

Rural-Urban Migration, Structural Transformation, and Housing Markets in China

Carlos Garriga

Federal Reserve Bank of St.Louis

Yang Tang

Nanyang Technological University

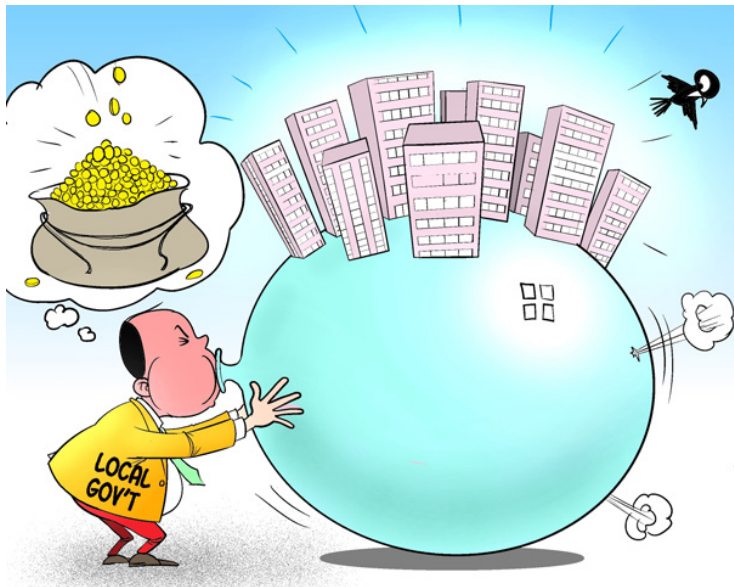
Ping Wang

Washington University in St.Louis and NBER

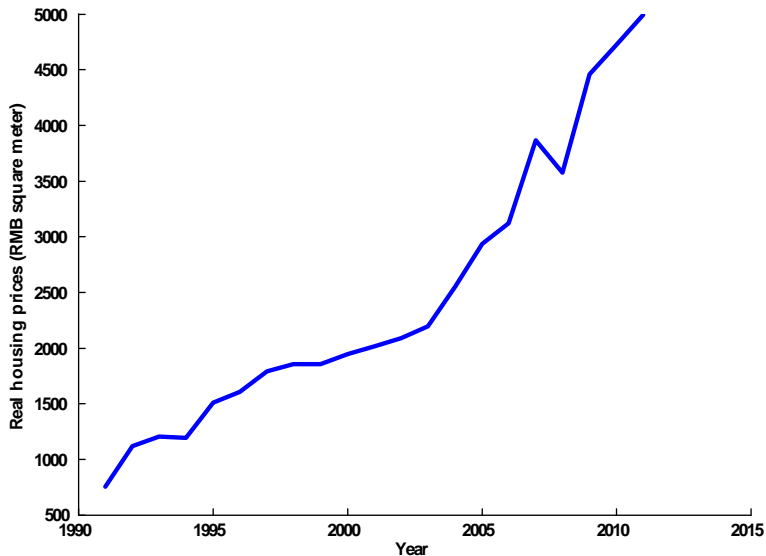
April 2015

The views expressed herein do not necessarily reflect those of the
FRB of St. Louis or the Federal Reserve System.

