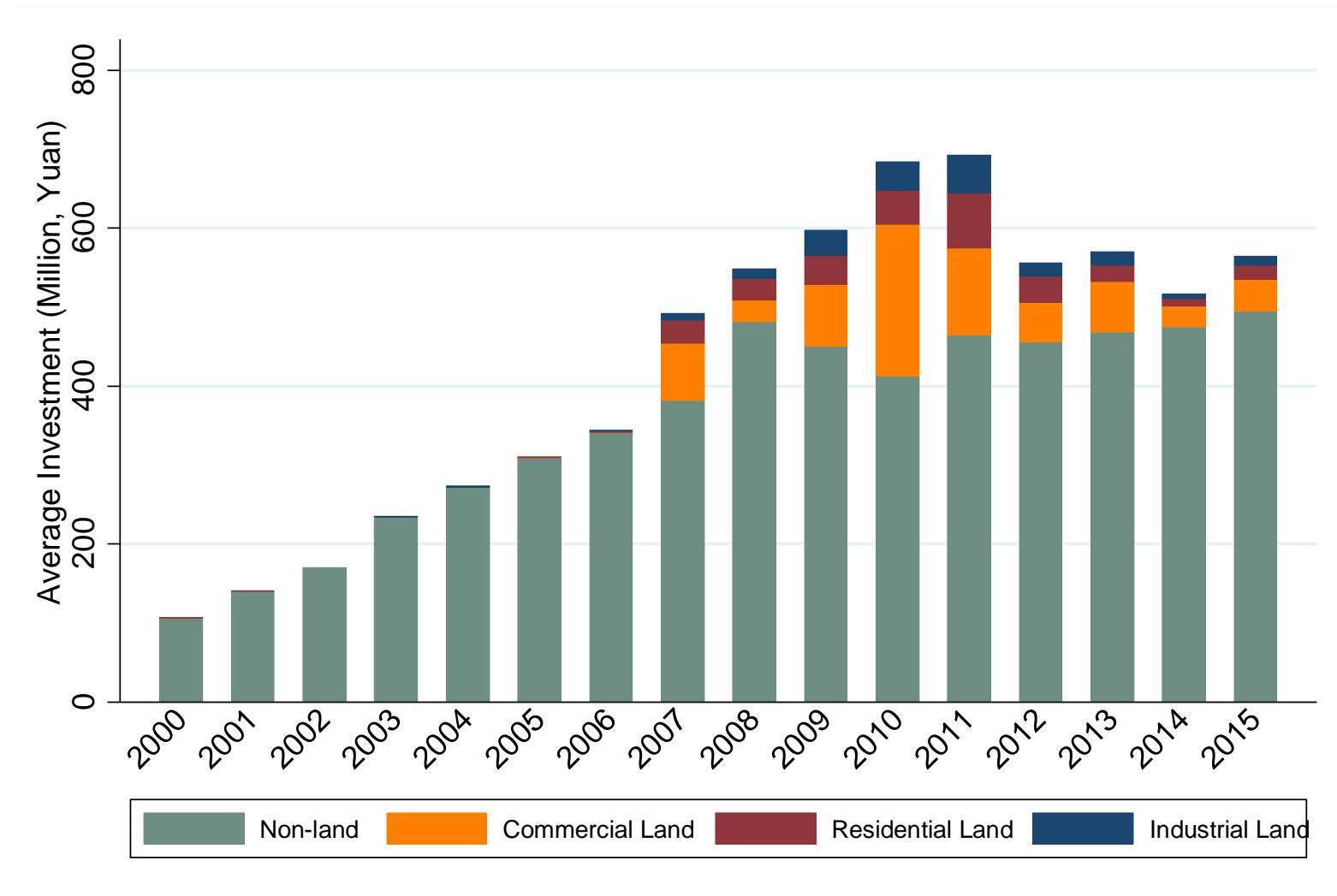
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Real Estate Boom in China



Investment of Publicly Listed Firms



Research Questions

Real estate fluctuations have important implications for long-run growth and business cycles, e.g., Liu, Wang & Zha (2012), Mian & Sufi (2014), Kaplan, Mitman, & Violante (2017)

A real estate boom relaxes financial constraints, e.g., Gan (2007), Channey, Sarer & Thesmar (2003), and stimulates entrepreneurship, e.g., Hurst & Lusardi (2004), Schmalz, Sraer & Thesmar (2015), Kerr, Kerr & Nanda (2015)

A real estate boom may also affect labor choice, e.g., Charles, Hurst & Notowidigdo (2015)

How does China's real estate boom affect capital allocation across firms?

