Housing Prices, Internal Migration, and Intergenerational Mobility

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January 4, 2025

Motivation

- Moving to wealthier regions has long been a critical pathway for escaping poverty
- However, housing prices have been surging, particularly in high-income areas ▸ Figure
- High housing prices at destinations may differentially impact migration across backgrounds
  - Disadvantaged people can be more affected, thereby trapped in the origin with lower incomes
  - Their affluent counterparts can still migrate and get better job opportunities
- The disparity can reinforce inequality and decrease intergenerational social mobility

$\Rightarrow$ This paper examines the role of housing affordability in shaping intergenerational mobility by influencing internal migration in China

Who responds more to housing prices is ex-ante ambiguous

- Disadvantaged families face various restrictions
  - Larger responses from **disadvantaged** individuals
  - Housing prices $\uparrow \Rightarrow$ intergenerational mobility $\downarrow$
- Advantaged people can be closer to the decision-making threshold
  - Larger responses from **advantaged** individuals
  - Housing prices $\uparrow \Rightarrow$ intergenerational mobility $\uparrow$

We need empirical analysis to determine which force dominates

Preview of Findings

IV approach:

- Examines the impact of housing prices on 1) migration decisions and 2) income
- Leverages housing policy limiting property purchases, creating quasi-exogenous negative shocks to housing prices

Reduced-form Findings:

- Higher housing costs decrease migration and income
  ... but impacts are mitigated by fathers' education
- 10% Housing prices $\uparrow \Rightarrow$ 12% intergenerational mobility $\downarrow$

Preview of Findings (Cont.)

Structural Modeling Results:

- Conduct counterfactual policy experiments
- Who respond more differ across destinations:
  - Rent subsidies in large cities $\rightarrow$ attract affluent migrants $\rightarrow$ widen income disparities
  - To increase intergenerational mobility:
    - Targeted subsidies for low-income individuals
    - Non-targeted subsidies in less expensive regions

Roadmap

1. Empirical Strategy
2. Reduced-Form Results
3. Structural Analysis
4. Conclusion

Empirical Strategy

For individual i born in year t with origin o: ▸ Chinese Prefectures

$$Outcome_{iot} = \beta_1 FatherEduy_{iot} + \beta_2 HP_{ot} + \beta_3 FatherEduy_{iot} \times HP_{ot} + \Pi Z_{ot} + \Omega X_{iot} + \mu_t + \eta_o + \epsilon_{iot}$$

- $Outcome_{iot}$:
  - $1\{\text{migration}\}$: Binary indicator for migration
  - log(income): Log income
- $FatherEdu_{iot}$: Father's years of education
- HP_{ot}: Average-weighted housing price at potential destinations

▸ Data ▸ HP construction ▸ IV

Migration Results

	Migration			
	OLS	IV	IV	IV
	(1)	(2)	(3)	(4)
FatherEduy	0.005***	0.005***		
	(0.001)	(0.001)		
FatherEduy× HP	0.009***	0.011***	0.011***	0.009***
	(0.001)	(0.002)	(0.002)	(0.002)
HP	-0.252***	-0.753***	-0.779**	-0.699**
	(0.073)	(0.292)	(0.303)	(0.297)
Eduy× HP	-	-	-	√
FatherEduy× birthyearFE	-	-	√	√
K-P F-stat		40.013	37.685	25.508
LM test		70.140	67.772	68.667
Obs.	14,976	14,976	14,976	14,976
Mean(Dep. Var.)	0.202	0.202	0.202	0.202