China Housing Boom

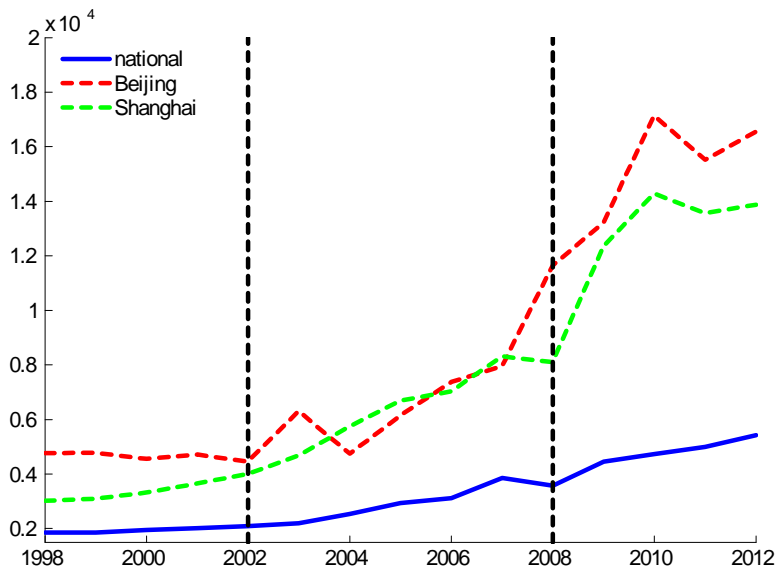


Housing Prices in China (National Index)



Source: National Bureau of Statistics of China

Motivation: Large Cities v.s. National



Source: National Bureau of Statistics of China

Is this housing boom a bubble?

Is this housing boom a bubble?

Maybe,

Is this housing boom a bubble?

Maybe, or maybe not

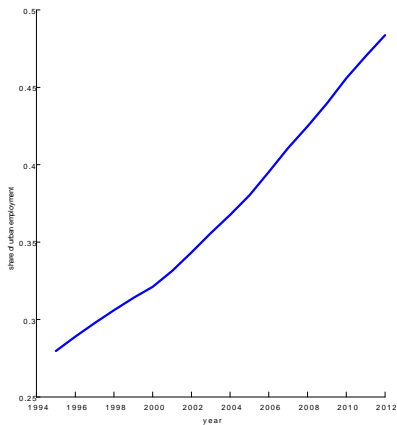
Is this housing boom a bubble?

Maybe, or maybe not

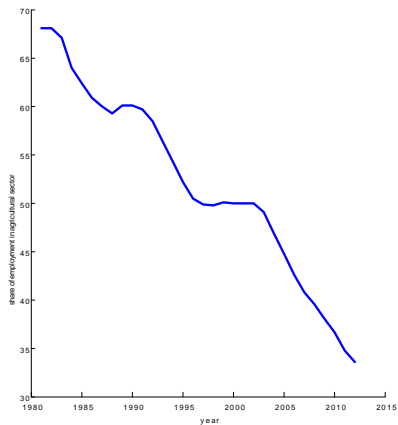
We explore whether the process of **structural transformation** can account for a major portion of the housing boom, even for large cities in China

Structural Transformation and Urbanization in China

Fraction of Urban Employment



Agricultural Employment Share



Source: National Bureau of Statistics of China

What do we do

- ▶ Want to quantify the role of structural transformation played in China's housing boom using a model of housing and migration.
- ▶ Three important channels
 1. **Structural transformation** that increases productivity, urban income and ability to pay.
 2. **Inelastic housing supply** due to heavily regulated land supply and entry of real estate developers.
 3. **Continual rural-urban migration** that fosters an ongoing increase in the demand for urban housing.

Main Findings (I): Aggregate Model

- ▶ The process of structural change accounts for:
 - ▶ 80.5% of housing and 14.5% of land prices over 1998-2012
 - ▶ 85.9% and 35.9% over 1998-2007
- ▶ Supply conditions account for 60+% of changes in housing prices and 40% of land prices
- ▶ Productivity (income) accounts for 20+% of the changes in housing and 50% in land prices
- ▶ Access to credit has limited impact

Main Findings (II): City Model (Beijing & Shanghai)

- ▶ The model accounts for 82.8% of housing and 36.2% of land price movements in Beijing, and 60.2% and 55.0% in Shanghai.
- ▶ While supply conditions continue to be crucial, productivity growth becomes more important in explaining Shanghai's housing prices.
- ▶ Land supply becomes more important in explaining Beijing's housing prices during 2008-2012.
- ▶ In both cities, the role played by productivity is enhanced during 2008-2012.

