Mobility and Housing: Cash Resettlement in China's Shantytown Renovation

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Motivation

- **Shantytown renovation**: resettlement of incumbent residents and reconstruction of facilities and properties.

- A key part the central government policy agenda since 2013.

- Goal: renovating over 10 million units of shanty homes.

- Resettlement approach: in-kind (实物化安置) and cash (现金化安置).

- **Cash-based resettlement**: popular after 2014 due to increasing housing inventories in lower-tier cities.
  - Among all projects: 9% in 2014, 28% in 2015, 48.5% in 2016, and 53.9% in 2017.
  - Primary funding source: China Development Bank (CDB) shantytown renovation loans.
    - Financed by Pledged Supplementary Lending (PSL) from PBoC.
  - Total loan amount during 2014-2018: 4 trillion RMB.
    - Net mortgage supply: 2011-2015 – 6.9 trillion RMB, 2016-2020 – 21.4 trillion RMB.

◂ Not much a monetary policy shock.

Motivation

- Perceived as one of the most important drivers of housing boom since 2015 in China.
- Cash-based resettlement: (Accumulated CDB loan amount)/(New housing sales in 2014)
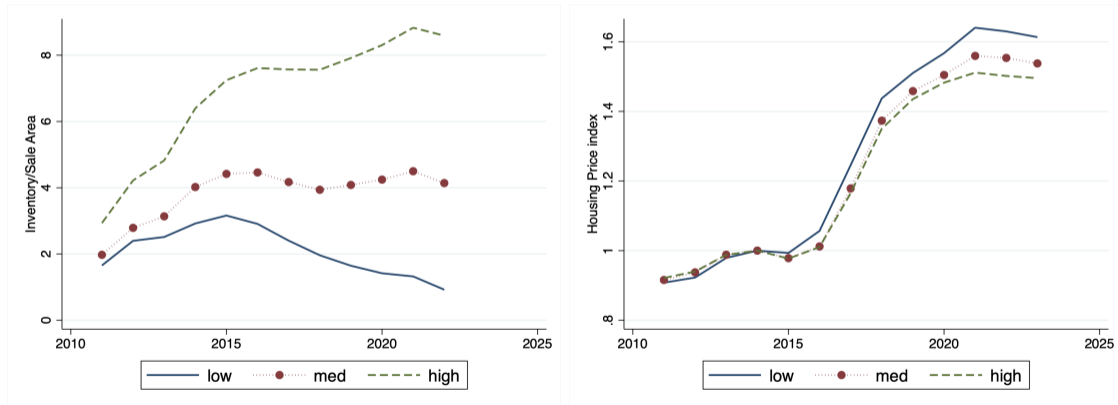- Puzzle: more treated with less responses.

Figure: Housing/Land Inventories and Housing Price Growth by CDB Loan Sizes

Motivation

- Meanwhile, accelerated intercity migration of urban households.
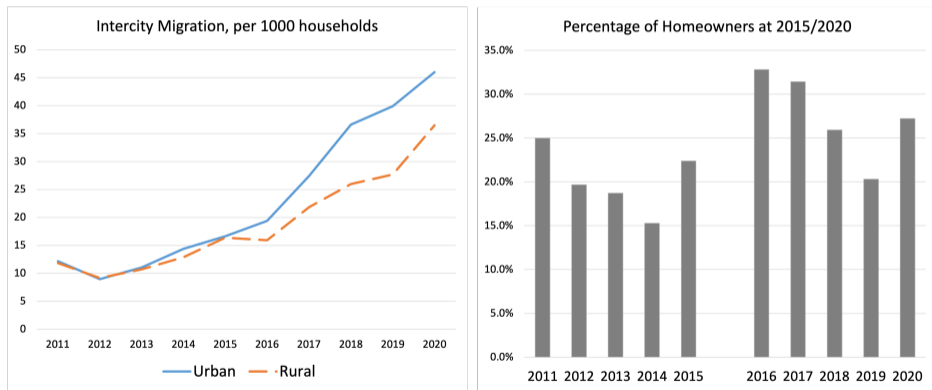- Much higher home ownership of migrants in 2020 as compared to in 2015

Figure: Intercity Migrants and Home Ownership

Overview of Results

- With household migration data from Population Census + spatial variation in CDB loans, we find that

  - In originating cities: housing price ↓, housing supply ↑, inventory ↑;
  - In destination cities: housing price ↑, housing supply ∼, inventory ↓;
  - Evidence on intercity money flow through existing network and by facilitating further household migration;
  - More CDB loan to destination → speculation before 2020 ↑, foreclosure after 2020 ↑.