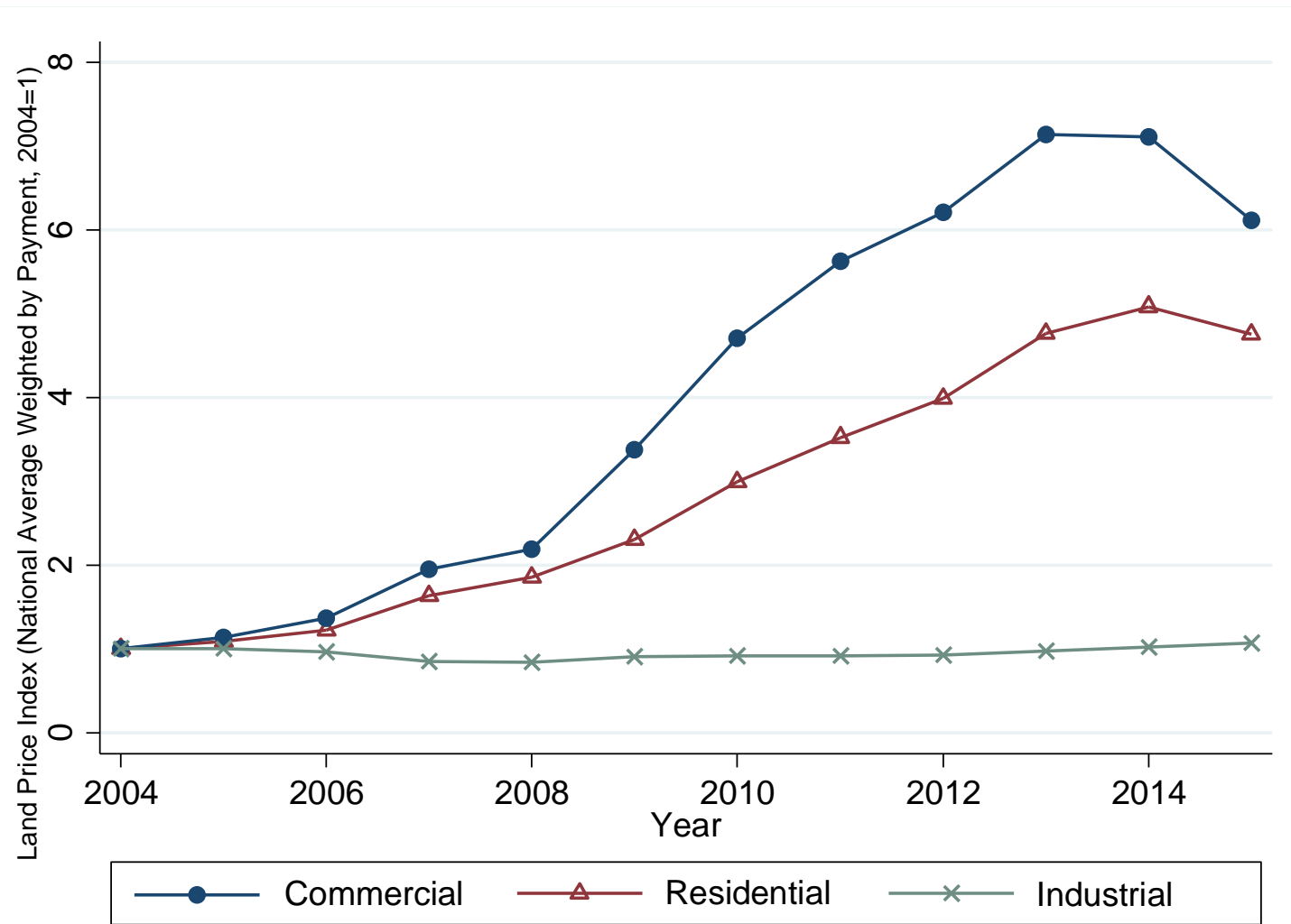
- **How does the real estate boom affect firm investment in China?**
- **How does the real estate boom affect firm innovation in China?**
- **How do banks allocate credit in response to the boom?**

The spectacular price boom and substantial variation across China offer an opportunity to examine these questions