▸ First Stage Results ▸ Descriptive Stats

Income Results

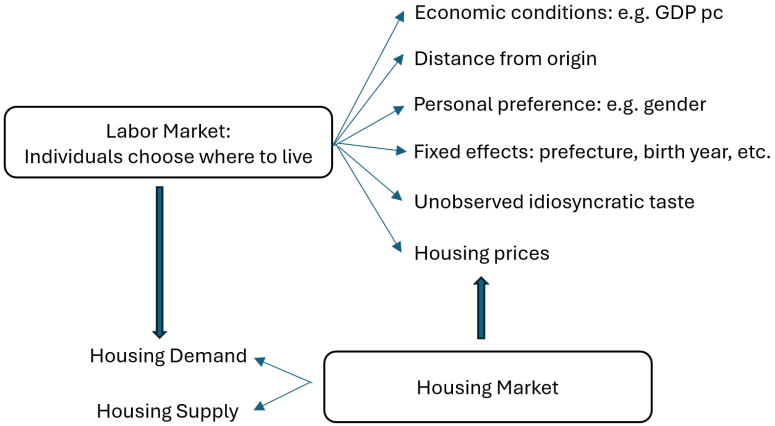
	lnIncome			
	OLS	IV	IV	IV
	(1)	(2)	(3)	(4)
FatherEduy	0.023***	0.023***		
	(0.004)	(0.004)		
FatherEduy× HP	0.028***	0.022**	0.021**	0.027***
	(0.006)	(0.010)	(0.009)	(0.010)
HP	-0.795**	-2.852**	-2.720**	-3.009**
	(0.334)	(1.288)	(1.327)	(1.351)
Eduy× HP	-	-	-	√
FatherEduy× birthyearFE	-	-	√	√
K-P F-stat		66.829	62.223	41.908
LM test		114.214	107.637	110.246
Obs.	12,068	12,068	12,068	12,068
Mean(Dep. Var.)	9.798	9.798	9.798	9.798

A 10 p.p. increase in HP increases intergenerational persistence by 12%

▸ First Stage Results ▸ Descriptive Stats

A More Structural Approach

- Enables counterfactual analysis of different policies



Technical Details

Counterfactual Analysis of Three Rent Subsidy Policies

	Change in Percentage Points (%)			Income Gap H vs. L Edu Fathers
FatherEdu	Stay	Migrate to Tier-1	Migrate to Non-Tier-1	(Mean Gap = 22 log points)
Baseline Fractions				
L	85.15	3.57	11.28	
H	78.1	8.97	12.93	
Panel A: 10% Rent Subsidy in Tier-1 Prefectures				
L	-0.79	1.01	-0.22	+3%
H	-1.20	1.70	-0.49	
Panel B: 10% Rent Subsidy in Tier-1 Prefectures for Migrants with Low-Education Fathers Only				
L	-0.92	1.18	-0.26	-13%
H	0.23	-0.29	0.06	
Panel C: 10% Rent Subsidy in Non-Tier-1 Prefectures				
L	-3.25	-0.21	3.46	-4%
H	-2.35	-0.49	2.84	

For interpretation, the -0.79 percentage point change in Panel A reflects a reduction in the proportion of individuals with low-education fathers staying in their origin, from 85.15% to 84.36%.