- Consistent with the two effects of the program:

  - Shantytown renovation program itself generates a net increase in future housing **supply**.
  - Cash-resettlement: migration and money flow have greatly shaped the spatial diffusion of household housing **demand**.

Overview of Results

- A quantitative spatial model with endogenous migration decisions.
  - Assumption: cash-based resettlement increases market liquidity for migrants selling houses.

- Key findings: small aggregate effect, but large effect on cross-sectional dispersion.
  - **Aggregate effect**: housing price during 2016-2020 increased by 4.70% or 378.39 RMB/sqm.
    - Observed housing price growth in the data: 37.9%.
  - **Spatial dispersion**: positive correlation between policy effect and initial housing price.
  - **Money flow and household migration**:
    - When sorting 283 cities into 10 groups based on housing price in 2014, only the top 2 groups had net loan inflow.
    - Cities with lower housing price/wages had more loss of CDB loans.
    - Cities in the bottom group lost 30% CDB loans.
  - **Counterfactual**: if all CDB loans stayed in originating cities (under voucher-based resettlement), gap in housing price growth between bottom 28 and top 31 cities: 20% → 9%.

Content

Literature Review

- The impact of intercity migration on the housing market.

  - Existing literature: migration networks & response of housing markets in destination cities.
    - Gyourko et al. (2013); Howard (2020); Glaeser et al. (2012); Chinco and Mayer (2016)

  - Our paper: endogenous migration decisions sparked by shantytown renovation programs & impact on both destination and origin cities.

- Impacts of slum upgrading programs in other economies.

  - Existing literature focus on local economic outcomes of the originating cities.
    - Collins and Shester (2013) (U.S.); Barnhardt et al. (2017) (India); Galiani et al. (2017) (El Salvador, Mexico, and Uruguay)

  - Our paper: broader effects of slum upgrading on endogenous migration decisions and the resulting housing market dynamics.

Data

- The China Development Bank (CDB) shantytown renovation loans.
  - Primary funding source for cash-based resettlement.

- National 1% Population Survey Data of 2015, National Population Census of 2020.
  - Migrants: left hukou address.
  - Origin (hukou city) - Destination (residence), migration year.
  - hukou type (urban or rural).

- Housing market data.
  - City annual panel of housing price from CityRE.
  - Mortgage foreclosure data from China Index Academy.
  - Land sale data from landchina.com.
  - City-level urban wage from statistic yearbook.
  - Other housing sale data from Wind.

Econometric Framework

- Spatial variation of CDB loans:

    - The CDB loan amount at originating cities:

    $$loan\_orig_i = \frac{Loan_i}{Sale^h_{i,14}}$$

    - The CDB loan amount at destination cities:

        - Bartik style: among all urban households with local hukou (N_o), $M_{o,d}$ resided in d by 2015.
        - Actual money flow **proportional** to $loan\_dest$ under regular conditions.

        $$loan\_dest_i = \frac{\sum_o Loan_o \cdot \frac{M_{o,i}}{N_o}}{Sale^h_{i,14}}$$

- Specification: DID using city-year panel for 2009-2023.

    $$y_{i,t} = \sum_{\tau \neq 2014} \beta_\tau \cdot \mathbf{1}_{t=\tau} \cdot loan\_orig_i + \gamma_\tau \cdot \mathbf{1}_{t=\tau} \cdot loan\_dest_i + \alpha_i + \theta_{p(i),t} + \epsilon_{i,t}$$

Housing Market Responses

- Summary of the results:
  - **In originating cities**: price ↓, supply ↑, inventories ↑.
  - **In destination cities**: price ↑, supply ∼, inventories ↓.

- Contrary to the prior: in the originating cities, more treated, less responses.
  - Reuters, 2018: "*The policy helped boost home sales and prices in smaller cities that struggled for years with a glut of unsold homes, playing a key role in reviving economic growth since 2015.*"
  - Caixin, 2018: "*Another problem linked to shantytown redevelopment is the upward pressure it puts on property prices in China's third- and fourth-tier cities, where most renovation projects take place.*"

- Two effects of the cash-based resettlement:
  - **Net increase of housing supply**: new land supply is 34% more than demolished.
  - **Outflow of money** through migration network.

◂ Housing prices. ◂ Residential land supply. ◂ Housing inventories.

Mechanism: Money Flow and Household Migration

- **Money flow via existing network**: track local home ownership of existing migrants.

