
Place-based Land Policy and Spatial Misallocation: Theory and Evidence from China

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Motivation

- **Place-based policies are extensively used:**
 - Why: to promote balanced development across regions (Neumark-Simpson-2015)
 - How: land supply quotas, wage subsidies, tax subsidies, industrial zones, ...
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- In this paper, we aim to provide answers by studying a **national large-scale place-based land policy** implemented by the Chinese government around 2003.
- We show that the policy may create spatial misallocation in labor and production.

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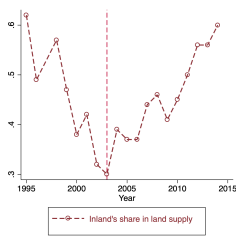
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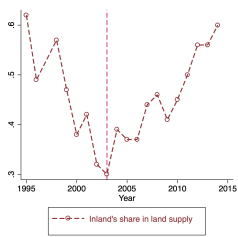
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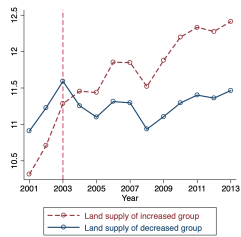
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(c) Divergence between Cities



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- **We evaluate such a policy both causally and quantitatively:**
 - Using the change of policy in 2003 to find the (local) causal evidence
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 - Quantitatively, it amplifies floor space constraints in developed (East) regions, creates spatial misallocation, and lowers national TFP, output, and welfare
- How about the targets?
 - It shrinks the east-inland geographical output gap → "place-based" ✓
 - But actually **decreases** incomes of workers from poorer areas → "people-based" ✗
 - The regional welfare implications are mixed
 - Instead, a regional monetary transfer policy is both more equal and efficient

Illustrating the mechanism

- Consider two regions (East & West):
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$$\text{Land Prices } \uparrow \Rightarrow \begin{cases} \text{Residential floor space cost } \uparrow \Rightarrow \text{Labor supply } \downarrow, \\ \text{Production floor space cost } \uparrow \text{ (Direct effect)} \Rightarrow \text{Labor demand } \downarrow. \end{cases}$$

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\Rightarrow Migrant to East $\downarrow \Rightarrow$ $\left\{ \begin{array}{l} \text{Workers are locked in the West with lower income,} \\ \text{Spatial misallocation in land and labor } \uparrow, \text{ (Indirect effect)} \\ \text{Agglomeration effect in the East } \downarrow, \\ \text{National TFP, output, and welfare } \downarrow. \end{array} \right.$

Empirical analysis

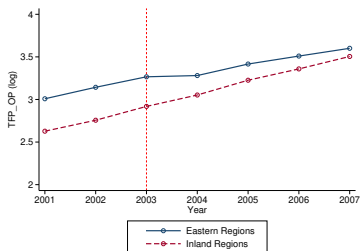
- A simple prefecture-level DID regression: For prefecture j in year t :

$$\ln(Prod_{jt}) = \alpha + \delta_1 Post2003_t \times East_j + \phi_j + \gamma_t + \epsilon_{jt} \quad (1)$$

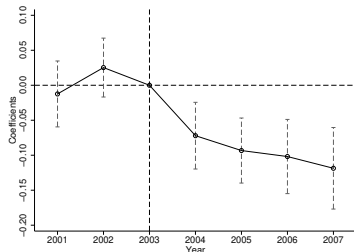
where $\ln(Prod_{jt})$ is the prefecture average firm productivity (Olley and Pakes, 1992).

- Regression assumptions validations:

(a) Time Trends of Firm Productivity



(b) Event Study of Firm Productivity



Empirical analysis

- Main DID results on productivity:

	(1)	(2)
Post2003×East	-0.0705*** (0.0267)	-0.0749*** (0.0266)
Province × Time Trend	N	Y
GDP Per Capita × Time Trend	Y	Y
Industry Share × Time Trend	Y	Y
Year FE	Y	Y
Prefecture FE	Y	Y
Observations	1,792	1,792
R-squared	0.7529	0.7537

- DID results on other variables and mechanism tests:

	Land Price	Housing Price	Average Wage	Migration Inflow
Post2003×East	↑	↑	↓	↓

- Additional results: Firm-level Border RD-DID regressions for firms at the policy border
- Robustness checks: Prod. estimation methods, land quotas, WTO and trade exports, tax and subsidies policies, two other urban policies, excluding 2003, etc.