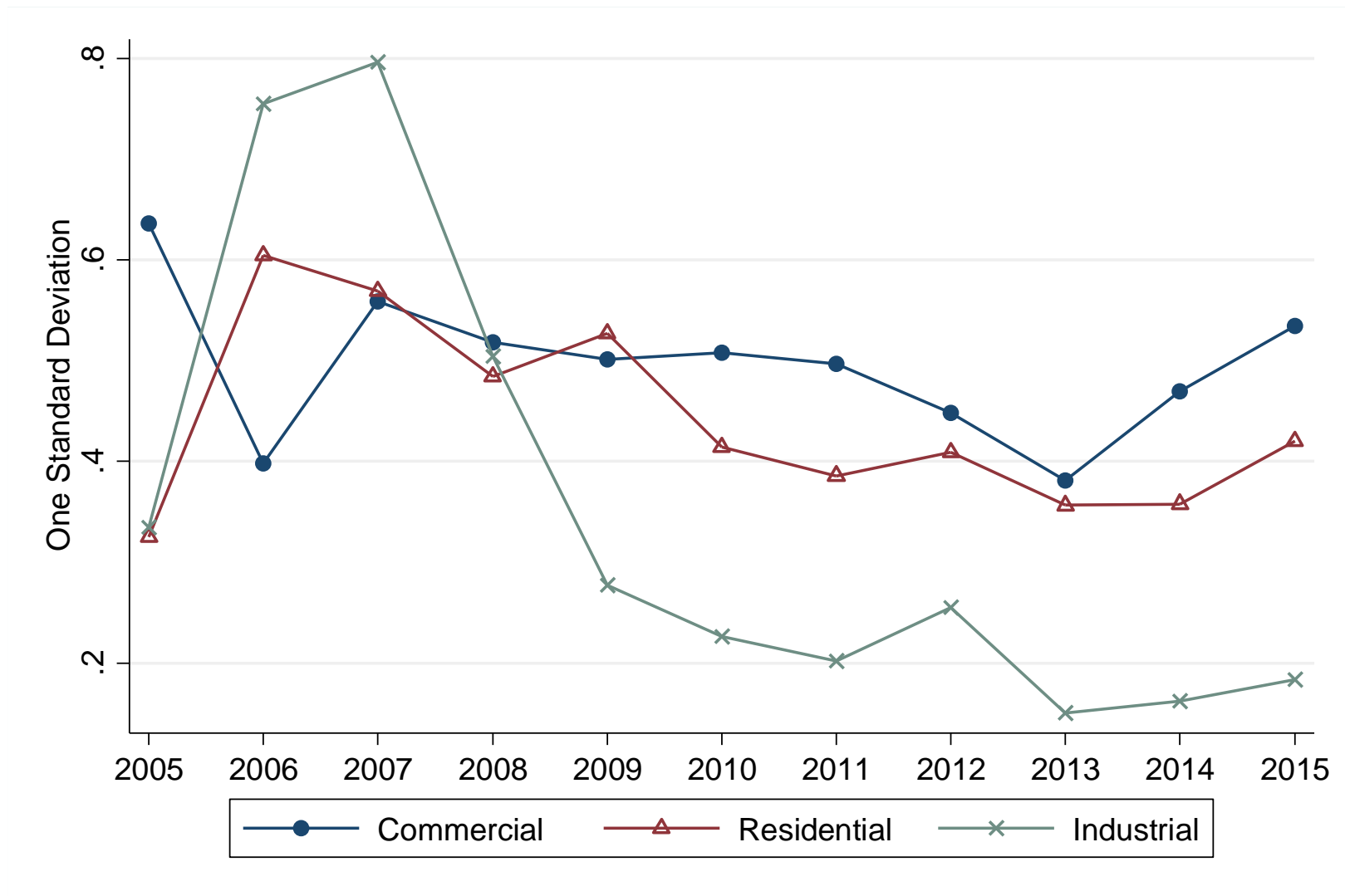
Land Transaction Data and Land Price Indices

- All land transactions in 2000-2015, 1.65 million transactions in 295 cities
 - Hand collected from Ministry of Land and Resources
 - Land buyer, land area, total payment, land usage, location, and transaction price
- We adopt the hedonic price regression approach, e.g., Deng, Gyourko and Wu (2012):
 - $\ln P_{i,k,c,t} = \beta_{k,c,0} + \sum_{s=1}^T \beta_{k,c,s} \cdot 1_{s=t} + \theta_{k,c} X_i + \varepsilon_{i,t}$
 1. Street ID dummy (9-digit administrative unit)
 2. Size of the land parcel
 3. Subcategories of land usage (54 types, e.g. public housing)
 4. Method of transaction (an indicator for transaction through listing bidding or English auction, and invited bidding and bilateral agreement excluded)
 5. A subjective evaluation of land quality (11 ranks)
- We merge the transactions with all publicly listed firms and non-listed manufactory firms

