The real impact of real estate shocks – Evidence from China

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Background of China's real estate market

- Average real estate price has risen for about a decade; huge price variations across cities.
- April 17, 2010, "Notice of the State Council on Resolutely Curbing the Soaring of Housing Prices in Some Cities" (State Council No. 10).
  - Beijing, April 30, 2010, restricts one additional property per household
  - Followed by other 45 cities

Research questions

- How do different types of firms (land owners vs non-land owner) respond to real estate price rises and the negative policy shocks
  - Investment, by different type
  - Financing
  - Investment efficiency
- Can real estate boom stimulate economic growth?

Theoretical predictions

- "collateral channel", rising real estate price increases collateral value, mitigate financial constrains, thus stimulate investment; collapse of the real estate market works in the opposite direction. (Gan 2007, Chaney, Sraer and Thesmar, 2012)
- "crowding out" effect
  - Bubble in one sector will cause investment to be diverted to that sector, crowing out investment in other sectors. (Miao and Wang, 2011, Chen and Wen 2014)
  - Rising price in one sector causes credits to be allocated to firms in that sector, crowing out credits available for other sectors. (Bleck and Liu, 2014)
  - Chakraborty, Goldstein and MacKinlay, 2014

Data

- Land transactions data, 1998-2012.
- Compiled to get land value data.

$$LandValue_{i,t} = \sum_{j}\sum_{k} LandArea_{j,k,i,t} * LandPrice_{j,k,t}$$

  - k: Commercial land; industrial land

- Delete finance, insurance, real estate, construction, and mining industries

Empirical tests -- Investment

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha + \beta \times \frac{LandValue_{i,t}}{K_{i,t-1}} + \gamma \times Land\,\mathrm{Price}_{i,t} + \varepsilon_i + \delta_t + control$$

- β>0
- IV of Landprice, e*r, where e measures the proportions of unavailable land area in each city and r is interest rate.

Empirical tests – Investment and borrowing

	I/K			ΔD/K		New Loan/K	
	OLS		IV	OLS	IV	OLS	IV
Land Value/K	0.223***	0.125***	0.434***	0.738***	2.257***	0.122***	0.362***
	(0.041)	(0.037)	(0.122)	(0.132)	(0.358)	(0.036)	(0.132)
Land Price	-0.001	-0.000	-0.010	-0.044***	-0.089***	0.011***	0.005
	(0.002)	(0.002)	(0.004)	(0.006)	(0.012)	(0.002)	(0.004)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
N	18707	18147	17908	19125	18903	18805	18574
R2	0.304	0.357	0.097	0.102	0.061	0.246	0.079