- **Prediction**: with money inflow from originating cities, existing migrant households are more likely to 1) *settle down* and 2) *buy local homes*.

  - *Loan2NP*: cash compensation per household/housing price at destination cities.

$$y_{o,d} = \beta \cdot Loan2NP_{o,d} + \alpha_d + \varepsilon_{o,d}$$

Table: Money Flow Through Existing Migrants

| | (1) | (2) |
Dep Var: fraction of existing migrants that	stay in 2020	own homes in 2020
Loan2NP	0.0319**	0.0287**
	(2.55)	(2.42)
Destination City FE	Yes	Yes
Pseudo-R2	0.094	0.077
Obs	4855	4855

Mechanism: Money Flow and Household Migration

- **Money flow via additional emigration**: city-level annual intercity emigration.
  - Link *LocalRecipients* (number of local urban households receiving cash compensation) to migrants from that city
- **Results**: more treatment, more emigration.

$$\frac{m_{o,t}}{N_o} = \sum_{\tau \neq 2014} \beta_\tau \cdot \mathbf{1}_{t=\tau} \cdot \frac{LocalRecipients_o}{N_o} + \delta_d + \theta_{p(d),t} + \epsilon_{d,t}$$
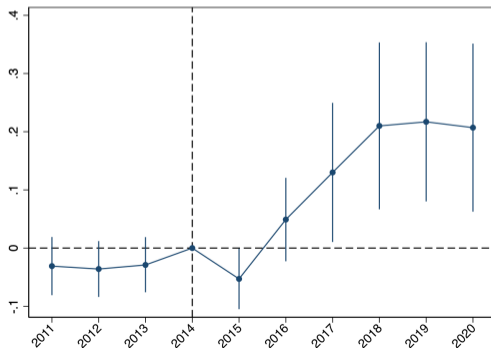
Housing Speculation

- Housing market is widely subject to speculation.

- **Local speculation**: we find local households are more likely to purchase homes when prices are pushed higher by immigrants since 2015.
    - Data: China Household Financial Survey.
    - Sample: urban households with local hukou.

- **Foreclosure rate**: this is followed by higher foreclosure rates since 2021.

◄ Local household intention to buy houses.

◄ Mortgage foreclosure rates.

Spatial Quantitative Model

- A spatial quantitative model.
  - Given originating city and wages across destination cities, households choose where to move.
  - After migration, they buy local houses and earn local wages.

- **Role of cash-based resettlement**: unlock households from illiquid housing markets.
  - Intercity migration is only feasible after selling houses in their originating cities.
  - Without money from selling previous houses, they cannot easily settle down if migrating.
  - Credit constraint, ...

- In the model:
  - endogenous: migration decisions, housing prices.
  - exogenous: wages, local housing supplies, population to migrate, second-hand housing market liquidity.

Model Setup

- Indirect utility of urban household n if migrating from originating city o to destination d:

$$V_{o,d}^{u,n} = \epsilon^u \cdot \ln \left(\underbrace{(w_d + P_o \cdot \bar{H}_o)}_{\text{Total wealth}} \cdot \underbrace{P_d^{-(1-\alpha)\gamma}}_{\text{Housing cost}} \cdot \underbrace{\kappa_{o,d}^{-\psi^u}}_{\substack{\text{Reallocation} \\ \text{disutility}}} \right) + \underbrace{\nu_{o,d}^n}_{\text{preference}}$$

- If free to migrate, share of households from o who migrate to d:

$$\lambda_{u,o,d} = \frac{\left(\frac{w_d + P_o \bar{H}_o}{P_d^{(1-\alpha)\gamma}}\right)^{\epsilon^u} \kappa_{o,d}^{-\epsilon^u \phi^u}}{\sum_i \left(\frac{w_i + P_o \bar{H}_o}{P_i^{(1-\alpha)\gamma}}\right)^{\epsilon^u} \kappa_{o,i}^{-\epsilon^u \phi^u}}$$

- Migrate only after selling previous houses with probability of η_o.

$$\mu_{u,o,d} = \begin{cases} \eta_o \cdot \lambda_{u,o,d} & \text{if } o \neq d \\ 1 - \eta_o + \eta_o \cdot \lambda_{u,o,o} & \text{if } o = d \end{cases}$$

- For rural households: replace $w_d + P_o \cdot \bar{H}_o$ with w_d.