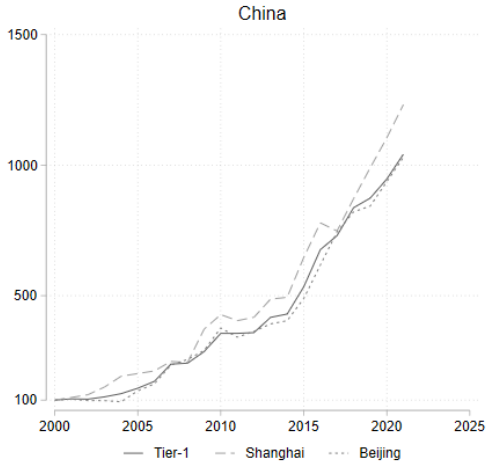
Takeaways

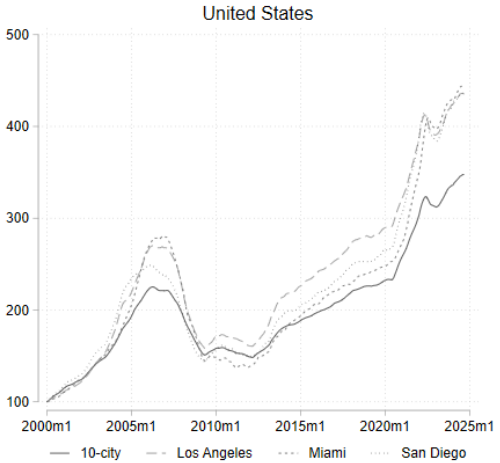
- High housing costs deter internal migration, especially for disadvantaged individuals
- This exacerbates inequality and reduces intergenerational mobility
- In China, where 1) geographical inequality and 2) low social mobility are prevalent, both issues can be addressed by facilitating internal migration through measures such as rent subsidies
- Policies should account for the segments of the population likely to respond

The End

Thank you for listening!

Housing Price Index





Sources: CEIC, S&P CoreLogic Case-Shiller Home Price Index

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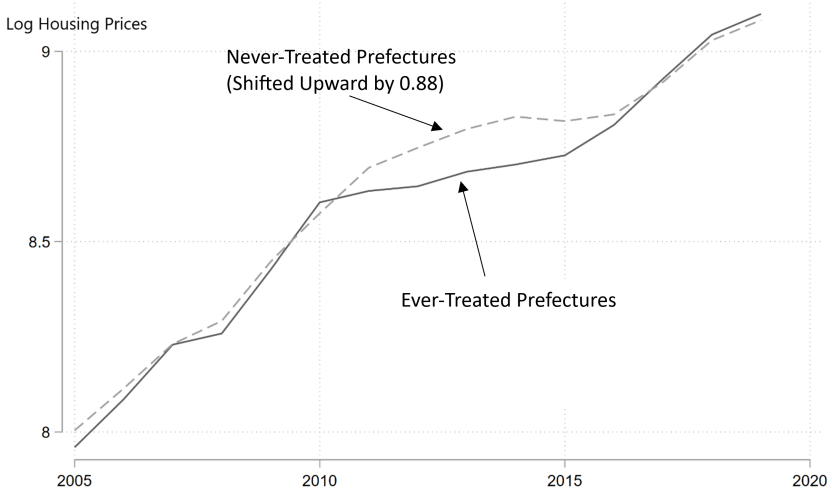
Housing Prices for Ever-Treated and Never-Treated Prefectures



Event Study Plot | IV Background | IV Construction | Back

Map of 334 Chinese Prefectures

A prefecture can have both rural and urban areas Back

Measuring Housing Price Exposure

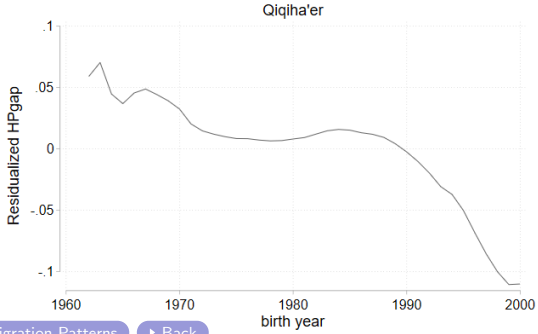
Goal: Measure exposure by origin and birth year

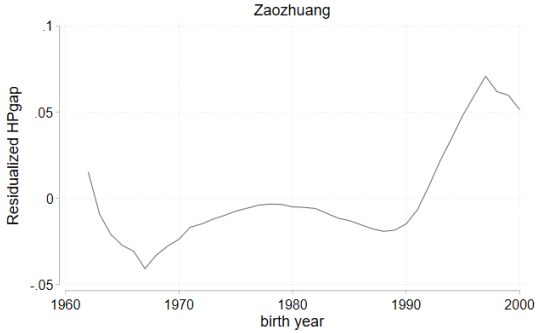
- Use the housing price gap between destinations and origin to capture the trade-off between staying and relocating
- Compute a weighted average of all potential destinations using migration patterns (e.g., 50% migrate to Shanghai $\rightarrow$ Shanghai prices weighted 50%)
- Aggregate time series into a lifetime measure, emphasizing ages with high migration rates (e.g., 5% migrate at age 20 $\rightarrow$ prices at 20 weighted 5%).