National Land Prices

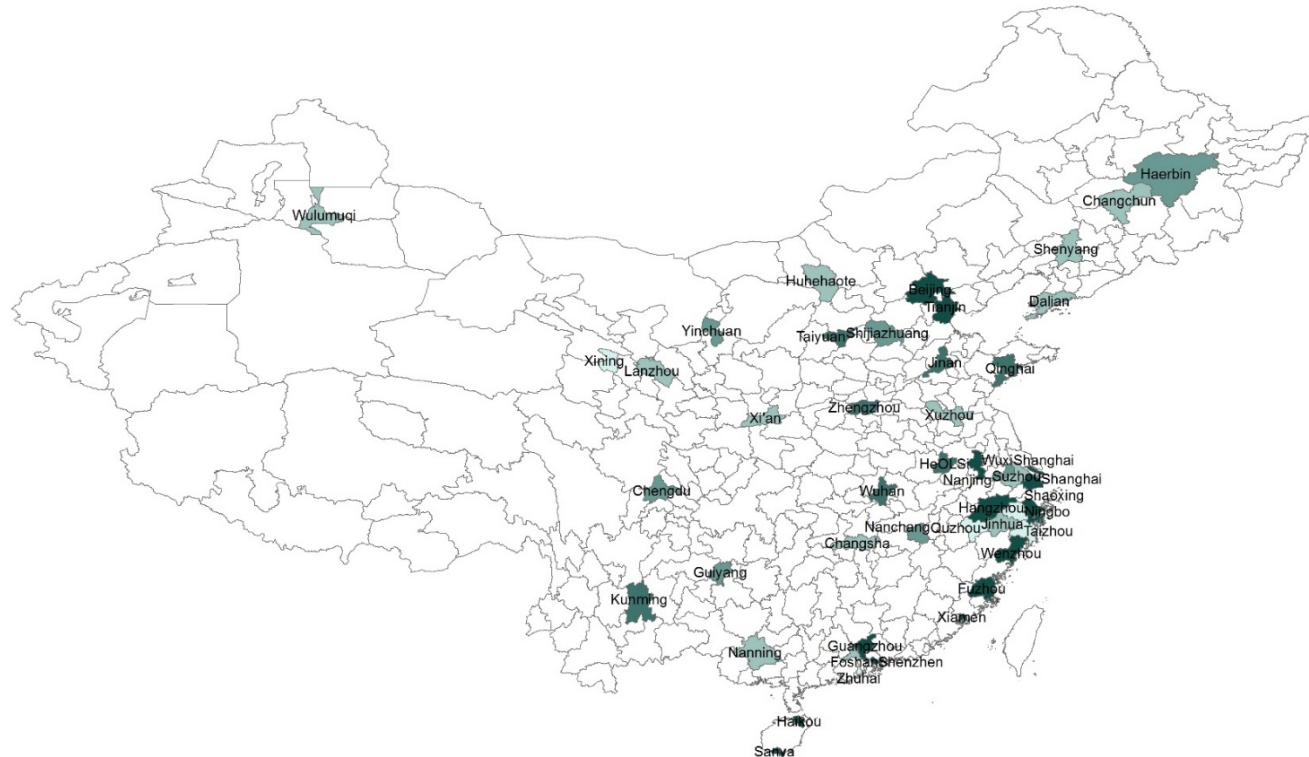


Cross-City Land Price Variation



A Quasi-Policy Experiment

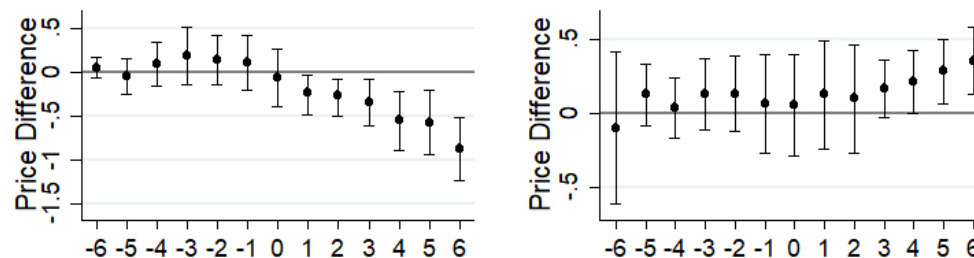
- In 2010, 46 cities adopted the policy of restricting residential home purchases to cool the real estate boom
 - This policy directly affected demand for residential housing, but not firms' investment opportunities and credit availability to these cities



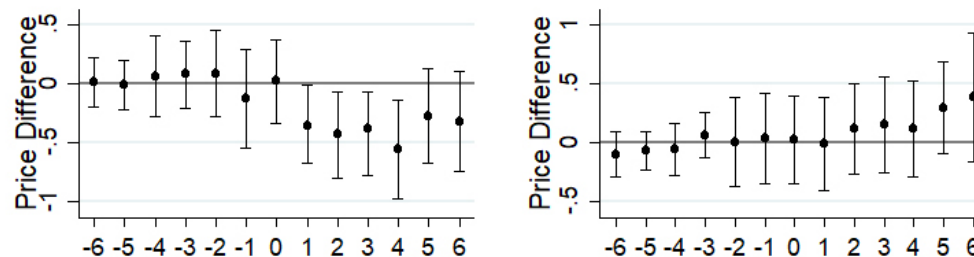
Did the Policy Affect Land Prices?

