Land-Price Dynamics and Macroeconomic Fluctuations

Zheng Liu, Pengfei Wang, and Tao Zha; Econometrica (2013)

UC3M Macro Reading Group - Discussion by Omar Rachedi

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Land price and business investment
This paper

- **Shocks to land prices main source of business cycles**

- Two premises:
  - Fluctuations in real estate prices are mostly driven by land prices
  - Real estate is a big component of US firms’ tangible assets

- Key ingredient: Households and entrepreneurs compete for land
  - Households value land (housing services).
  - Entrepreneurs borrow by using land as a collateral asset

- Positive **housing demand shock** (households value land more)
  - Price of land rises, so also the entrepreneurs’ collateral value
  - Entrepreneurs borrow more, expand investment and production, thus demand more land, land price further rises
  - Households supply more labor, get richer, and demand more land, land price rises and so on...
Sketch of the model (1/2)

- **Households**
  - Supply labor and value consumption goods, **land** and leisure

\[ E_0 \sum_{t=0}^{\infty} \beta^t A_t \{ \log C_{ht} + \varphi_t \log L_{ht} - \psi_t N_{ht} \} \]

- Budget constraint \( C_{ht} + q_{lt} (L_{ht} - L_{ht-1}) + \frac{S_t}{R_t} = w_t N_{ht} + S_{t-1} \)
Sketch of the model (1/2)

▷ Households
 ▷ Supply labor and value consumption goods, land and leisure

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E_0 \sum_{t=0}^{\infty} \beta^t A_t \{\log C_{ht} + \varphi_t \log L_{ht} - \psi_t N_{ht}\}
\]

▷ Budget constraint \( C_{ht} + q_{lt}(L_{ht} - L_{ht-1}) + \frac{S_t}{R_t} = w_t N_{ht} + S_{t-1} \)

▷ Entrepreneurs
 ▷ Value consumption goods \( E_0 \sum_{t=0}^{\infty} \beta^t A_t \log C_{et} \)
 ▷ Produce using capital, labor and land \( Y_t = Z_t \left[ L_{et-1}^{\phi} K_{t-1}^{1-\phi} \right]^\alpha N_{et}^{1-\alpha} \)
 ▷ Budget constraint \( C_{et} + q_{lt}(L_{et} - L_{et-1}) + B_{t-1} = Y_t - w_t N_{et} - \frac{l_t}{Q_t} + \frac{B_t}{R_t} \)
 ▷ Can borrow up to a fraction of value of their assets (land and capital)

\[
B_t \leq \theta_t E_t [q_{lt+1} L_{et} + q_{kt+1} K_t]
\]
Sketch of the model (2/2)

- **Market clearing**
  - Goods: \( C_{ht} + C_{et} + \frac{I_t}{Q_t} = Y_t \)
  - Labor: \( N_{et} = N_{ht} \)
  - Land: \( L_{ht} + L_{et} = \bar{L} \)
  - Bonds: \( S_t = B_t \)

- **Shocks:**
  - Shock to household’s preference for housing: \( \varphi_t \)
  - Shock to household’s labor disutility: \( \psi_t \)
  - Patience shock: \( A_t \)
  - Permanent and transitory shocks to TFP: \( Z_t \)
  - Permanent and transitory shocks to investment-specific technology: \( Q_t \)
  - Financial shock: \( \theta_t \)
Mechanism (1/2)

▶ Consider the optimal choices of land

▶ Households:

\[ q_{lt} = \frac{\varphi_t C_{ht}}{L_{ht}} + \beta E_t \left[ \frac{C_{ht+1}}{C_{ht+1}} q_{lt+1} \right] \]

▶ Entrepreneurs:

\[ q_{lt} = \frac{\mu_t}{C_{et}} \theta_t E_t [q_{lt+1}] + \beta E_t \left[ \frac{C_{et+1}}{C_{et+1}} \left( \alpha \phi \frac{Y_{t+1}}{L_{et}} + q_{lt+1} \right) \right] \]

▶ Which shock can make land price fluctuate?

▶ TFP shock affects \( q_l \) through \( Y \), but in data \( \text{Var}(q_l) > \text{Var}(Y) \).

▶ By directly affecting \( q_l \), housing and financial shocks could do the job.

▶ In the quantitative evaluation \( \varphi_t \) explains \( \approx 90\% \) of \( \text{Var}(q_l) \), \( \theta_t \) irrelevant.
Mechanism (2/2)
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Mechanism (2/2)
Estimation

- Loglinearize the model around the steady state in which the credit constraint is binding
- Estimate by Bayesian methods
- Data: quarterly time series for the US (1975:Q1-2010:Q4)
  - real price of land;
  - real per capita consumption;
  - real per capita investment;
  - real per capita nonfarm nonfinancial business debt;
  - per capita hours worked;
  - quality-adjusted relative price of investment.
Relative importance of the shocks

Variance decompositions of aggregate quantities

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Role of housing demand shock in the last recession

Actual path (thin line) and simulated data using housing shock only (thick line)
Sensitivity analysis

- Robustness checks and extensions
  - Allow land supply to grow.
  - Add working capital.
  - External capital producers.
  - Drop patience shock
  - Investment-specific shocks as latent variable
  - Different land-price series (based on CoreLogic rather than FHFA)
  - Occasionally binding credit constraint
    - "Weighed" collateral constraint: $B_t \leq \theta_t E_t [\omega_l q_{lt+1} L_{et} + \omega_k q_{kt+1} K_t]$
  - Allow for time-varying volatility of housing demand shock

- Results do not drastically change.
Conclusions

- Recent literature emphasizes role **real estate** prices in driving cycles
- Here the authors take a step back by focusing on **land** prices.
  - Housing demand shock triggers fluctuations in land prices.
  - Firms’ borrowing tied to value of land
  - Land competition, amplify and propagate the shock.
- Housing demand shocks are quantitatively relevant, TFP and financial shocks are marginal.