Math Formula | Variation for Estimation | Back

Variation for Estimation

- **Within Prefecture**: Individuals from the same origin but born in different years experience varying housing price shocks during key migration decision ages
- **Across Prefectures**: Individuals from different origins are exposed to different housing price shocks





▸ Migration Patterns ▸ Back

Data

- CEIC database, panel data on housing prices, 2000-2017
- China Household Finance Survey (CHFS) 2017, individual-level data

Sample:

- Individuals aged 17–55, both men and women
- Individuals report their own income and parental information

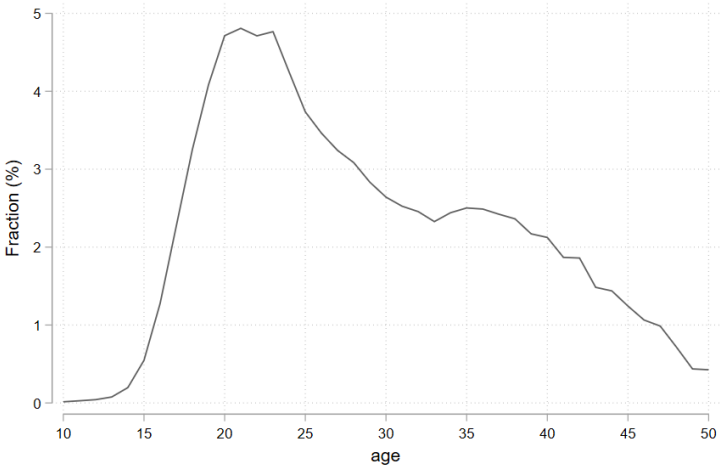
Back Detailed Version

Data

- CEIC database, annual data for each prefecture, 2000-2017 Chinese Prefectures
  - Selling prices for residential properties (log yuan per square meter, adjusted to 2000 RMB)
  - Local economic conditions
- China Household Finance Survey (CHFS) 2017, nearly nationally representative survey
  - Migration history, parental information (regardless of co-residence), demographics, and income (including for agricultural and informal sectors)

  Sample:
  - Individuals aged 17–55, both men and women, from non-Tier-1 prefectures
  - Individuals report their own income and parental information
- Census samples 2000 and the China Migrants Dynamic Monitoring Survey (CMDS)
  - for constructing some variables and relevant statistics

Age-specific Migration Probability



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Housing Price Gap Calculation

For an individual from origin o, born in year t, and aged ℓ, choosing among potential destinations $\{d\}$:

$$HP_{ot} = \sum_{k=16}^{min\{\ell,45\}} a_k \times \Big(\sum_{d \neq o} w_{od} lnprice_{d,t+k} - lnprice_{o,t+k}\Big) \Big/ \sum_{k=16}^{min\{\ell,45\}} a_k$$

Weights are generated using the 2000 census for years before the sample period

Mean$(HP) = .55$, meaning that HP_{dest} are on average 173% of HP_{orig}

▸ Figure of a_k ▸ Numerical Example

Housing Price Gap Calculation

For an individual from origin o, born in year t, and aged ℓ, choosing among potential destinations $\{d\}$:

$$w_{od} = \frac{\#\text{ of people migrated from o to d}}{\#\text{ of people migrated from o}}$$

$$HP_{ot} = \sum_{k=16}^{min\{\ell,45\}} a_k \times \Big(\sum_{d\neq o} w_{od} lnprice_{d,t+k} - lnprice_{o,t+k}\Big) \Big/ \sum_{k=16}^{min\{\ell,45\}} a_k$$

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$$a_k = \frac{\#\text{ of people migrated at age k}}{\#\text{ of migrants}}$$