Model: Overview

- **Spatial allocation of workers:**

- J prefectural cities with two sectors: Urban v.s. Rural
- Workers choose city-sector s.t. wages, migration & housing costs
- Urban production combining H/L-skill workers & production floor space
- Agglomeration in urban productivity due to population density

- **Endogenous floor space market s.t. land supply constraints**

- Floor space construction using fixed land supply (policy determined);
- Residential vs. Production floor space
- Endogenous floor space price due to production & residential demand
- Local residents gain all the returns from the residential floor space market

▶ Model: Workers

▶ Model: Migration

▶ Model: Production

▶ Model: Floor Space Market

▶ Model: Equilibrium

▶ Model: Data

▶ Model: Calibration

▶ Model: Unobserved

▶ Model: Estimation

▶ Model: Equilibrium Analysis

Take the model to the data: Overview

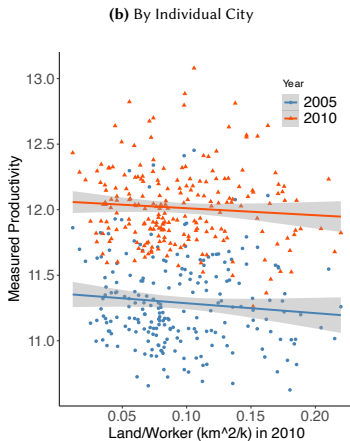
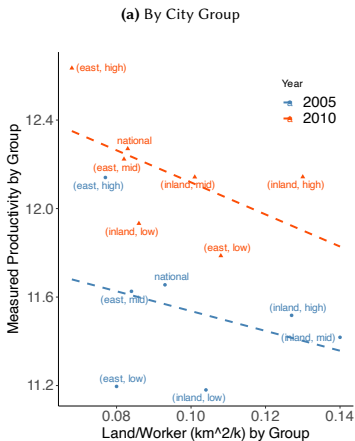
- **Data Used (233 cities with two sectors in both 2005 and 2010)**
 - [1.] City-sector-level Population and city-sector-pair migration flow from *Census*;
 - [2.] City-sector-level average residential housing cost from *Census*;
 - [3.] City-sector-level high/low-skill wages from various *City Statistic Yearbooks* of each city;
 - [4.] Land usage and other aggregate city-sector-level data from *Urban Statistic Yearbooks*.
 - [5.] The land price gap between production and residence from China Land Market Website
- **Unobservables and Parameters to be Solved or Estimated**
 - [1.] Calibrated/Estimated Preference, Production, Friction Parameters: $\{ \beta, \alpha, \eta_j, \delta, \epsilon, \tau \}$
 - [2.] Unobserved Productivities and Agglomeration Parameter: $\{ A_{ju}^h, A_{ju}^l, \gamma \}$
 - [3.] Unobserved Floor Space and Construction Intensity Parameter: $\{ S_{ju}^R, S_{ju}^M, \phi_j \}$
 - [4.] Unobserved Migration Costs: $\tau_{in,jk}^S$
- The "Data Used" allows us to solve the "Unobservables" in an Excel spreadsheet.

Model fit: The spatial distribution of productivity

$$\ln(\widetilde{Prod}_{ju}) = \underbrace{(1 - \alpha)\ln(S_{ju}^M)}_{\text{land scale premium (Direct effect)}} + \frac{\alpha\sigma}{\sigma - 1} \left(\underbrace{\ln\left(\left(\frac{A_{ju}^h}{A_{ju}^l}\Gamma_{ju}^h\right)^{\frac{\sigma-1}{\sigma}} + (\Gamma_{ju}^l)^{\frac{\sigma-1}{\sigma}}\right)}_{\text{skill premium (Indirect effect)}} + \underbrace{\ln(a_{ju}^l)}_{\text{fundamental (Indirect effect)}} + \underbrace{\gamma\ln(D_{ju})}_{\text{(Agglomeration effect)}} \right)$$

Regions (loc., dev.)	No. of prefectures	Measured Productivity										Land Tightness	
		Total	LSP	2005			2010				2005	2010	
				SP	Fund	Agg	Total	LSP	SP	Fund	Agg	Land/Worker	
National	225	33.84	2.19	0.59	31.06	-0.01	35.86	2.22	0.62	32.92	0.11	0.093	0.083
(east, high)	21	35.21	2.24	0.67	32.07	0.22	36.81	2.29	0.67	33.51	0.33	0.077	0.068
(east, mid)	51	33.84	2.25	0.49	31.06	0.04	35.75	2.24	0.57	32.76	0.17	0.084	0.082
(east, low)	25	32.61	2.13	0.50	30.00	-0.02	34.84	2.06	0.50	32.57	-0.30	0.080	0.108
(inland, high)	2	33.69	2.06	0.59	31.44	-0.40	35.24	2.13	0.77	32.65	-0.33	0.127	0.130
(inland, mid)	50	32.97	2.11	0.69	30.34	-0.17	35.35	2.17	0.69	32.40	0.09	0.140	0.101
(inland, low)	76	32.50	2.09	0.56	30.21	-0.37	35.10	2.14	0.52	32.74	-0.30	0.104	0.086

Model fit: Correlation between productivity and land tightness



► [Back to Main](#)