Roadmap

- ▶ Literature Review
- ▶ Institutional Background
- ▶ Theoretical Framework
- ▶ Quantitative Analysis
 - ▶ National-level
 - ▶ Multiple City
- ▶ Conclusions

Literature

- ▶ **Structural Transformation:** Laitner (2000), Hansen-Prescott (2001), Ngai-Pissaridis (2004), Gollin et al. (2002), Kongsamut et al. (2003), Casselli-Coleman (2001), Duarte-Restuccia (2010), Buera-Koboski (2009, 2012), Herrendorf et al. (2013).
- ▶ **Dynamic rural-urban migration:** Lucas (2004), Bond-Riezman-Wang (2014)
 - ▶ House prices and cities: Davis-Heathcote (2005), Glaeser et al. (2005)
 - ▶ Growth in China: Brandt-Hsieh-Zhu (2008), Song-Storesletten-Zilibotti (2011)
- ▶ **China housing:**
 - ▶ Bubbles: Wu-Gyourko-Deng (2012), Chen-Wen (2014), Fang-Gu-Zhou (2014), Fang-Gu-Xiong-Zhou (2015)
 - ▶ Signaling values: Wei-Zhang-Liu (2012)

Migration and Housing Policies in China

Migration Policies in China

- ▶ China had a household registration system “hukou” to control migration between urban and rural areas

- ▶ Open policy reforms started in 1978.

Migration Policies in China

1. “Leave land without leaving home” (1978-1983)

- ▶ Migration flows within rural areas were allowed.
- ▶ Excessive agricultural workers were absorbed by TVEs.

2. “Leave both land and home” (1984-1994)

- ▶ Rural workers started to move to bigger cities, including megalopolises.

3. Highly active stage (post-1995):

- ▶ Abandonment of the centrally planned food and housing allocation system.
- ▶ Temporary work permits in large cities in eastern coastal areas.

Housing Policies in China: From Planned to Market

1. Probation and experiment stage (1978-1988)

- ▶ Limited access to urban housing markets.
- ▶ Public housing rents adjusted to rising construction costs.

2. Further urban housing reform (1988-1998)

- ▶ Ownership of private housing purchased from the public sector recognized.
- ▶ Two options: Paying the market price for complete ownership of unit, and paying the “standard price” (subsidized) only provided partial ownership.

3. Current stage of urban housing reform (post-1998)

- ▶ Replace material distribution of housing by monetary transfers.
- ▶ Cheap-rent housing provided for lowest income households.

Basic Features

- ▶ Two regions: city and rural
- ▶ Two types of goods: manufactured (produced in the city), and agricultural goods (produced in the rural area)
- ▶ Agents: workers (rural or city), housing developers and a government.
- ▶ Workers (continuum and infinitely-lived):
 - ▶ Inelastically provide 1 unit of labor.
 - ▶ All identical except their disutility costs of migration $\epsilon \sim F(\epsilon)$.

Issues Ignored in the Paper

Design a **conservative benchmark**:

- ▶ Rule out bubbles in the baseline setting with housing as a necessity and without secondary market trading.
- ▶ Ignore precautionary or speculative motives of housing investments.
- ▶ Focus only on extensive margin via migration flow rather than intensive margin via quantity or quality of housing.
- ▶ Put aside small city to large city migration.
- ▶ Hybrid tenure decisions: owning/renting with a consol mortgage with fractional downpayment.
- ▶ Not allow for endogenous timing of housing demands and vacancies.

Equilibrium Housing Prices

$$q_t = \frac{\Psi_t}{(1 - \alpha) (A_t^h)^{\frac{1}{1-\alpha}}} \left[\frac{\Delta F(\epsilon_t^*)}{\ell_t} \right]^{\frac{\alpha}{1-\alpha}}$$

- ▶ **Direct effects:**
 - (+) cost (developer entry fees, Ψ_t and A_t^h)
 - (-) incremental urban land supply (ℓ_t)
- ▶ **Indirect effects:** via net migration flows, $\Delta F(\epsilon_t^*)$
 - (+) urban manufacturing productivity
 - (+) access to mortgage financing

Calibration

Calibration (I)

- ▶ Preferences: Housing as a necessity (**no speculative demand**)

$$U(c_t^m, c_t^f, h_t) = \begin{cases} [\theta(c_t^m)^\rho + (1 - \theta)(c_t^f)^\rho]^{\frac{1}{\rho}} & \text{if } h_t \geq 1 \\ -\infty & \text{otherwise} \end{cases} .$$