$$LandPrice_{i,j,t} = \alpha + \sum_{\epsilon t} \beta_{\epsilon t} * EventTime_{j,t,\epsilon t} + \sum \lambda_j * t + \mu_t + \gamma_j + \epsilon_{i,t}$$

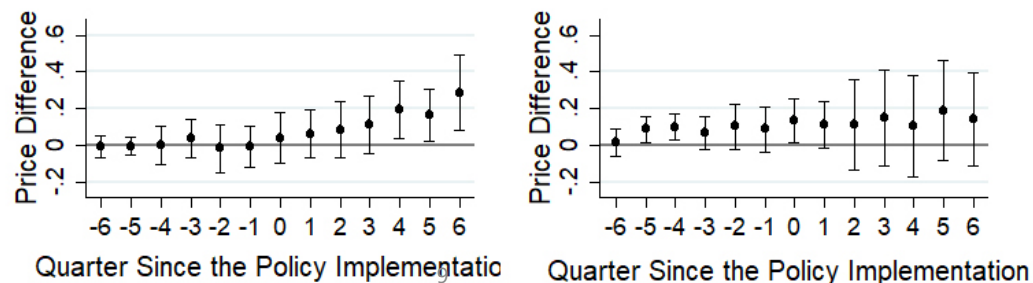
Panel A: Residential Land



Panel B: Commercial Land



Panel C: Industrial Land



Land Price Change and resource misallocation

$$Y_{i,t} = \alpha + \beta * Policy Shock_{i,t} + \sum_i \lambda_i * t + \mu_i + \delta_t + \varphi_{i,t}$$

	Mark-up Dispersion		TFP Losses (Hsieh and Klenow, 2009)		TFP Losses (Midrigan and Xu, 2014)	
	Simple Average	Output Weighted Average	Simple Average	Output Weighted Average	Simple Average	Output Weight Average
	Without city specific time trend					
Policy Shock	-0.089** (0.008)	-0.156*** (0.014)	-0.131** (0.044)	-0.127*** (0.038)	-0.051** (0.014)	-0.058 (0.077)
	With city specific time trend					
Policy Shock	-0.081*** (0.011)	-0.121* (0.011)	-0.142*** (0.041)	-0.085** (0.039)	-0.040*** (0.014)	-0.039 (0.042)

Channels for the resources misallocations

- Investment; Innovation; Bank Credits
 - City-level tests
 - Firm-level tests (public firms and non-listed firms)
 - Loan-level tests

How do real estate prices affect investments and innovation? – City level tests

- Hypothesis: A real estate boom induces firms, especially firms with land, to buy more land and reduce non-land investments and innovation; policy shocks reverses the effects

$$Y_{i,t} = \alpha + \beta * Policy Shock_{i,t} + \sum_i \lambda_i * t + \mu_i + \delta_t + \varphi_{i,t}$$

– $Y_{i,t}$: ln(patent applications), ln(R&D expenditure), ln(land investment), ln(non-land investment)

City-level tests

$$Y_{i,t} = \alpha + \beta * Policy Shock_{i,t} + \sum_i \lambda_i * t + \mu_i + \delta_t + \varphi_{i,t}$$

	Ln(Patent)	Ln(R&D Expenditure)	Ln(Land investment)	Ln(Land investment)_2	Ln(non-Land Investment)	Ln(non-Land investment)_2
Without city specific time trend						
Policy Shock	0.026* (0.015)	0.089*** (0.024)	-0.252** (0.107)	-0.304*** (0.100)	0.110** (0.030)	0.084** (0.040)
With city specific time trend						
Policy Shock	0.012 (0.017)	0.054** (0.026)	-0.055*** (0.018)	-0.064*** (0.019)	0.041** (0.016)	0.066 (0.060)

How do real estate prices affect firm investments and innovations?—Firm level tests

- Hypothesis: A real estate boom induces firms, especially firms with land, to buy more land and reduce non-land investments and innovations; policy shocks reverses the effects

$$Y_{it} = \alpha + \beta \cdot \frac{LandValue_{i,t-1}}{K_{i,t-1}} + \gamma \cdot I_{Non-owner} + \delta \cdot Policy\ Shock$$

$$+ \kappa_1 \cdot I_{Non-owner} \cdot Policy\ Shock_{i,k,t-1} + \theta X_{it} + \varepsilon_i + \delta_t + \epsilon_{it}$$

$$Y_{it} = \alpha + \beta \cdot \frac{LandValue_{i,t-1}}{K_{i,t-1}} + \gamma \cdot I_{Non-owner} + \delta \cdot Policy\ Shock$$

$$+ \kappa_1 \cdot \frac{LandValue_{i,t-1}}{K_{i,t-1}} \cdot Policy\ Shock_{i,k,t-1} + \theta X_{it} + \varepsilon_i + \delta_t + \epsilon_{it}$$