Weights are generated using the 2000 census for years before the sample period

Mean$(HP) = .55$, meaning that HP_{dest} are on average 173% of HP_{orig}

▸ Figure of a_k ▸ Numerical Example

Instruments: Housing Purchase Restriction (HPR) policy

- Introduced in 46 prefectures across China between late 2010 and early 2011.
- Restricted households from owning more than two properties
- Gradually abolished since 2014
- Widely used as an unexpected negative shock to housing price growth

Policy Dates Back

IV

Construction:

- Define a prefecture-year dummy variable indicating whether the Housing Purchase Restriction (HPR) policy is in effect
- Calculate the weighted average in the same way as for housing prices
- Use the weighted average of policy implementation as the IV for the housing price gap
- The first-stage coefficient is expected to be negative, as the policy reduced housing demand and slowed price growth

Assumption:

- No other events influence migration or income while being correlated with the HPR policy

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Descriptive Statistics

	Mean	SD
Migration	0.20	0.40
lnIncome	9.80	1.67
FatherEduy	5.74	4.51
HPgap	0.51	0.51
Male	0.46	0.50
Eduy	10.05	3.75
Rural	0.67	0.47
Age	43.19	8.95

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Top 5 destinations of Qiqiha'er

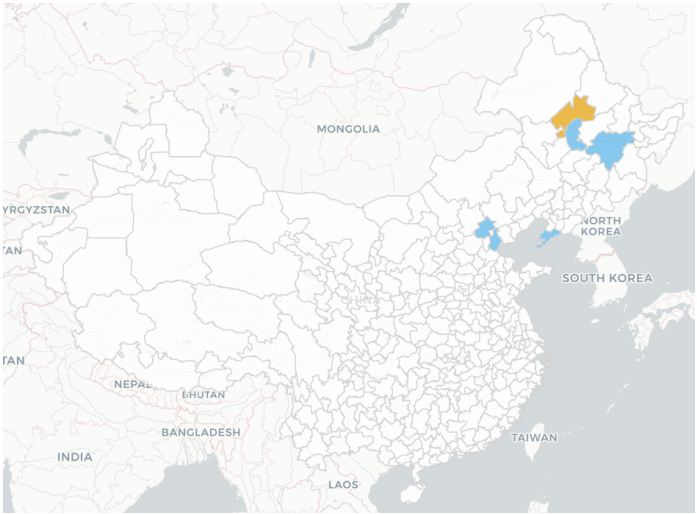

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Table: The List of 46 Prefectures that Adopted the Housing Purchase Restriction Policy with Dates of Announcing and Abolishing the Policy

Prefecture	Start Year	Start Month	End Year	End Month	Prefecture	Start Year	Start Month	End Year	End Month
Beijing	2010	4			Fuzhou	2010	10	2014	8
Tianjin	2010	10	2014	10	Xiamen	2010	10	2014	8
Shijiazhuang	2011	2	2014	9	Nanchang	2011	2	2014	7
Taiyuan	2011	1	2014	8	Jinan	2011	1	2014	7
Huhehaote	2011	4	2014	6	Qinghai	2011	1	2014	9
Shenyang	2011	3	2014	9	Zhengzhou	2011	1	2014	8
Dalian	2011	3	2014	9	Wuhan	2011	1	2014	7
Changchun	2011	5	2015	6	Changsha	2011	3	2014	8
Haerbin	2011	2	2014	8	Guangzhou	2010	10		
Shanghai	2010	10			Shenzhen	2010	9		
Nanjing	2010	10	2014	9	Zhuhai	2011	11	2016	3
Wuxi	2011	2	2014	8	Foshan	2011	3	2014	8
Xuzhou	2011	5	2014	8	Nanning	2011	3	2014	10
Suzhou	2011	3	2014	9	Haikou	2010	10	2014	7
Hangzhou	2010	10	2014	8	Sanya	2010	10		
Ningbo	2010	10	2014	7	Chengdu	2011	2	2015	1
Wenzhou	2011	3	2013	8	Guiyang	2011	2	2014	9
Shaoxing	2011	8	2014	8	Kunming	2011	1	2014	8
Jinhua	2011	3	2014	8	Xian	2011	3	2014	9
Quzhou	2011	9	2014	7	Lanzhou	2011	3	2014	7
Zhoushan	2011	8	2013	1	Xining	2011	8	2014	9
Taizhou	2011	8	2014	8	Yinchuan	2011	2	2014	8
Hefei	2011	1	2014	8	Wulumuqi	2011	3	2014	8