- ▶ Mobility cost: Follows Pareto distribution $[1, \infty)$:

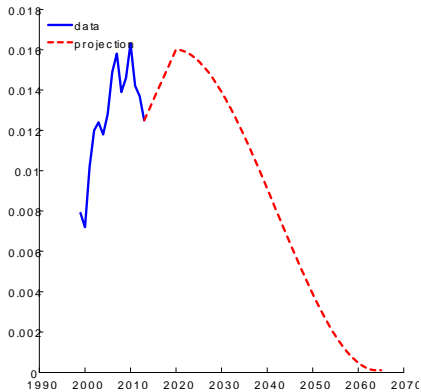
$$F(\epsilon) = 1 - \left(\frac{1}{\epsilon}\right)^\lambda .$$

Urban Employment Projection

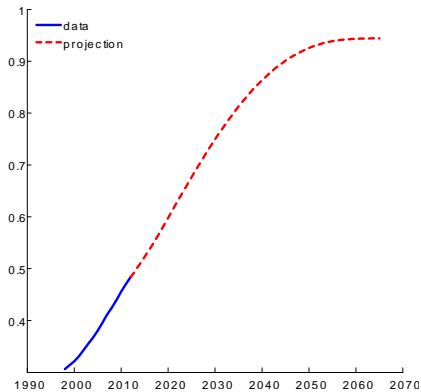
Structural transformation is completed by **2065**.

Findings are robust with a slower projection, **2100**.

Migration Flow



Fraction of Urban Employment



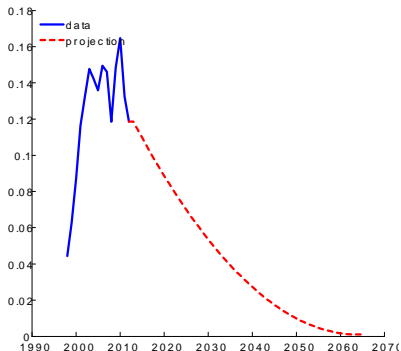
Source: National Bureau of Statistics of China and Model Implied Data

Residential-land Supply Projection

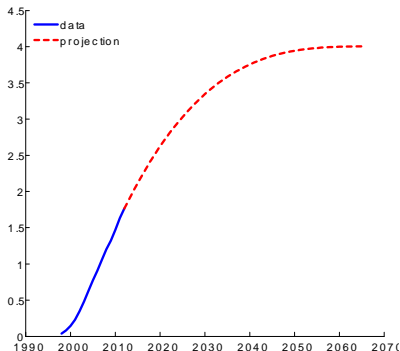
Land markets fully privatized in 2002 (sales through auctions).

$$\text{Residential land supply} = \frac{\text{land space purchased by real-estate enterp.}}{\text{total real for inhabitation, mining and manuf.}}$$