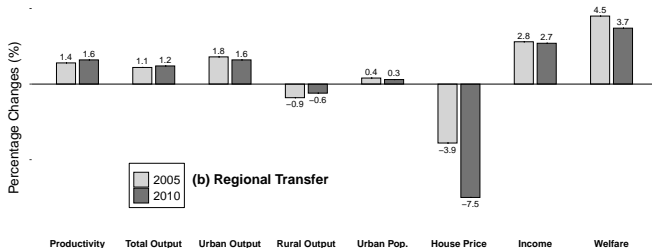
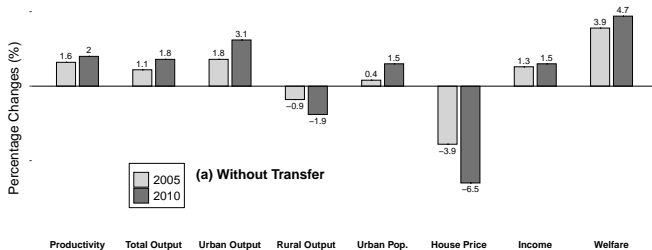
Counterfactual: Removing the inland-favoring land policy

- What will happen if we remove the inland-favoring land supply policy?
- Keep pre-2003 land allocation rule (*C1: Without Regional Transfer*):
 - Keep national total new land supply unchanged
 - Distribute new land based on land supply growth **before 2003** in each city
- Remove the (*Inland-favoring Land Policy*) and instead use (*C2: Direct Regional Transfer*)
 - Not an optimal transfer policy, just simple rule-based transfers

Removing the Inland-favoring Policy: Total Land Supply (km^2)

Regions (loc., dev.)	No. of Cities	Reality		Counterfactual	
		2005	2010	$\widehat{2005}$	$\widehat{2010}$
National	225	22268	28336	22268	28336
(east, high)	21	5838	7272	6597	10958
(east, mid)	51	5875	7832	5734	6551
(east, low)	25	1418	1681	1472	1596
(inland, high)	2	169	206	169	169
(inland, mid)	50	5131	6578	4537	4819
(inland, low)	76	3837	4767	3760	4244

Counterfactual: Aggregate effects



Counterfactual: Aggregate effects decomposition

- Aggregate effects on TFP mainly come from indirect effect and agglomeration effect
- Similar patterns on urban output and urban population

Decomp.	$\widehat{\Delta}$ Productivity		$\widehat{\Delta}$ Urban Output		$\widehat{\Delta}$ Rural Output		$\widehat{\Delta}$ Urban Pop.	
	2005	2010	2005	2010	2005	2010	2005	2010
(a) Without Transfer								
Total	5.9%	8.1%	3.0%	3.1%	-1.4%	-1.9%	1.3%	1.5%
Direct	0.3%	-0.8%	0.3%	-0.8%	0.0%	0.0%	0.0%	0.0%
Indirect	3.2%	5.8%	1.6%	3.2%	-1.4%	-1.7%	1.3%	1.2%
Agglomeration	2.4%	3.1%	1.0%	0.8%	0.0%	-0.3%	0.0%	0.3%
(b) Regional Transfer								
Total	5.1%	6.8%	2.0%	1.6%	-0.9%	-0.3%	0.4%	0.3%
Direct	0.3%	-0.8%	0.3%	-0.8%	0.0%	0.0%	0.0%	0.0%
Indirect	2.9%	5.3%	1.1%	2.4%	-0.9%	-0.6%	0.4%	0.3%
Agglomeration	1.9%	2.3%	0.6%	0.0%	0.0%	0.3%	0.0%	0.0%

Counterfactual: Spatial effects on economic development

- Spatial effects on TFP mainly come from the most developed regions
- Similarly on urban output and urban population
- (The above patterns are similar for the case with regional transfer)

Regions (loc., dev.)	No. of prefectures	Δ Productivity		Δ Urban Output		Δ Rural Output		Δ Urban Pop.		Δ House Price	
		$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$
National	225	5.9%	8.1%	3.0%	3.1%	-1.4%	-1.9%	1.3%	1.5%	-3.0%	-6.2%
(east, high)	21	7.4%	14.9%	8.1%	17.8%	0.0%	3.3%	6.9%	13.9%	-17.4%	-32.4%
(east, mid)	51	-0.3%	-2.3%	-0.7%	-4.4%	-0.4%	0.0%	-0.7%	-3.0%	1.4%	11.9%
(east, low)	25	-0.6%	-2.7%	-0.8%	-4.6%	-1.4%	-3.5%	-0.6%	-3.2%	-3.3%	2.8%
(inland, high)	2	-0.1%	-2.6%	0.0%	-3.2%	0.0%	1.7%	0.1%	-1.0%	1.6%	18.5%
(inland, mid)	50	-0.7%	-7.8%	-2.6%	-11.8%	-1.5%	-2.9%	-1.9%	-7.5%	1.6%	9.6%
(inland, low)	76	-0.4%	-4.9%	-1.7%	-6.7%	-1.9%	-3.2%	-1.6%	-5.1%	-3.8%	-1.7%