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Table: IV Results: First Stage

	(1) HP	(2) FatherEduy× HP	(3) HP	(4) FatherEduy× HP	(5) HP	(6) FatherEduy× HP
HPR	-0.1653***	4.4652***	-0.1610***	3.0489***	-0.1626***	3.1662***
	(0.0139)	(0.3927)	(0.0139)	(0.4377)	(0.0139)	(0.4335)
FatherEduy× HPR	0.0015**	2.2914***	0.0004	2.6472***	-0.0004	2.7095***
	(0.0006)	(0.0600)	(0.0006)	(0.0568)	(0.0006)	(0.0567)
FatherEduy× birthyearFE	-	-	√	√	√	√
Eduy× birthyearFE	-	-	-	-	√	√
Obs.	14,976	14,976	14,976	14,976	14,976	14,976
Adj. R-sq	0.9951	0.4555	0.9952	0.4937	0.9952	0.4947

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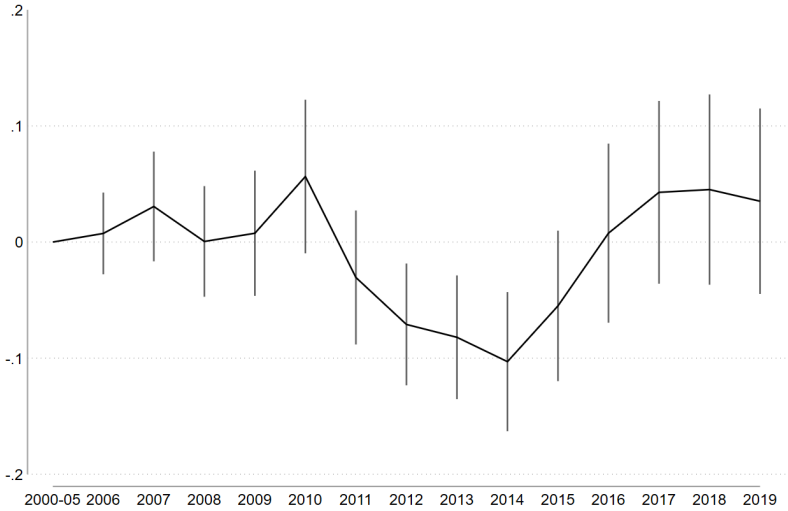
Housing Purchase Restriction Policy Event Study Plot



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Labor Market: Conditional Logit Model

The utility for an individual i, with parental background f, from origin o, born in year t, by choosing to live in prefecture p, is expressed as:

$$U_{ifopt} = \delta_{fpt} + \chi_{iop} + \epsilon_{ifopt}$$

where:

$$\delta_{fpt} = \beta_f^h h_{pt} + M'_{pt}\Theta + \mu_p + \pi_{ft} + \xi_{fpt}$$

$$\chi_{iop} = \beta^d \, lnDistance_{op} + \beta^r \, rural_i \times 1\{o \neq p\} + \beta^m male_i \times 1\{o \neq p\}$$

- h_{pt}: Housing price in prefecture p and year t
- M_{pt}: Macroeconomic conditions
- ϵ_{ifopt}: Idiosyncratic taste term, drawn from a standard Type I Extreme Value distribution
- ln $Distance_{op}$: Log distance between origin o and prefecture p. Set to zero if $p = o$
- $Rural_i$, $Male_i$: Indicator for rural origin of individual i and indicator for male individuals
- $\mu_p, \pi_{ft}, \xi_{fpt}$: Fixed effects for prefecture, parental background and year, and residual effects

The origin is one of the choices

Individual Choice:

- Individual i choose to live in p if $U_{ifopt} > U_{ifodt}$ for $\forall d \neq p$
- The probability that individual i choose to live in prefecture p is:

$$Pr_{ifopt} = \frac{\exp\left(\delta_{fpt} + \chi_{iop}\right)}{\sum_{n \in N} \exp\left(\delta_{fnt} + \chi_{ion}\right)}$$

Estimation Procedure:

- Step 1: Estimate the probability equation using Maximum Likelihood Estimation (MLE) to obtain $\hat{\delta}_{fpt}$'s, defined at the father's education $\times$ prefecture $\times$ birth year level
- Step 2: Estimate $\hat{\delta}_{fpt} = \beta_f^h h_{pt} + \theta g_{pt} + \mu_p + \pi_{ft} + \xi_{fpt}$ using 2SLS
  - As residual ξ_{fpt} includes amenities which are correlated with housing prices h_{pt}, the Housing Purchase Restriction policy is used as an instrument for h_{pt}

The probability that individual i choose to live in prefecture p is:

$$Pr_{ifopt} = \frac{\exp\left(\delta_{fpt} + \chi_{iop}\right)}{\sum_{n \in N} \exp\left(\delta_{fnt} + \chi_{ion}\right)}$$

Estimation Challenges:

- Data is insufficient to estimate δ_{fpt} for each birth year and each level of fathers' education
- To address this, the sample is divided into early and late birth cohorts based on birth years
- Fathers' education is categorized into high (H) and low (L) levels

Simplified Model:

$$\begin{aligned}\hat{\delta}_{fpt} = {} & \beta_1 FatherEduHigh_f \times HousingPrices_{pt} + \beta_2 HousingPrices_{pt} \\ & + G'_{pt}\Theta + \mu_p + \pi_{ft} + \xi_{fpt}\end{aligned}$$

Table: Discrete Choice Model

	OLS		IV	
	(1)	(2)	(3)	(4)
FatherEduHigh× HousingPrices	0.380***	0.384***	0.747**	0.758**
	(0.107)	(0.110)	(0.322)	(0.326)
HousingPrices	-1.181***	-1.011***	-4.050***	-3.606**
	(0.347)	(0.376)	(1.230)	(1.436)
FatherEduHigh× birthcohort FE	√	√	√	√
Prefecture FE	√	√	√	√
Controls	-	√	-	√
K-P F-stat			12.880	7.772
LM test			19.100	9.569
Obs.	607	603	607	603
Mean(Dep. Var.)	0.178	0.180	0.178	0.180

Back Other Estimates

Other Estimates

Variable	Estimate
b_Distance	-1.228
b_male	0.067
b_ruralHK	0.026

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Housing Market

After equating housing demand with housing supply:

$$h_{pt} = \Gamma lnL_{pt} + \varepsilon_{pt}$$

where:

- $\Gamma > 0$: A parameter calibrated based on existing literature
- ε_{pt}: Captures factors such as preferences for housing, the price-to-rent ratio, government land regulations, and other local characteristics.

Equilibrium

Equilibrium is defined by a menu of housing prices $\{h_{pt}\}$ and populations $\{L_{pt}\}$, such that:

$$\begin{aligned} L_{pt} &= \sum_{i \in \mathcal{I}_t} w_i \cdot Pr(\text{Individual } i \text{ choose to live in prefecture } p) \\ &= \sum_{i \in \mathcal{I}_t} \omega_i \cdot \frac{\exp\left(\delta_{fpt} + \chi_{iop}\right)}{\sum_{n \in N} \exp\left(\delta_{fnt} + \chi_{ion}\right)} \end{aligned} \tag{1}$$

where $\delta_{fpt} = \beta_f^h h_{pt} + \theta g_{pt} + \mu_p + \pi_{ft} + \xi_{fpt}$ and w_i is the survey weight for the individual

The housing price h_{pt} satisfies:

$$h_{pt} = \Gamma ln L_{pt} + \varepsilon_{pt} \tag{2}$$

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