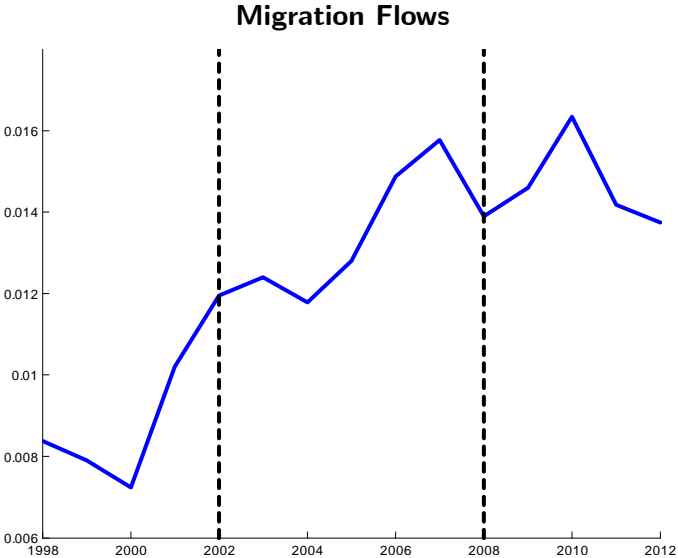
Net Residential Land Supply



Accumulated Land Supply



Migration Flows



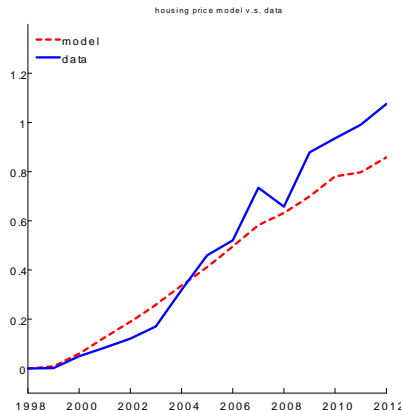
Source: Model implied data

Manufacturing productivity $\{A_t^m\}_{t-1008}^{2065}$ is computed to match the

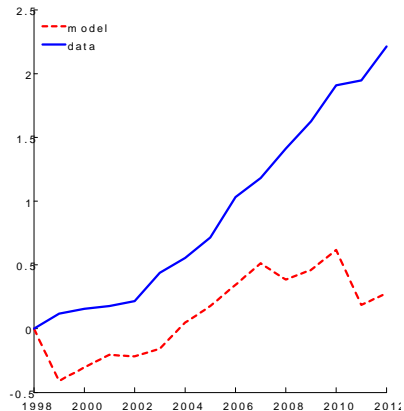
Quantitative Findings: National

Quantitative Findings: Model vs. Data

Housing Prices



Land Prices



Source: National Bureau of Statistics of China and Model Implied Data

Quantitative Findings

Model Prediction 1998-2012: National

	Housing (%)		Land (%)	
	Data	Model	Data	Model
Ave. growth:1998-2012	9.7	6.4	16.0	3.4
Ave. growth:1998-2007	9.1	6.6	13.0	6.5
Ratio of 2012/1998	2.93	2.36	9.14	1.32
Ratio of 2007/1998	2.08	1.79	3.26	1.67
	Success	NMSE	Success	NMSE
1998-2012	0.60	0.0190	0.18	0.5662
1998-2007	0.67	0.0062	0.53	0.1985
1998-2002	2.35	0.0016	3.32	0.1107
2003-2007	0.36	0.0082	0.68	0.2192
2008-2012	0.31	0.0263	0.29	0.6241

Quantitative Findings: Decomposition

Decomposition of Key Indicators

	Period	Entry Fee	Land supply	Downpay	Prod.
Housing Prices	1998-2012	26.7%	36.0%	15.6%	21.7%
	1998-2002	34.5%	34.6%	18.9%	12.0%
	2003-2007	28.4%	32.0%	14.6%	25.0%
	2008-2012	10.9%	38.6%	8.0%	42.5%
Land Prices	1999-2007	18.2%	22.3%	6.0%	48.6%
	1999-2002	20.2%	25.9%	7.9%	46.2%
	2003-2007	15.6%	13.2%	4.4%	54.9%
	2008-2012	18.3%	17.0%	8.0%	56.7%

Quantitative Findings: Decomposition

- ▶ **Supply factors** are the most important factor for increases in housing prices (62.7%) and land prices (40.5%).
- ▶ **Productivity(income)** accounts for about 20% of the changes in housing prices, and 50% of land prices.
- ▶ Productivity becomes more important over time for both housing and land prices, while supply factors become less important in housing prices.
- ▶ The contributions of access to credit to all indicators are below 20%.