Model Setup

- At $t = 1$, rational speculators:

$$F(K_d) = K_d R + \frac{1}{a} \cdot \frac{K_d^2}{N_d w_d}$$

$$F'(K_d) \geq \hat{P}_d^e \text{ with equality if } K_d > 0 \ \rightarrow \ K_d = \frac{\max(\hat{P}^e{}_d - R, 0) \cdot a N_d w_d}{2}$$

- At $t = 1$, housing market clearing condition:

$$P_d \cdot (\underbrace{H_d + \bar{L}_{u,d}\bar{H}_d}_{\substack{\text{new + second-hand} \\ \text{housing supply}}}) = \underbrace{(1 - \alpha\gamma)}_{\substack{\text{housing spending} \\ \text{share}}} \times \sum_o \big[\underbrace{\bar{L}_{u,o}\mu_{u,o,d}}_{\substack{\text{immigration} \\ \text{from o}}} \cdot (w_d + P_o\bar{H}_o) + \underbrace{\bar{L}_{r,n}\mu_{r,o,d}}_{\substack{\text{Immigration} \\ \text{from o}}} \cdot w_d \big] + K_d$$

Model Setup

- At $t = 2$, a different set of households make migration decisions.
  - Fundamental shocks: $(\bar{L}_{u,o}, \bar{L}_{r,o}, w_d, H_d) \rightarrow (\bar{L}'_{u,o}, \bar{L}'_{r,o}, w'_d, H'_d)$
    - $\bar{L}_{u,o}/\bar{L}_{r,o}$: total urban/rural migrants from city o; w_d: wage in d; H_d: new housing supply in d.
  - Policy shock: On top of that, introduce shantytown renovation with cash resettlement.

- Cash-based resettlement affects both demand and supply.
  - Demand side: all with cash compensation are free to migrate and buy houses.
  - Supply side: new housing supply increase proportional the demolished.

- Solution: a system of equations with relative changes, constant elasticities, and baseline equilibrium share (known as "exact hat algebra," Dingel and Tintelnot, 2021).
  - Advantage: robust to time-invariant city characteristics missed in the model.
  - Examples: home-purchasing restrictions.

Model Parameters

- Calibration:
    - $\bar{H}_o$: quality-adjusted shanty home size, the 2015 Population 1% Survey.
    - $1 - \alpha = 22.5\%$: renter's home spending share, the China Statistical Yearbook of 2014.
    - $1 - \alpha\gamma = 48.7\%$: home-buyers' housing spending share, housing sales/household spending.
    - $a = 0.48$: rational speculative capital, match time-series price growth.
    - $R = 1.246$: household required return rate, accumulated return of bank WMPs during 2016-2020.

- Estimation:
    - $(\epsilon^u, \epsilon^r, \psi^u, \psi^r) = (6.65, 5.44, 0.257, 0.333)$: migration elasticity, migration network data during 2011-2015.
    - η_o: housing market liquidity, backed out using eqbm conditions.
    - ξ_o: fraction of rural households willing to emigrate, backed out using eqbm conditions.
    - $(\ell, \beta) = (1.659, 1.215)$: cross-sectional regression.
    - $\nu = 0.97$: cross-sectional regression.

Housing Market Liquidity
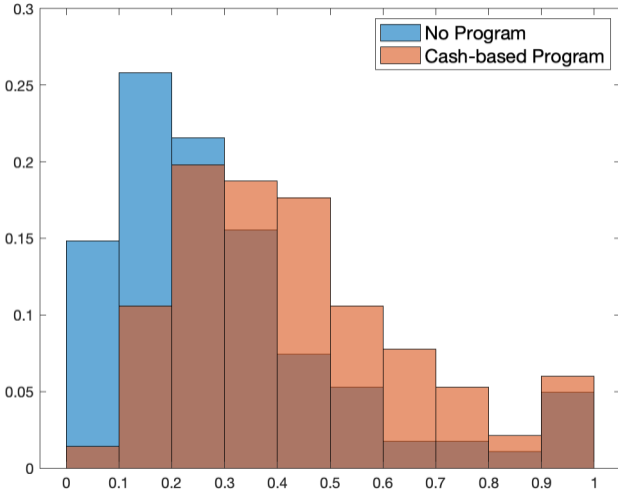
Figure: Model-implied Second Housing Market Liquidity

Model Fitness

- The model estimated using 2011-2015 data matches the data in 2016-2020 quite well in terms spatial correlation with: 1) cash-based resettlement and 2) initial housing prices.