- $Y_{i,t}$: I/K where I is investment in a type (total, non-land, commercial land, residential, industrial land) or R&D expenditure/K, and $\ln(\text{patent applications})$

Firm-level tests on investments —public firms

Panel A	Gross Investment		Non-land Investment		Commercial Land Investment		Residential Land Investment		Industrial Land Investment	
	(1)	(2)	(4)	(5)	(7)	(8)	(10)	(11)	(13)	(14)
Land Value _{t-1} ^{Commercial} (LVC)	0.133***	0.137***	0.129***	0.131***	0.008	0.009	0.039***	0.039***	0.009***	0.009***
	(0.035)	(0.035)	(0.033)	(0.033)	(0.011)	(0.011)	(0.012)	(0.012)	(0.003)	(0.003)
Non-owner	-0.054**	-0.103***	0.021	-0.011	-0.015***	-0.027***	-0.054***	-0.059***	-0.006***	-0.006***
	(0.024)	(0.026)	(0.024)	(0.026)	(0.004)	(0.005)	(0.003)	(0.004)	(0.001)	(0.001)
Policy Shock	0.007	-0.032*	0.040**	0.014	-0.032***	-0.041***	-0.000	-0.004	-0.000	-0.001
	(0.017)	(0.018)	(0.017)	(0.017)	(0.005)	(0.006)	(0.003)	(0.003)	(0.001)	(0.001)
Non-owner*Policy Shock		0.129***		0.085***		0.031***		0.011***		0.001
		(0.028)		(0.028)		(0.005)		(0.003)		(0.001)
Number of Observations	10804	10804	10804	10804	10804	10804		10804	10804	10804
Adj. R-squared	0.396	0.398	0.400	0.401	0.137	0.141		0.149	0.103	0.103

Firm-level tests on investments —public firms

	Gross Investment		Non-Land Investment		Commercial Land Investment		Residential Land Investment		Industrial Land Investment	
	(1)	(3)	(4)	(6)	(7)	(9)	(10)	(12)	(13)	(15)
Land Value _{t-1} ^{Commercial} (LVC)	0.133***	0.228***	0.129***	0.180***	0.008	0.041*	0.039***	0.046	0.009***	0.009**
	(0.035)	(0.058)	(0.033)	(0.050)	(0.011)	(0.023)	(0.012)	(0.030)	(0.003)	(0.004)
Non-owner	-0.054**	-0.054**	0.021	0.021	-0.015***	-0.015***	-0.054***	-0.054***	-0.006***	-0.006***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.004)	(0.004)	(0.003)	(0.003)	(0.001)	(0.001)
Policy Shock	0.007	0.019	0.040**	0.046***	-0.032***	-0.027***	-0.000	0.001	-0.000	-0.001
	(0.017)	(0.017)	(0.017)	(0.017)	(0.005)	(0.004)	(0.003)	(0.003)	(0.001)	(0.001)
LVC*Policy Shock		-0.161***		-0.078		-0.056**		-0.013		0.000
		(0.053)		(0.047)		(0.023)		(0.038)		(0.004)
Number of Observations	10804	10804	10804	10804	10804	10804	10804	10804	10804	10804
Adj. R-squared	0.396	0.397	0.400	0.400	0.137	0.142	0.149	0.149	0.103	0.103

Firm-level tests on investment —non-listed firms

	Gross Investment			Non-land Investment			Commercial Land Investment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Land Value _{t-1} ^{Commercial} (LVC)	0.081***	0.074***	0.077***	0.118*	0.022***	0.006*	0.066***	0.064***	0.044**
	(0.004)	(0.019)	(0.019)	(0.075)	(0.004)	(0.004)	(0.019)	(0.019)	(0.016)
Non-owner	-0.081***	-0.078***	-0.077***	0.034	0.020	0.033	-0.083***	-0.046***	-0.083***
	(0.005)	(0.005)	(0.006)	(0.023)	(0.023)	(0.023)	(0.004)	(0.005)	(0.004)
Policy Shock	0.033	0.011	0.015	0.018***	0.020***	0.016***	-0.020**	-0.011	-0.023**
	(0.060)	(0.063)	(0.059)	(0.001)	(0.001)	(0.001)	(0.009)	(0.009)	(0.009)
Non-owner*PCC		0.134***			0.158**			0.008	
		(0.050)			(0.0070)			(0.007)	
LVC*PCC			0.022***			0.034***			-0.005***
			(0.007)			(0.005)			(0.001)
Number of Observations	1,908,876	1,908,876	1,908,876	1,908,876	1,908,876	1,908,876	1,908,876	1,908,876	1,908,876
Adj. R-squared	0.689	0.603	0.674	0.688	0.603	0.674	0.688	0.603	0.674