Quantitative Findings: Cities

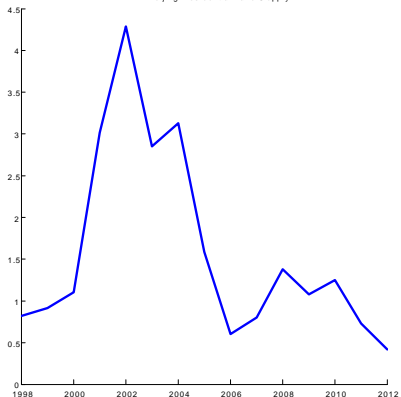
Multiple City Framework

- ▶ Suppose there are cities $I > 1$. All of the cities are identical, having access to the same technology to produce manufactured goods that can be costlessly traded across cities.
- ▶ The cities differ in two aspects:
 1. the relative productivity of the manufacturing sector.
 2. the availability of land (exogenously) supplied by the government.
- ▶ City selection is determined by lottery
- ▶ The city labor markets are segmented because labor mobility across cities is not permitted.
- ▶ Housing supply side is modeled the same way as the aggregate model.

Residential Land Supply

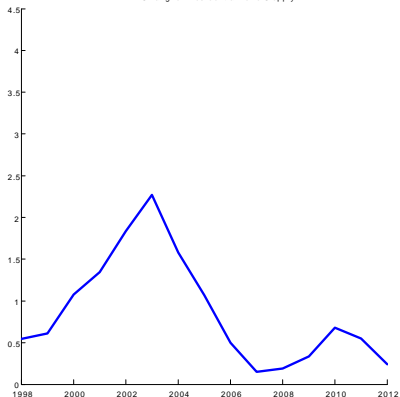
Beijing

Beijing Residential Land Supply



Shanghai

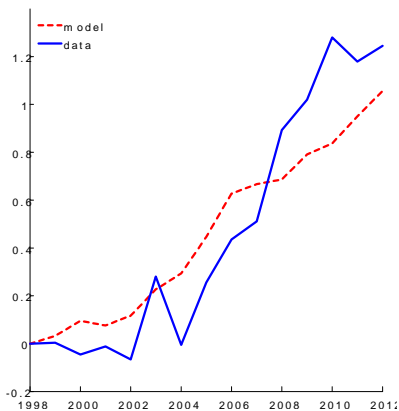
Shanghai Residential Land Supply



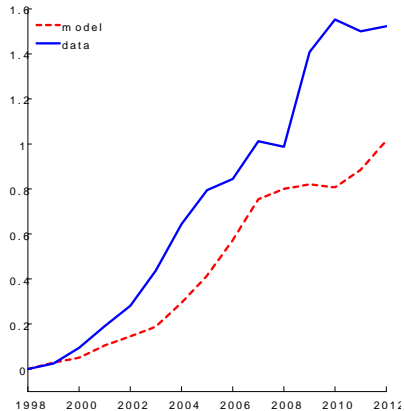
Source: National Bureau of Statistics of China

Housing Prices: Model vs. Data

Beijing



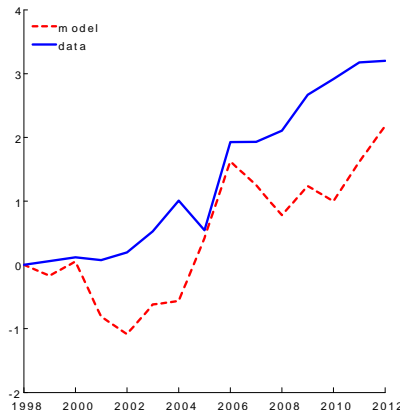
Shanghai



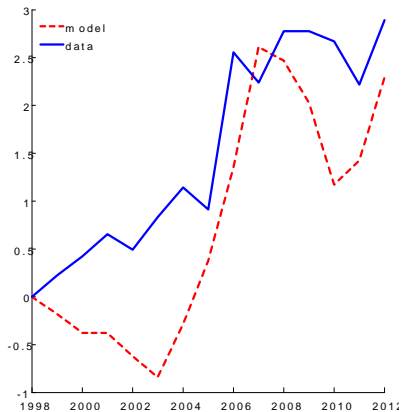
Source: National Bureau of Statistics of China and Model Implied Data

Land Prices: Model vs. Data

Beijing



Shanghai



Source: National Bureau of Statistics of China and Model Implied Data

Model Prediction 1998-2012: Beijing

Model Prediction 1998-2012: Beijing

	Housing (%)		Land (%)	
	Data	Model	Data	Model
Ave growth:1998-2012	4.50	8.1	26.2	26.0
Ave growth:1998-2007	2.16	7.32	23.6	18.0
Ratio of 2012/1998	3.25	2.87	24.5	8.87
Ratio of 2007/1998	1.67	1.95	6.89	3.50