Table: Evaluating Model Fitness

	Data	Model	Data	Model
Dep Var: housing price growth	(1)	(2)	(3)	(4)
loan_orig	-0.0344*	-0.0471***		
	(-1.702)	(-4.767)		
loan_dest	0.829*	0.695***		
	(1.819)	(4.090)		
$log(P)$			0.208***	0.181***
			(3.434)	(9.196)
Prov FE	Yes	Yes	Yes	Yes
Observations	252	252	252	252
R-squared	0.465	0.413	0.503	0.506

◂ Scatter Plot.

- Average housing price growth across cities: 4.70% or 378.39 RMB/sq.m
  - In data: housing price growth from 2015 to 2020 is 37.9%, wage growth is 50.9%.
  - Share of houses purchased by rational speculators: 8.90%

- Household leverage (i.e., housing spending/cash compensation): 2.52
  - Total sample CDB loans = 4 trillion RMB.
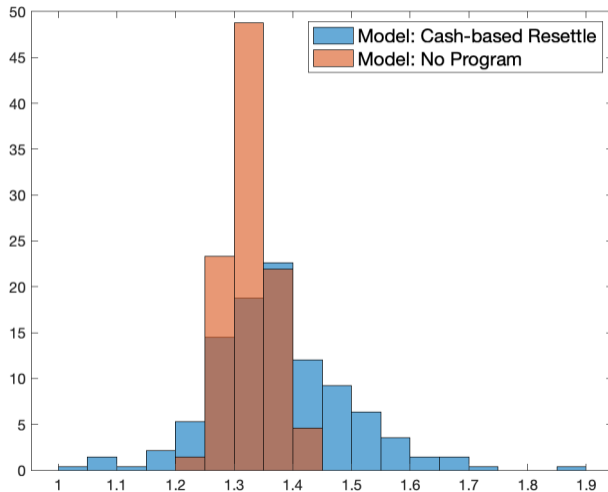
Figure: Policy Effect Across Cities

Spatial Reallocation of CDB Loans
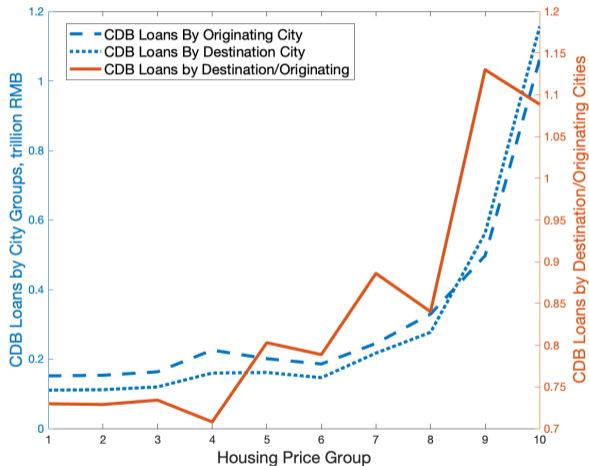
Figure: Spatial Reallocation of CDB Loans by City Groups

Quantify Role of Migration

- How much did migration contribute to spatial variation in housing price growth?

- Alternative: Voucher-based Resettlement (房票)
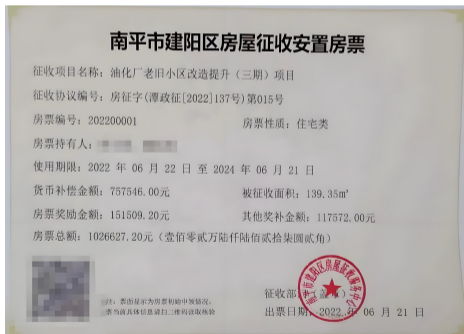
- Spatial and time restrictions on usage.
- Bonus for earlier usage;
- Typically no secondary market.
- Anqing (2015), Xi'an (2016), Jining (2016), Wenzhou (2020), Zhengzhou (2022), Guangzhou (2024).

Cash-based vs Voucher-based Resettlement

- Gap in housing price growth between bottom and top group: 20% → 9%.
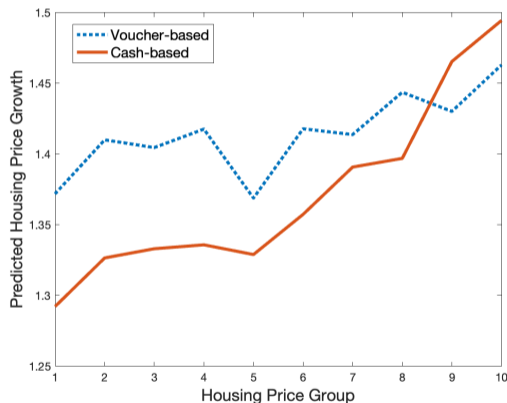
Figure: housing price Growth Under Cash- vs Voucher-based Resettlement

Conclusion

- Cash-based resettlement has unlocked households from illiquid housing market and facilitated migration into cities with higher wages/housing prices.
- (So far) relatively small aggregate price growth but large impact on spatial variation.