► Spatial Effects on TFP Decomposition

► Spatial Effects on Migration

Counterfactual: Spatial effects on income and welfare

- A direct regional monetary transfer policy could redistribute these gains
- Lower housing costs for Tier 1 | Higher income for Tier 1+ after transfer

Regions (loc., dev.)	No. of prefectures	Without Transfer				Regional Transfer			
		$\widehat{\Delta \text{Income}}$		$\widehat{\Delta \text{Welfare}}$		$\widehat{\Delta \text{Income}}$		$\widehat{\Delta \text{Welfare}}$	
		2005	2010	2005	2010	2005	2010	2005	2010
National	225	1.46%	1.74%	3.8%	4.1%	3.18%	3.26%	4.8%	2.9%
(east, high)	21	2.69%	7.43%	10.8%	14.5%	-10.3%	-10.9%	7.7%	2.5%
(east, mid)	51	0.28%	-0.08%	-0.2%	-4.0%	0.49%	5.03%	1.2%	2.1%
(east, low)	25	1.10%	1.92%	-1.5%	1.2%	0.72%	6.49%	1.9%	6.3%
(inland, high)	2	0.01%	-1.61%	-0.6%	-5.3%	2.30%	5.63%	2.0%	3.1%
(inland, mid)	50	0.95%	-0.91%	-0.1%	-5.1%	20.0%	6.94%	5.8%	4.2%
(inland, low)	76	2.24%	1.92%	2.7%	-3.5%	6.49%	7.05%	5.0%	4.0%

► Spatial Effects on Income Decomposition

► Spatial Effects on Welfare Decomposition

Conclusion

- We study how a place-based policy can lead to spatial misallocation
- We focus on China's inland-favoring land supply policy in 2003
- We find evidence that it may create spatial misallocation in labor and production
- Using a spatial equilibrium model, we find that by removing this policy and replacing it with regional transfers, we can not only increase national-level output and TFP but also increase the income and welfare of workers from underdeveloped regions

Appendix

MODEL

Model I: Worker Preferences

- Worker's Utility:

$$U_{in,jk}^o = \frac{z_{in,jk}^o}{\tau_{in,jk}^s} \left(\frac{c_{in,jk}^o}{\beta} \right)^\beta \left(\frac{s_{in,jk}^o}{1-\beta} \right)^{1-\beta} \quad (2)$$

- Shock ($z_{in,jk}^o$) follows Fréchet Distribution: $F(z_{in,jk}^o) = e^{-z_{in,jk}^o{}^{-\epsilon}}$, $\epsilon > 1$
- FOCs: $c_{in,jk}^o = \beta v_{in,jk}^s$, $s_{in,jk}^o = (1-\beta) \frac{v_{in,jk}^s}{Q_{jk}}$

- Indirect Utility:

$$U_{in,jk}^o = \frac{z_{in,jk}^o v_{in,jk}^s Q_{jk}^{\beta-1}}{\tau_{in,jk}^s} \quad (3)$$

- Notations: i,j: location (home, current); n,k: sector (rural, urban); c: Goods consumption; s: Housing consumption; τ : Migration cost; z: Location preference shock; Q: Housing rent; v: Income

Model I: Migration Flows

- Income: (wage + hometown housing rent)

$$v_{in,jk}^s = w_{jk}^s + \frac{Q_{in} S_{in}^R}{H_{in}^R} \quad (4)$$

- Gravity Equation of Migration Flow:

$$\pi_{in,jk}^s = \frac{(\tau_{in,jk}^s Q_{jk}^{\beta-1})^{-\epsilon} (v_{in,jk}^s)^\epsilon}{\sum_{j'k'=11}^{JK} ((\tau_{in,j'k'}^s Q_{j'k'}^{\beta-1})^{-\epsilon} (v_{in,j'k'}^s)^\epsilon)} = \frac{\Phi_{in,jk}^s}{\Phi_{in}^s} \quad (5)$$

- Proportion of skill s people migrating from in to jk (on people from in with skill s)

[▶ Back to Main](#)

Model II: Production

- Rural Production: $Y_{jr} = A_{jr} H_{jr}$.
- Urban Production:

$$Y_{ju} = (X_{ju})^\alpha (S_{ju}^M)^{1-\alpha}, \text{ where } X_{ju} = [(A_{ju}^h H_{ju}^h)^{\frac{\sigma-1}{\sigma}} + (A_{ju}^l H_{ju}^l)^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \quad (6)$$