	Success Rate	NMSE	Success Rate	NMSE
1998-2012	0.55	0.0540	0.74	0.5399
1998-2007	1.84	0.0313	1.39	0.1929
1998-2002	4.54	0.0137	49.0	0.2037
2003-2007	0.87	0.0401	2.11	0.1923
2008-2012	0.23	0.0606	1.50	0.5620

Model Prediction 1998-2012: Shanghai

Model Prediction 1998-2012: Shanghai

	Housing (%)		Land (%)	
	Data	Model	Data	Model
Ave growth:1998-2012	12.4	8.1	19.4	39.4
Ave growth:1998-2007	11.4	9.5	27.6	61.2
Ratio of 2012/1998	4.48	2.76	18.0	9.92
Ratio of 2007/1998	2.75	2.12	9.39	13.61

	Success Rate	NMSE	Success Rate	NMSE
1998-2012	0.41	0.1605	1.28	0.2950
1998-2007	0.47	0.0545	1.59	0.3939
1998-2002	0.25	0.0062	0.85	0.3209
2003-2007	1.07	0.0676	2.91	0.3969
2008-2012	0.15	0.1974	4.54	0.2701

Decomposition: Beijing

Decomposition of Key Indicators (Beijing)

	Period	Entry Fee	Land supply	Downpay	Prod.
Housing Prices	1998-2012	28.8%	31.4%	17.9%	21.9%
	1998-2002	28.2%	33.1%	16.1%	22.6%
	2003-2007	27.6%	23.6%	21.5%	27.3%
	2008-2012	19.0%	28.6%	0.4%	51.9%
Land Prices	1999-2007	13.1%	10.8%	12.6%	63.5%
	1999-2002	14.3%	3.6%	21.3%	60.8%
	2003-2007	16.0%	17.2%	2.0%	64.8%
	2008-2012	3.3%	14.4%	11.4%	70.9%

Decomposition: Shanghai

Decomposition of Key Indicators (Shanghai)

	Period	Entry Fee	Land supply	Downpay	Prod.
Housing Prices	1998-2012	28.3%	24.9%	17.7%	29.1%
	1998-2002	29.0%	29.3%	19.5%	22.2%
	2003-2007	31.4%	24.8%	19.0%	24.9%
	2008-2012	12.9%	6.7%	1.1%	79.4%
Land Prices	1999-2007	24.3%	22.8%	14.2%	38.7%
	1999-2002	30.8%	12.9%	8.5%	47.8%
	2003-2007	24.6%	31.5%	20.6%	23.2%
	2008-2012	16.4%	9.4%	13.5%	60.7%

Quantitative Findings: Decomposition

- ▶ **Supply conditions** are the most important drivers, accounting for more than 50% housing price growth in both cities.
- ▶ **Land supply** and **productivity** together capture more than 70% of land price growth in each city.
- ▶ **Productivity** become more important over time for explaining housing price movements during the last subperiod.
- ▶ **Land supply** becomes more important in explaining Beijing's housing prices during 2008-2012.

Conclusions

Summary

- ▶ The role of structural transformation played in the rapid growth of housing and land prices is very important
- ▶ The aggregate model accounts for 80.5% of housing prices and 14.5% of land prices from 1998-2012
- ▶ The performance improves substantially during the pre-financial tsunami period 1998-2007, accounting for 85.9% and 35.9% of housing and land price movements, respectively.
- ▶ **Structural transformation** and the resulting **rural-urban migration** are sizeable drivers of housing prices over the period of 1998-2012.

Policy Implications

- ▶ China's housing prices do not seem to be at odds with **market fundamentals**.
- ▶ If it is desired to cool down the housing market, proper control of **land prices** may be more appropriate.
- ▶ For larger cities, if it is desired to slow down the growth of house prices, **supply policies** are more important than credit controls.