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

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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?

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.
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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**

- 1994: 0.25
- 1996: 0.3
- 1998: 0.35
- 2000: 0.4
- 2002: 0.45
- 2004: 0.5
- 2006: 0.5
- 2008: 0.5
- 2010: 0.5
- 2012: 0.5

**Agricultural Employment Share**

- 1980: 70
- 1985: 65
- 1990: 60
- 1995: 55
- 2000: 50
- 2005: 45
- 2010: 40
- 2015: 35

Source: National Bureau of Statistics of China
Large City Migration, Employment, and Housing Prices

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


  - House prices and cities: Davis-Heathcote (2005), Glaeser et al. (2005)

- **China housing**:
  - 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

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

   - 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.
1. Probation and experiment stage (1978-1988)
   - Limited access to urban housing markets.
   - Public housing rents adjusted to rising construction costs.

   - 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

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

- **Direct effects:**
  (+) cost (developer entry fees, \( \Psi_t \) and \( A^h_t \))
  (-) incremental urban land supply (\( \ell_t \))

- **Indirect effects:** via net migration flows, \( \Delta F(\epsilon_t^*) \)
  (+) urban manufacturing productivity
  (+) access to mortgage financing
Calibration
Preferences: Housing as a necessity \textbf{(no speculative demand)}

\[
U(c^m_t, c^f_t, h_t) = \begin{cases} 
\left[ \theta(c^m_t)^\rho + (1 - \theta)(c^f_t)^\rho \right]^{\frac{1}{\rho}} & \text{if } h_t \geq 1 \\
-\infty & \text{otherwise}
\end{cases}
\]

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).

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

Manufacturing productivity $\{A^m_t\}_{t=1998}^{2065}$ is computed to match the fraction of urban employment.
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

<table>
<thead>
<tr>
<th></th>
<th>Housing (%)</th>
<th>Land (%)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>Ave. growth:1998-2012</td>
<td>9.7</td>
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<tr>
<td>Ratio of 2012/1998</td>
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<td>Ratio of 2007/1998</td>
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<td>1998-2012</td>
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<td>1998-2007</td>
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<td>1998-2002</td>
<td>2.35</td>
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<td>2003-2007</td>
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<td>2008-2012</td>
<td>0.31</td>
<td>0.0263</td>
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## Quantitative Findings: Decomposition

### Decomposition of Key Indicators

<table>
<thead>
<tr>
<th>Period</th>
<th>Entry Fee</th>
<th>Land supply</th>
<th>Downpay</th>
<th>Prod.</th>
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<tbody>
<tr>
<td>1998-2012</td>
<td>26.7%</td>
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<tr>
<td>1998-2002</td>
<td>34.5%</td>
<td>34.6%</td>
<td>18.9%</td>
<td>12.0%</td>
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<td>2003-2007</td>
<td>28.4%</td>
<td>32.0%</td>
<td>14.6%</td>
<td>25.0%</td>
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<td>2008-2012</td>
<td>10.9%</td>
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<td><strong>Prices</strong></td>
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<td>1999-2007</td>
<td>18.2%</td>
<td>22.3%</td>
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<td>1999-2002</td>
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<td>2003-2007</td>
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<td>2008-2012</td>
<td>18.3%</td>
<td>17.0%</td>
<td>8.0%</td>
<td>56.7%</td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Data</td>
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<td>Ave growth: 1998-2012</td>
<td>4.50</td>
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<tr>
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<td>Ratio of 2007/1998</td>
<td>1.67</td>
<td>1.95</td>
<td>6.89</td>
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### Success Rate and NMSE

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<th>NMSE</th>
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<tr>
<td>1998-2012</td>
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<td>0.0540</td>
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<td>1998-2002</td>
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## Model Prediction 1998-2012: Shanghai

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<tr>
<td>2008-2012</td>
<td>12.9%</td>
<td>6.7%</td>
<td>1.1%</td>
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<td>2003-2007</td>
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<tr>
<td>2008-2012</td>
<td>16.4%</td>
<td>9.4%</td>
<td>13.5%</td>
<td><strong>60.7%</strong></td>
</tr>
</tbody>
</table>
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
The role of structural transformation played in the rapid growth of housing and land prices in 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 driver 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.