- First Order Conditions:

$$w_{ju}^l = \alpha X_{ju}^{\alpha-1} S_{ju}^{M 1-\alpha} A_{ju}^l \frac{\sigma-1}{\sigma} X_{ju}^{\frac{1}{\sigma}} H_{ju}^l^{-\frac{1}{\sigma}} \quad (7)$$

$$w_{ju}^h = \alpha X_{ju}^{\alpha-1} S_{ju}^{M 1-\alpha} A_{ju}^h \frac{\sigma-1}{\sigma} X_{ju}^{\frac{1}{\sigma}} H_{ju}^h^{-\frac{1}{\sigma}} \quad (8)$$

$$S_{ju}^M = \left(\frac{1-\alpha}{q_{ju}} \right)^{\frac{1}{\alpha}} X_{ju} \quad (9)$$

FOC gives us a measure of skill premium ω of city j :

$$\omega_{ju} = \frac{w_{ju}^h}{w_{ju}^l} = \left(\frac{A_{ju}^h}{A_{ju}^l} \right)^{\frac{\sigma-1}{\sigma}} \left(\frac{H_{ju}^h}{H_{ju}^l} \right)^{-\frac{1}{\sigma}} \quad (10)$$

Model II: Production

- Zero Profit Condition:

$$(X_{ju})^\alpha (S_{ju}^M)^{1-\alpha} - W_{ju} X_{ju} - q_{ju} S_{ju}^M = 0 \quad (11)$$

where $W_{ju} X_{ju} = w_{ju}^l H_{ju}^l + w_{ju}^h H_{ju}^h$

- FOC + Zero profit gives us production floor price at equilibrium:

$$q_{ju} = (1 - \alpha) \left(\frac{\alpha}{W_{ju}} \right)^{\frac{\alpha}{1-\alpha}} \quad (12)$$

- Agglomeration:

$$A_{ju}^s = a_{ju}^s \times (D_{ju})^\gamma, \quad D_{ju} = \frac{H_{ju}^h + H_{ju}^l}{\bar{L}_j} \quad (13)$$

Model III: Floor Space Market Clearing

- Production & Residential price difference (city-level tax equivalent of land use regulations η_j)

$$q_{ju} = \eta_j Q_{ju} \quad (14)$$

- Rural floor space price: $Q_{jr} = \tau Q_{ju}$ (simplified, calibrate from data)
- Urban floor space production: from land

$$S_{ju} = \phi_j L_j \quad (15)$$

- Urban floor space market clearing: supply = demand

$$S_{ju}^M = \left(\frac{(1 - \alpha)}{q_{ju}} \right)^{\frac{1}{\alpha}} X_{ju} = \theta_j S_{ju} \quad (16)$$

$$S_{ju}^R = E[s_{ju}] H_{ju} = (1 - \beta) \frac{E[v_{ju}] H_j}{Q_{ju}} = (1 - \theta_j) S_{ju} \quad (17)$$

Model IV: Spatial Equilibrium

A **Spatial General Equilibrium** for this economy is defined by a set of exogenous economic conditions $\{\tau_{in,jk}^s, A_j^s, \eta_j, \phi_j, L_j, H_{in}^s\}$, a list of endogenous prices $\{Q_{ju}, q_{ju}, w_{jk}^s\}$, quantities $\{v_{in,jk}^s, Y_{jk}, H_{jk}^s, S_{ju}\}$, and proportions $\{\pi_{in,jk}^s, \theta_j\}$ that solve firms' problem, workers' problem, floor space producers' problem, and market clearing such that:

- (i). **[Worker Optimization]** Taking the exogenous economic conditions $\{\tau_{in,jk}^s, A_{jk}^s\}$ and the aggregate prices $\{Q_{ju}, w_{jk}^s\}$ as given, workers' optimal choices of migration pins down the equilibrium labor supply in each city H_{jk}^s and the migration flow between each city pairs $\pi_{in,jk}^s$.
- (ii). **[Firm Optimization]** Taking the exogenous economic conditions $\{A_{jk}^s\}$ and the aggregate prices $\{q_{ju}, w_{jk}^s\}$ as given, firms' optimal choices of production pins down the equilibrium labor demand H_j^s , equilibrium production floor space demand $\theta_j S_{ju}$ in each city.
- (iv). **[Market Clearing]** For all cities, labor supply equals labor demand, and floor space supply equals floor space demand. This pins down the equilibrium aggregate prices $\{Q_{ju}, q_{ju}, w_{jk}^s\}$, the equilibrium floor space S_{ju} , and the equilibrium output Y_{ju} .

TAKE THE MODEL TO THE DATA

Take the Model to the Data: Calibration of Fixed Parameters

Step 1: Calibrate Fixed Parameters: $\{ \beta, \alpha, \eta_j, \delta, \epsilon, \tau \}$ from "Data Used" and literature.