Purchase restriction policies — 46 cities

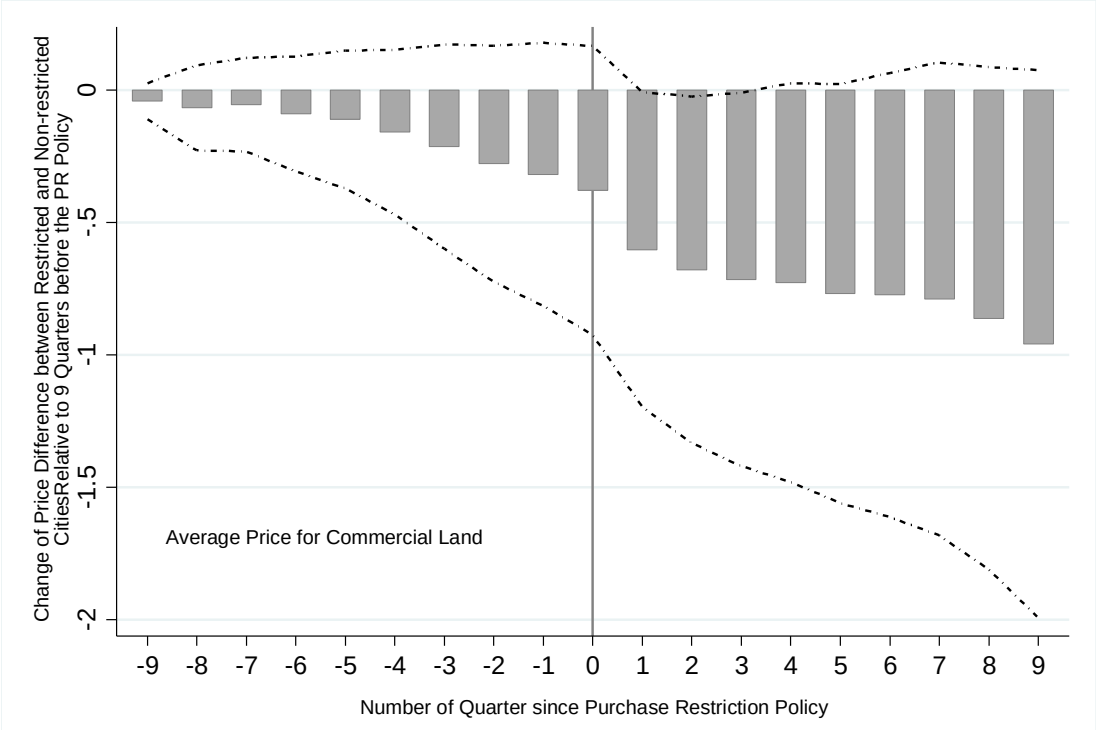
City	Announcement day		City	Announcement day
State Council Notice No 10.	2010/04/27		…	…
Beijing	2010/04/30		Xining	2011/08/01
Shenzhen	2010/09/30		Zhoushan	2011/08/02
Xiamen	2010/10/01		Shaoxing	2011/08/25
Shanghai	2010/10/07		Taizhou	2011/08/25
Ningbo	2010/10/09		Quzhou	2011/09/09
…	…		Zhuhai	2011/11/01

Predictions of the policies

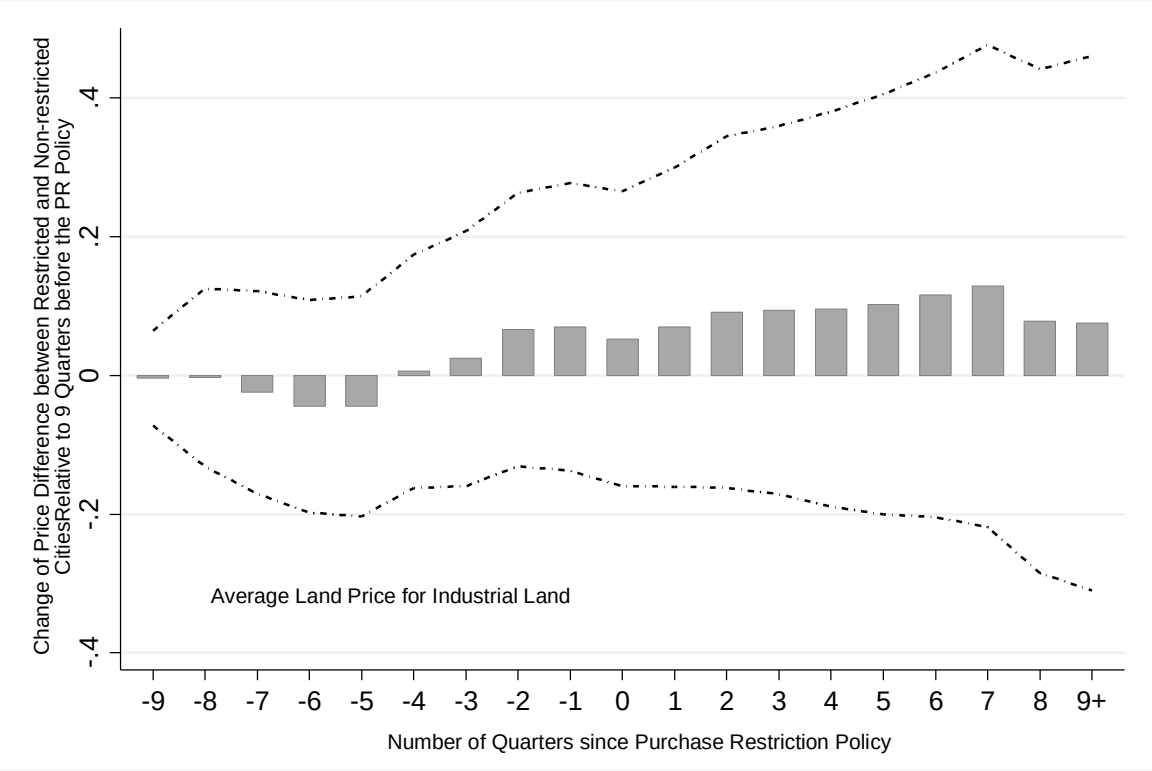
- Policy shocks → Land Price drops in the affected cities → Land Value decreases for firms holding lands in these cities → Investment reduced for affected firms.