Conclusion

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- Implications: 1) potential driver for ghost towns; 2) fiscal transfer from lower to top-tier cities; and

Conclusion

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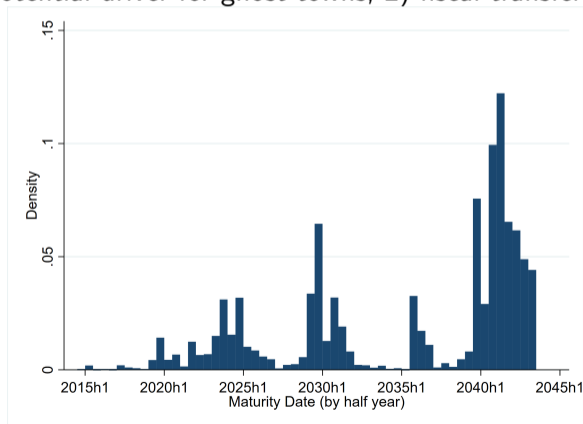
Figure: Timeline of CDB Loans Repayment

Monetary Policy

- **Not much a monetary policy shock.**
  - Monetary base changes were largely driven by fluctuations in foreign exchange reserves.
  - PBoC actively manages the monetary base with tools including OMO, MLF and also PSL.
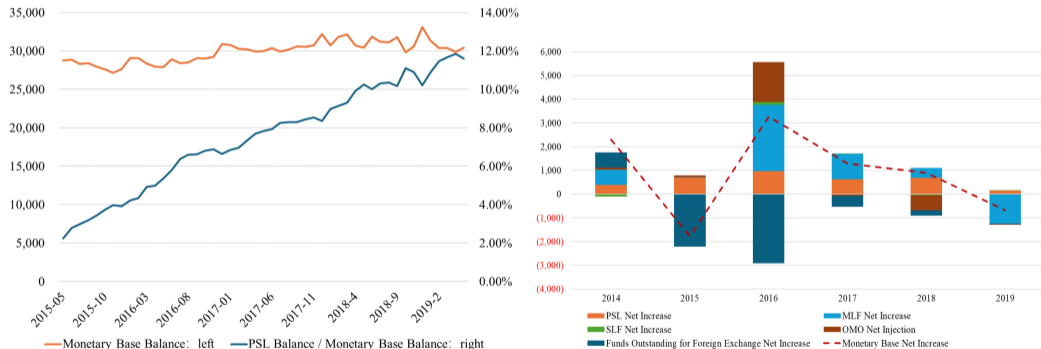
Figure: PSL and Monetary Base

Housing Market Responses - Price Impact

- When increasing from 0 to mean: *loan_orig* → 5.0% ↓, *loan_dest* → 14.5% ↑.
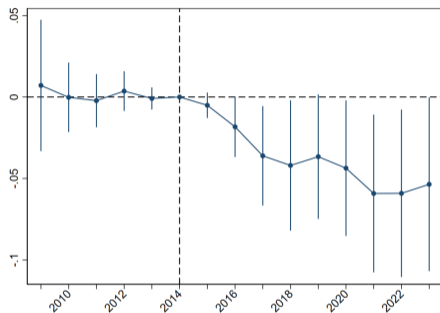
(a) Originating Cities (*loan_orig*)
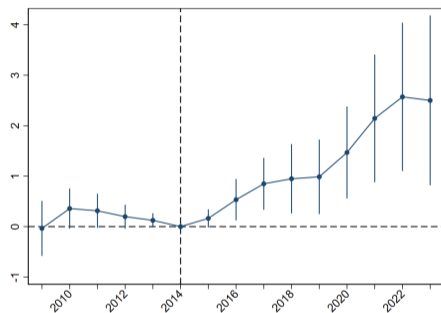
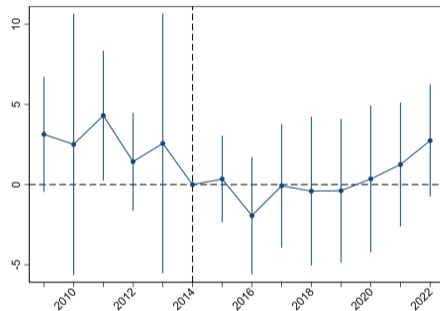(b) Destination Cities (*loan_dest*)

Figure: Responses of Housing Prices to Cash-based Resettlement

◂ Back.