Table1: Fixed Parameters

Parameter	Description	Value	Source
β	share of consumption in utility	0.77	<i>Urban Household Survey</i>
α	share of labor in production	0.88	<i>Enterprise Surveys</i>
η_j	relative cost of production to residential land	city-specific	China Land Market Website
σ	elasticity of substitution between H/L-skills	1.4	Katz and Murphy (1992)
ϵ	migration elasticity	1.9	Fang and Huang (2022)
τ	relative cost of rural housing	0.34	<i>Census</i>

[▶ Back to Main](#)

Take the Model to the Data: Solve Unobservables

Step 2: Solve Unobserved Productivities, Floor Space, and Migration Costs from "Data Used."

- **Unobserved Productivities:** (from the FOCs of the firm)

$$A_{ju}^l = \frac{q_{ju}^{\frac{1-\alpha}{\alpha}} w_{ju}^l (\Xi_{ju}^l)^{\frac{1}{\sigma-1}}}{\alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}}, \quad A_{ju}^h = \frac{q_{ju}^{\frac{1-\alpha}{\alpha}} w_{ju}^h (\Xi_{ju}^h)^{\frac{1}{\sigma-1}}}{\alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}} \quad (18)$$

where $\Xi_{ju}^s = \frac{w_{ju}^s H_{ju}^s}{w_{ju}^h H_{ju}^h + w_{ju}^l H_{ju}^l}$ is the share of labor income distributed to low skill workers.

- Intuitively, observed higher production floor prices, higher wages, and a higher share of skill s in total payroll in "Data Used" all require higher skill s productivity at equilibrium.

► FOCs of the firm

► Back to Main

Take the Model to the Data: Estimate Agglomeration

Step 3: Estimate Agglomeration Elasticity using Indirect Inference

- Naive regression $\log(A_j^s) = \gamma \log(D_j) + a_j^s$ suffers from endogeneity for sure.
- Number of workers D is correlated with local productivity fundamentals a
- We use indirect inference from our empirical study of the 2003 policy change.
- **Data:** $\ln(\overline{TFP}_{ju}) = \alpha + \delta_1 Post2003 \times East_{ju} + \phi_{ju} + \gamma_t + \epsilon_{jut}$

	(1) OP	(2) LP
Post2003×East	-0.0749*** (0.0241)	-0.0516* (0.0268)
Trend Variables	Y	Y
Year FE	Y	Y
City FE	Y	Y
Observations	1,788	1,788
R-squared	0.7537	0.6351

Take the Model to the Data: Estimate Agglomeration

Step 3: Estimate Agglomeration Elasticity using Indirect Inference

- First calculate real world equilibrium city-urban TFP: $\ln(\widetilde{TFP}_{ju}) = \ln\left(\frac{Y_{ju}}{(H_{ju}^h + H_{ju}^l)^\alpha}\right)$
- Second, choose agglomeration elasticity γ_0 (and correspondingly, $a_j^{s,0}$), simulate a counterfactual equilibrium of 2005 without inland-favoring policy, then calculate: $\ln(\widetilde{TFP}_{ju}^0)$
- Third, run pooled reg. of "real world" ($Post2003 = 1$) and counterfactual ($Post2003 = 0$):
- **Model:** $\ln(\widetilde{TFP}_{ju}^0) = \alpha + \delta_1^0 Post2003 \times East_{ju} + \phi_{ju} + \gamma_t + \epsilon_{jut}$

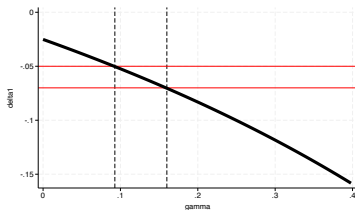
▶ Back to Main

Take the Model to the Data: Estimate Agglomeration

Step 3: Estimate Agglomeration Elasticity using Indirect Inference

- Matching $\hat{\delta}_1^* = -0.05$ would give us an estimate of $\gamma = 0.13$.

Figure5: Relationship between γ and $\hat{\delta}_1$



▶ Back to Main

COUNTERFACTUAL

Counterfactual: Details of the land allocation rule

The detailed allocation rule is as follows:

$$\widehat{L}_j(t) = L_j(2003) + \underbrace{\sum_j [L_j(t) - L_j(2003)]}_{\text{actual total increment of land}} \times \frac{L_j(2003)(1 + g_{L_j})^{t-2003}}{\underbrace{\sum_j L_j(2003)(1 + g_{L_j})^{t-2003}}_{\text{city } j\text{'s share if no inland-favoring}}} \quad (19)$$

- $L_j(2003)$: city j 's urban land stock in 2003;
- $\sum_j [L_j(t) - L_j(2003)]$: National land supply increase from 2003 to t ;
- g_{L_j} : j 's land supply growth rate before 2003.