Policy shocks → Commercial Land Price

$$Land\,\mathrm{Price}_{j,t} = \alpha + \sum_{et} \beta_{et} \times Treated_j \times EventTime_{j,t,et} + \sum \lambda_j \times t \times City_j + \varepsilon_t + \gamma_j$$



Policy shocks → Industrial Land Price



DID tests

$$Y_{i,t} = \alpha + \beta \times Treated_i \times PostEvent_{i,t} + \gamma \times Treated_i + TimeDummy$$

- Treated groups
  - firms with lands in any of the 46 cities before 2009
- Control groups
  - All other firms
  - All other firms with headquarters in the 46 cities
  - All other firms with lands but not in the 46 cities

DID tests

	I/K	ΔD/K	New loan/K
Panel A: All other firms as control			
DID	-0.080***	-0.134**	-0.071***
	(0.024)	(0.066)	(0.023)
Panel B: All other firms with headquarters in 46 cities			
DID	-0.084***	-0.157***	-0.072***
	(0.025)	(0.068)	(0.024)
Panel C: All other land owners			
DID	-0.124***	-0.198**	-0.084**
	(0.033)	(0.083)	(0.033)

Summary of results

- Real estate price rise increases land value of companies that hold lands → more borrowing , more investment

- Policy shocks → real estate price drops in the affected cities → Land value decreases for firms holding lands in these cities → less borrowing , less investment

Break down of investment

- Total investment = non-land investment + commercial land investment + industrial land investment
- Collateral channel: no predictions on investment composition
- Crowd out: less non-land investment; more land investment, especially commercial land

Breaking down of investment-IV

	Non-Land/K	Commercial Land/K	Industrial Land/K	Non-Land/I	Commercial Land/I	Industrial Land/I
	IV	IV	IV	IV	IV	IV
Land Value/K	-0.138**	0.246***	0.005	-0.345***	0.313***	-0.002
	(0.065)	(0.060)	(0.010)	(0.072)	(0.092)	(0.029)
Land Price	-0.000	0.005***	0.002***	-0.009***	0.036***	0.007***
	(0.003)	(0.002)	(0.000)	(0.003)	(0.003)	(0.001)
N	11455	10927	10927	11589	10763	10510
R2	0.067	0.138	0.087	0.042	0.162	0.085

Breaking down of investment-DID

	Non-Land/K	Commercial Land/K	Industrial Land/K	Non-Land/I	Commercial Land/I	Industrial Land/I
Panel A: All other firms as control						
β	**0.013**	**-0.025***	**-0.001**	**0.129*****	**-0.133*****	**-0.006**
	(0.024)	**(0.014)**	**(0.003)**	**(0.035)**	**(0.034)**	**(0.009)**
Panel B: All other firms with headquarters in 46 cities						
β	**0.013**	**-0.027***	**-0.001**	**0.130*****	**-0.136*****	**-0.004**
	(0.024)	**(0.015)**	**(0.003)**	**(0.035)**	**(0.034)**	**(0.010)**
Panel C: All other land owners						
β	**0.009**	**-0.028***	**-0.001**	**0.131*****	**-0.140*****	**-0.006**
	(0.025)	**(0.015)**	**(0.003)**	**(0.035)**	**(0.035)**	**(0.010)**

Non-land owners subsample

- Collateral channel: no predictions on any behavior of non-land owners

- Crowd out: non-owners will reduce investment when the land price in their headquarter cities rise; they should increase investment after the policy shocks if their headquarters are in the 46 cities