Housing Market Responses - Quantity Impact

- Residential land supply using the requisitioned land increased during 2015-2022.
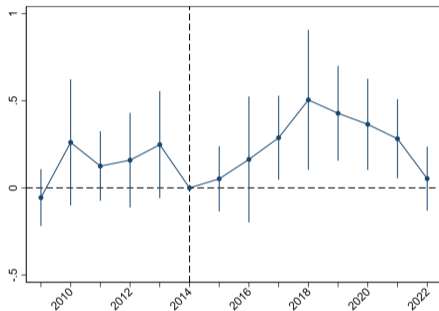
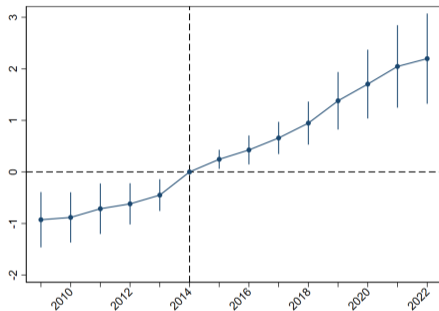(a) Originating Cities (*loan_orig*) (b) Destination Cities (*loan_dest*)
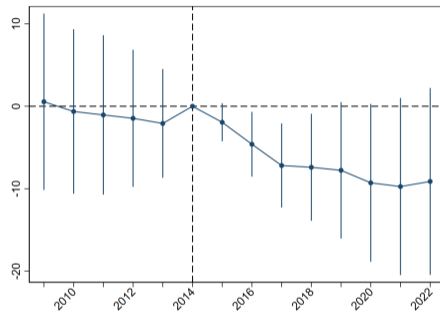
Figure: Responses of Residential Land Supply to Cash-based Resettlement

- Level of inventories kept increasing in originating cities and dropped in destination cities.

(a) Originating Cities (*loan_orig*)   (b) Destination Cities (*loan_dest*)

Figure: Responses of Inventories to Cash-based Resettlement

Housing Speculation

- **Local speculation**: local households are more likely to buy homes when prices are pushed higher by immigrants.
  - Data: China Household Financial Survey.
  - Sample: urban households with local hukou.

Table: Local Household Intention of Buying Homes

Dep Var: buyintent	(1)	(2)	(3)	(4)
Year	2013	2015	2017	2019
loan_orig	-0.000849	-0.0218***	-0.0131***	-0.00908**
	(-0.0868)	(-3.434)	(-2.685)	(-2.228)
loan_dest	0.0275	0.302**	0.517***	0.224**
	(0.146)	(2.189)	(3.874)	(2.273)
Prov FE	Yes	Yes	Yes	Yes
Observations	13,695	11,831	15,650	18,762
R-squared	0.012	0.008	0.009	0.007
#Cities	140	145	146	138

◂ Back.

Housing Speculation

- **More foreclosure**: higher rate of mortgage foreclosure in destination cities.
  - Data: residential property foreclosure from China Index Academy.

Table: Home Foreclosure and the Shantytown Renovation Program

Dep Var	(1) $\frac{\text{foreclosure price, 22}}{\text{foreclosure price, 21}}$	(2) $\frac{\text{foreclosure Area, 22-23}}{\text{Sale Area, 15-21}}$
loan_orig	0.0393***	-0.001
	(3.355)	(-0.423)
loan_dest	-0.299	0.087**
	(-1.483)	(2.129)
Prov FE	Yes	Yes
Observations	251	258
R-squared	0.226	0.428

‹ Back.

- Home purchasing restrictions apply for about 41 cities (283 cities in our sample).
- Only temporarily lifted between 2014-2017.

Apr. 2010- Jul. 2011
- Individuals without local hukou need local social security account active for more than 1/2 years to qualify as eligible buyers.
- 41 cities
- Beijing: 5 years local social security.

Sep. 2016- Apr. 2017
- Previous restrictions restored.
- 29 of the 36 cities that had abolished HPRs in 2014 restored them.

Before 2010
No home-purchasing restrictions (HPRs).

2014
All cities except 5 cities (Beijing, Shanghai, Guangzhou, Shenzhen, and Sanya) abolished HPRs.

By May 2024
All cities except Beijing and Shanghai abolished HPRs.