► [Back to Main](#)

Counterfactual: Results on land supply

Table2: Removing Inland-favoring Policy: Land Supply Per Thousand Workers (km^2/k)

Regions (loc., dev.)	No. of Cities	Reality		Counterfactual	
		2005	2010	$\widehat{2005}$	$\widehat{2010}$
National	225	0.093	0.083	0.092	0.082
(east, high)	21	0.077	0.068	0.082	0.090
(east, mid)	51	0.084	0.082	0.083	0.071
(east, low)	25	0.080	0.108	0.084	0.106
(inland, high)	2	0.127	0.130	0.127	0.107
(inland, mid)	50	0.140	0.101	0.126	0.079
(inland, low)	76	0.104	0.086	0.103	0.080

▶ [Back to Main](#)

Counterfactual: Regional transfer instead of land policy

$$\widehat{DT}_{iu} = \underbrace{-\left(\hat{Q}_{iu}\hat{S}_{iu}^R - Q_{iu}S_{iu}^R\right)}_{\text{restore urban land income}} + \underbrace{\frac{\hat{Q}_{iu}-Q_{iu}}{Q_{iu}} Q_{iu}S_{iu}^R}{\sum_i \frac{|\hat{Q}_{iu}-Q_{iu}|}{Q_{iu}} Q_{iu}S_{iu}^R} \times \gamma_u^1 \times \Delta\Pi_L^R}_{\text{adjust for housing price } \uparrow} \Bigg|_{\hat{Q}_{iu}-Q_{iu}>0} +$$

$$\underbrace{\frac{\hat{Q}_{iu}-Q_{iu}}{Q_{iu}} Q_{iu}S_{iu}^R}{\sum_i \frac{|\hat{Q}_{iu}-Q_{iu}|}{Q_{iu}} Q_{iu}S_{iu}^R} \times \gamma_u^2 \times \Delta\Pi_L^R}_{\text{adjust for housing price } \downarrow} \Bigg|_{\hat{Q}_{iu}-Q_{iu}<0}$$

$$\widehat{DT}_{ir} = \underbrace{\frac{\Delta\Pi_L^M H_{ir}}{\sum_i H_{ir}}}_{\text{urban-rural transfer}} + \underbrace{\frac{\hat{Q}_{ir}-Q_{ir}}{Q_{ir}} Q_{ir}S_{ir}^R}{\sum_i \frac{|\hat{Q}_{ir}-Q_{ir}|}{Q_{ir}} Q_{ir}S_{ir}^R} \times \gamma_r^1 \times \Delta\Pi_L^R}_{\text{adjust for housing price } \uparrow} \Bigg|_{\hat{Q}_{ir}-Q_{ir}>0} +$$

$$\underbrace{\frac{\hat{Q}_{ir}-Q_{ir}}{Q_{ir}} Q_{ir}S_{ir}^R}{\sum_i \frac{|\hat{Q}_{ir}-Q_{ir}|}{Q_{ir}} Q_{ir}S_{ir}^R} \times \gamma_r^2 \times \Delta\Pi_L^R}_{\text{adjust for housing price } \downarrow} \Bigg|_{\hat{Q}_{ir}-Q_{ir}<0}$$

Counterfactual: Spatial effects on TFP decomposition

Table3: Spatial Effects on Measured Productivity (Regional Transfer)

		Measured Productivity									
Regions (loc., dev.)	No. of Cities	2005					2010				
		Total	LSP	SP	Fund	Agg	Total	LSP	SP	Fund	Agg
National	225	5.1%	0.8%	-0.7%	4.2%	0.8%	6.8%	0.4%	-0.6%	4.9%	1.9%
(east, high)	21	6.7%	2.9%	-2.7%	4.3%	2.2%	13.6%	4.7%	-2.5%	4.8%	6.2%
(east, mid)	51	-0.6%	-0.3%	0.1%	0.0%	-0.4%	-2.7%	-2.1%	0.3%	0.6%	-1.6%
(east, low)	25	-1.3%	0.3%	0.2%	-0.4%	-1.3%	-3.2%	-0.9%	-0.1%	-0.4%	-1.8%
(inland, high)	2	-0.2%	-0.2%	0.0%	0.0%	0.0%	-3.0%	-2.4%	0.0%	-0.1%	-0.5%
(inland, mid)	50	-1.2%	-1.0%	0.0%	1.0%	-1.1%	-8.3%	-3.6%	-0.3%	-1.4%	-3.3%
(inland, low)	76	-0.7%	-0.3%	0.1%	0.2%	-0.8%	-5.2%	-2.1%	0.2%	-1.0%	-2.4%

▶ [Back to Main](#)

Counterfactual: Spatial effects on migration

Table4: Spatial Effects on Migration in 2005 (Without Transfer)

Regions (loc., dev.)	No. of Cities	Urban Pop. High-skill	Urban Pop. Low-skill	Rural Pop. High-skill	Rural Pop. Low-skill
National	225	0.0%	1.5%	-1.2%	-1.8%
(east, high)	21	1.4%	8.1%	-0.2%	-0.2%
(east, mid)	51	-0.9%	-0.7%	-1.4%	-0.8%
(east, low)	25	-0.5%	-0.7%	-2.3%	-1.3%
(inland, high)	2	-0.1%	0.1%	-0.2%	0.1%
(inland, mid)	50	-1.6%	-2.1%	-1.3%	-1.9%
(inland, low)	76	-1.1%	-2.0%	-0.7%	-2.1%