Firm-level tests on innovations —public firms

	R&D Expenditure			Patent (Logged)		
	(1)	(2)	(3)	(4)	(5)	(6)
Land Value _{t-1} ^{Commercial} (LVC)	0.063	0.064	0.039	0.076	0.079	0.044
	(0.066)	(0.066)	(0.054)	(0.054)	(0.054)	(0.058)
Non-owner	0.028	0.000	0.027	0.016	-0.028	0.016
	(0.033)	(0.032)	(0.033)	(0.040)	(0.045)	(0.040)
Policy Shock	0.047***	0.033**	0.043***	0.110***	0.075**	0.106***
	(0.014)	(0.015)	(0.014)	(0.031)	(0.032)	(0.031)
Non-owner*Policy Shock		0.058*			0.115**	
		(0.033)			(0.053)	
LVC*Policy Shock			0.046			0.053
			(0.065)			(0.103)
Number of Observations	2535	2535	2535	10804	10804	10804
Adj. R-squared	0.634	0.635	0.634	0.734	0.734	0.734

How do real estate affect banks' credit allocation?

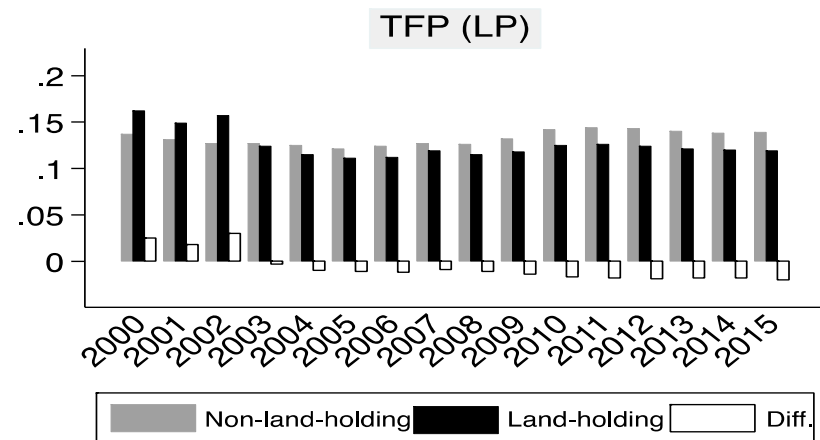
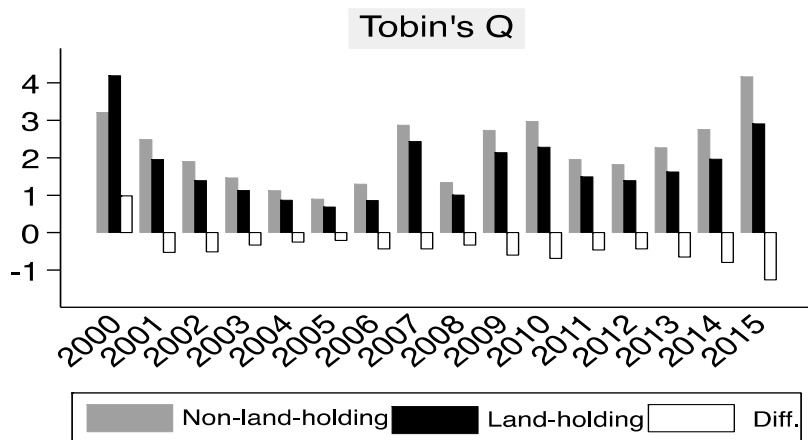
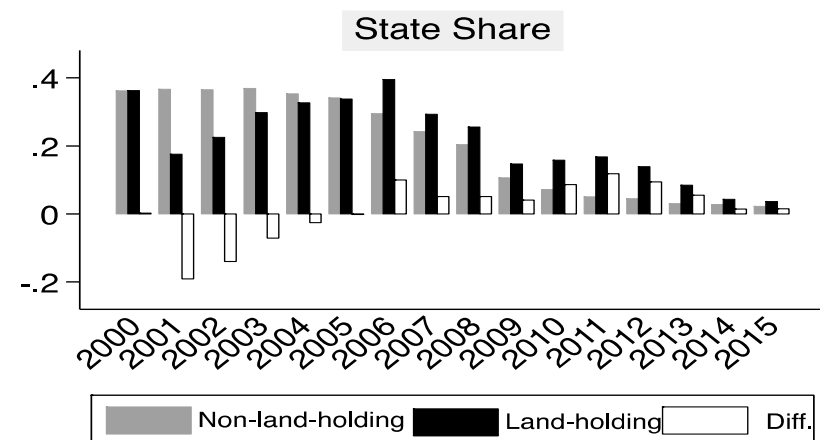
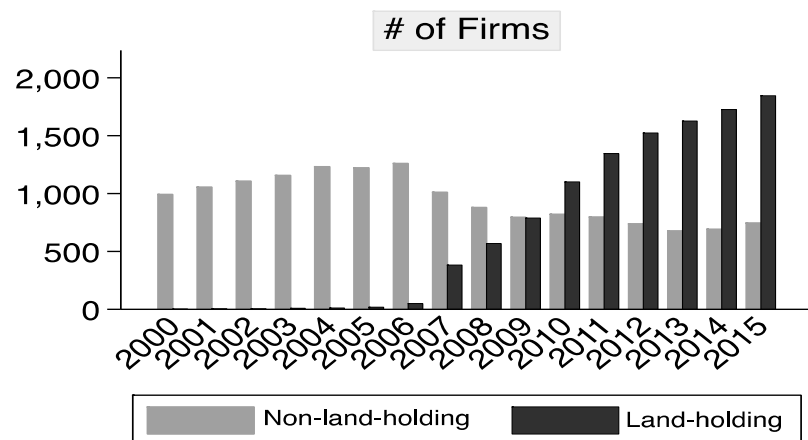
- Hypothesis: A real estate boom reduces bank's willingness to grant loans without land collateral; policy shock reverse the effects
- Bank Loan Level Analysis