Non-owner firms -- IV

	I/K		ΔD/K	
	OLS	IV	OLS	IV
Commercial land price in headquarters	-0.034***	-0.150***	-0.013***	-0.070***
	(0.005)	(0.056)	(0.002)	(0.014)
N	10400	10053	10528	10210
R2	0.442	0.092	0.115	0.092
Industrial land price in headquarters	0.005	3.381	0.006	2.509
	(0.013)	(3.161)	(0.004)	(2.732)
N	9548	9232	9663	9376
R2	0.447	0.074	0.115	0.074

Non-owner firms -- DID

	I/K	New loan/K	ΔD/K
DID	0.077***	0.012***	0.009**
	(0.011)	(0.003)	(0.004)
Tobin's Q	0.012***	-0.001	0
	(0.002)	(0.001)	(0.001)
Cash Flow	-0.004***	-0.001***	-0.001***
	(0.001)	(0.000)	(0.000)
	…	…	…
N	14213	13566	13477
R2	0.445	0.087	0.082

Loan level analyses

	Loan With Land Collateral	Loan for Non-Land Owner	Size of Loan
	IV	IV	IV
Bank Branch City Land Price	**0.352*** **	**-0.145** **	0.261
	(0.125)	**(0.068)**	(0.330)
Non-Land Owner*Bank Branch Land Price			**-0.405** **
			(0.166)
Non-Land Owner			2.410**
			(1.154)
...	...	...	...
Number of Observations	31502	31502	31502
Adj. R-squared	0.204	0.780	0.460

Summary of results

- Land value rises → less non-land investment and more commercial land investment

  Land price rises → less investment for non-owner firms which are affected more comparing to other non-owner firms
- Policy shocks → reverse the above effects
- Bank branch city land price rises → more loan with land collateral, less loan to non-land owners

Net effects – Owners vs. non-owners

	SOE	log(TA)	Log(# of Employee)	TFP (OP)	TFP (LP)
Land Owner	0.327	21.445	7.655	0.002	0.046
Non-Land Owner	0.196	20.884	6.951	0.009	0.053
Difference	0.131***	0.561***	0.704***	-0.007***	-0.007***
	(0.006)	(0.017)	(0.020)	(0.003)	(0.000)

- Owners are more likely to be SOEs, large, (finally unconstrained), less efficient

Net effects – Investment efficiency

- Investment-Q sensitivity

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha + \beta \times Tobin'sQ + \gamma \times Tobin'sQ \times \frac{LandValue_{i,t}}{K_{i,t-1}} + \phi \times \frac{LandValue_{i,t}}{K_{i,t-1}} + \lambda \times Land\,\mathrm{Pr}ice + \varepsilon_i + \delta_t + control$$

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha + \beta \times Tobin'sQ + \gamma \times Tobin'sQ \times Treated_i \times PostEvent_{i,t} + \varepsilon_i + \delta_t + control$$

- TFP -- A

$$Y = AK^{\alpha}L^{\beta}$$

Investment-Q sensitivity

	OLS	IV	DID
Tobin's Q	0.023***	0.024***	0.018***
	(0.003)	(0.003)	(0.003)
Tobin's Q * LandValue/K	**-0.018*** **	**-0.030***	
	(0.009)	**(0.017)**	
Tobin's Q * Treated*Postevent			**0.015***
			(0.008)
LandValue/K	0.170***		
	(0.041)		
LandPrice	0.000		
	(0.002)		
Treated*Postevent			-0.086***
			(0.022)
N	18147	17908	18151
R2	0.357	0.098	0.446

TFP– Olley-Pakes & Levinsohn-Petrin measures

	OLS		2nd stage IV		DID
LandValue/K	-0.033***	-0.036***	-0.094***	-0.114**	
	(0.012)	(0.012)	(0.026)	(0.024)	
Treated*Postevent					0.015*
					(0.008)

	OLS		2nd stage IV		DID
LandValue/K	-0.013**	-0.013***	-0.049***	-0.050**	
	(0.001)	(0.001)	(0.002)	(0.002)	
Treated*Postevent					0.002***
					(0.001)

Conclusion

- Existence of crowding out effect
  - Boom in real estate fosters more investment into speculative real estate sector (commercial land), crowding out non-land investment
  - Boom in real estate increases financial constrain gap between owner vs. non-owner , non-owners who are affected more have to borrow less, invest less
- Aggregate net effect may be negative—lower investment efficiency.
- Real estate stimulate investment??