Figure: Timeline of Home Purchasing Restrictions

◂ Back.
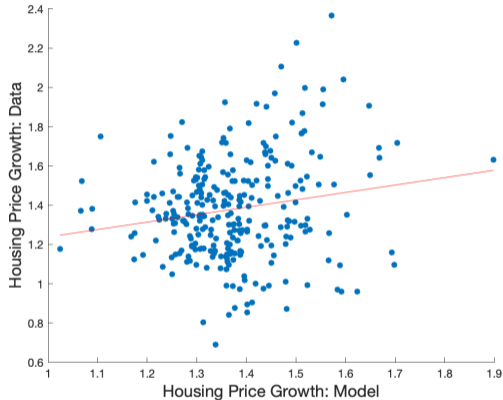
Figure: housing price Growth: Model vs Data
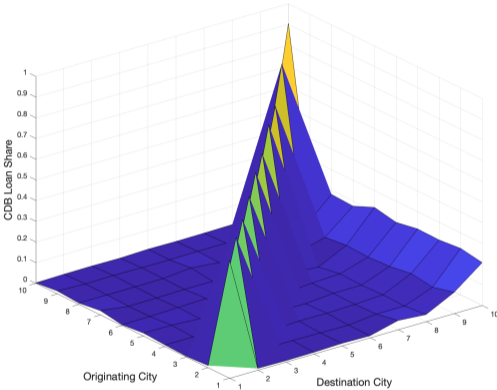
Figure: Policy Effect Across Cities

‹ Back.
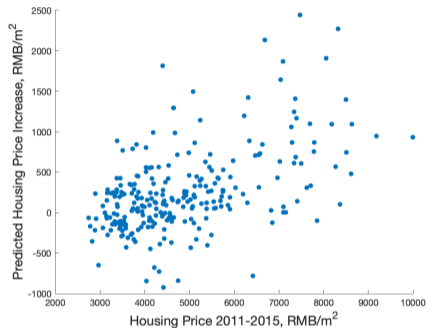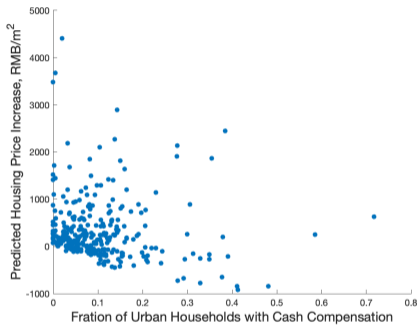
Figure: City Pairwise Reallocation of CDB Loans

◂ Back.

Cash-based vs Voucher-based Resettlement

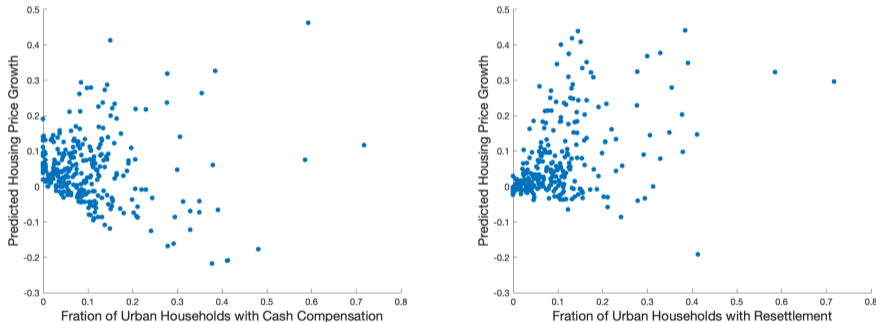- Under voucher-based resettlement, no negative correlation between size of program and price growth.

Figure: Cash-based vs Voucher-based resettlement

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Discussion on Welfare and Efficiency

- Average effect across households: 7.10% → 7.90%, or 701 → 467.48 RMB/sqm.

- Average household surplus change: 168,521.38 RMB per household.

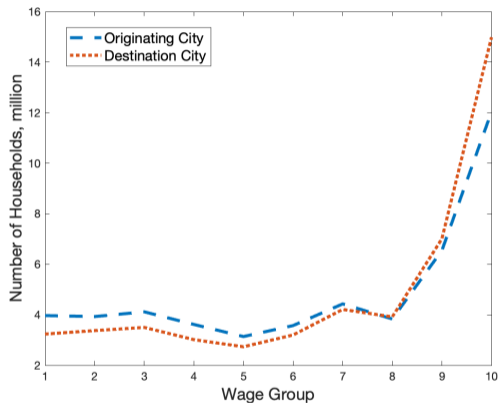- Less labor migration to cities with higher wages.

Back.

Figure: Labor Reallocation: Cash-based vs Voucher-based Resettlement

◂ Back.