$$Loan\ Type_{i,t} = \alpha + \beta * Policy\ Shock_{i,t} + \sum_i \lambda_i * t + \mu_i + \delta_t + \varphi_{i,t}$$

Policy shocks and Loans of Different Types

	Loans with Real Estate Collateral	Loans with Non-Real Estate Collateral	Loans without Collateral	Real Estate Collateral =2; Non-Real Estate Collateral=1; No Collateral=0
Panel A	Without city-specific time trend			
Policy Shock (Bank Branch City)	-0.038***	-0.081***	0.019***	-0.030***
	(0.006)	(0.004)	(0.003)	(0.003)
Panel B	With city-specific time trend			
Policy Shock (Bank Branch City)	-0.025***	-0.074*	0.012**	-0.022***
	(0.007)	(0.032)	(0.006)	(0.008)

Comparisons of land owners vs. non-land owners



Summary of results

1. Real estate boom causes affected banks to grant more real estate collateralized loan and less loans to non-land owners; Non-land owners cut all type of investments and innovation; Firms with more land invest more in commercial land with no increase in non-land investment and innovations.
2. Non-land firms are more financially constrained and more efficient as measured by Tobin's Q and TFP
3. In general, less bank credit are allocated to efficient firms, which have to cut investment and innovation; the inefficient firms get more credits, but they investment into commercial land instead of their core business or innovation.

Alternative explanations — “4 trillion policy” ?

Table 3. Robustness of the Effect of Policy Shock

Panel A	Bank Loan (Logged)		Bank Loan from City Commercial Bank (Logged)	
	(1)	(2)	(3)	(4)
Policy Shock	0.032	0.030	-0.097	-0.047
	(0.058)	(0.063)	(0.077)	(0.041)
City Specific Time Trend	No	Yes	No	Yes
Number of Observations	2626	2626	2626	2626
Adj. R-squared	0.391	0.396	0.121	0.128
Panel B	Migrates in 10,000 Population (Logged)		CPI Index	
	(5)	(6)	(7)	(8)
.Policy Shock	0.031	0.047	0.166	0.135
	(0.048)	(0.081)	(0.125)	(0.174)
City Specific Time Trend	No	Yes	No	Yes
Number of Observations	1035	1035	2626	2626
Adj. R-squared	0.153	0.195	0.215	0.255

Robustness tests – TFP & Input use

Table 8. Policy Shock, Input Use and TFP, 2008-2014

Panel A	TFP	Labor	Capital	Materials	Land Investment
	(1)	(2)	(3)	(4)	(5)
Policy Shock	0.026	0.215***	0.461***	0.170***	-0.072***
	(0.015)	(0.035)	(0.045)	(0.043)	(0.009)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
City Specific Time Trend	Yes	Yes	Yes	Yes	Yes
Number of Observations	1,908,876	1,908,876	1,908,876	1,908,876	1,908,876
Adj. R-squared	0.547	0.543	0.497	0.477	0.178
Panel B	Labor Gap	Capital Gap	Material Gap		
	(6)	(7)	(8)		
Policy Shock	-0.075***	-0.107***	-0.048		
	(0.026)	(0.037)	(0.027)		
Control Variables	Yes	Yes	Yes		
Firm Fixed Effects	Yes	Yes	Yes		
City Specific Time Trend	Yes	Yes	Yes		
Number of Observations	1,908,876	1,908,876	1,908,876		
Adj. R-squared	0.665	0.658	0.670		

Conclusion

- On net, the real estate boom leads to less (rather than more) efficient resource allocation in China
 - Real estate boom causes firms to invest more on lands and less on non-land investment or innovation
 - Real estate boom causes banks to grant more collateralized loans and less credit loan, thus less loans to non-land owners