▶ [Back to Main](#)

Counterfactual: Spatial Effects on Migration

Table5: Spatial Effects on Migration in 2010 (Without Transfer)

Regions (loc., dev.)	No. of Cities	Urban Pop. High-skill	Urban Pop. Low-skill	Rural Pop. High-skill	Rural Pop. Low-skill
National	225	0.0%	1.8%	-1.4%	-2.2%
(east, high)	21	8.6%	14.8%	5.1%	2.7%
(east, mid)	51	-2.5%	-3.0%	-1.8%	-0.8%
(east, low)	25	-3.8%	-3.0%	-0.8%	-2.2%
(inland, high)	2	-1.0%	-1.0%	3.5%	1.9%
(inland, mid)	50	-6.3%	-7.6%	-2.3%	-3.1%
(inland, low)	76	-3.2%	-5.2%	-2.6%	-3.8%

▶ [Back to Main](#)

Counterfactual: Spatial effects on income decomposition

Table6: Spatial Effects on Income (Regional Transfer)

Regions (loc., dev.)	No. of Cities	Δ Income		Δ Wage Income		Δ Non-wage Income	
		$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$
National	225	3.18%	3.26%	1.09%	1.12%	10.20%	10.42%
(east, high)	21	-10.32%	-10.89%	0.29%	0.89%	-31.03%	-27.53%
(east, mid)	51	0.49%	5.03%	0.37%	0.15%	0.90%	22.10%
(east, low)	25	0.72%	6.49%	1.64%	2.72%	-3.10%	24.58%
(inland, high)	2	2.30%	5.63%	-0.01%	-1.77%	10.01%	28.79%
(inland, mid)	50	20.00%	6.94%	1.02%	0.36%	95.33%	31.66%
(inland, low)	76	6.49%	7.05%	2.34%	2.36%	26.27%	34.55%

▶ [Back to Main](#)

Counterfactual: Spatial effects on welfare decomposition

Table7: Spatial Effects on Welfare

Regions (loc., dev.)	No. of Cities	Without Transfer (Year 2005)				
		Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	3.8%	2.5%	1.7%	5.3%	1.0%
(east, high)	21	10.8%	7.3%	6.9%	16.0%	2.4%
(east, mid)	51	-0.2%	-0.5%	-0.6%	-0.1%	-0.5%
(east, low)	25	-1.5%	0.5%	0.8%	-2.7%	1.5%
(inland, high)	2	-0.6%	-0.3%	-0.2%	0.3%	-0.7%
(inland, mid)	50	-0.1%	-2.3%	-1.7%	0.5%	-2.2%
(inland, low)	76	2.7%	-0.1%	0.5%	3.4%	0.7%

▶ [Back to Main](#)

Counterfactual: Spatial effects on welfare decomposition

Table8: Spatial Effects on Welfare

Regions (loc., dev.)	No. of Cities	Without Transfer (Year 2010)				
		Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	4.1%	3.4%	0.2%	7.2%	3.8%
(east, high)	21	14.5%	19.4%	16.7%	15.9%	14.0%
(east, mid)	51	-4.0%	-4.6%	-5.7%	-3.2%	-3.6%
(east, low)	25	1.2%	-2.6%	-2.5%	7.2%	1.3%
(inland, high)	2	-5.3%	-5.7%	-6.8%	-5.1%	-4.7%
(inland, mid)	50	-5.1%	-10.3%	-9.0%	-4.4%	-3.2%
(inland, low)	76	-3.5%	-5.1%	-3.9%	-9.6%	-0.4%

▶ [Back to Main](#)

Counterfactual: Spatial effects on welfare decomposition

Table9: Spatial Effects on Welfare

Regions (loc., dev.)	No. of Cities	Regional Transfer (Year 2005)				
		Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	4.8%	-10.2%	-8.8%	6.3%	5.2%
(east, high)	21	7.7%	-18.0%	-16.2%	14.9%	0.3%
(east, mid)	51	1.2%	-4.4%	-4.3%	1.4%	3.1%
(east, low)	25	1.9%	-7.2%	-8.8%	2.0%	6.1%
(inland, high)	2	2.0%	-0.5%	-0.4%	2.0%	2.8%
(inland, mid)	50	5.8%	-4.9%	-5.5%	3.3%	23.7%
(inland, low)	76	5.0%	-7.1%	-8.3%	4.8%	8.8%

▶ [Back to Main](#)

Counterfactual: Spatial effects on welfare decomposition

Table10: Spatial Effects on Welfare

Regions (loc., dev.)	No. of Cities	Regional Transfer (Year 2010)				
		Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	2.9%	-14.3%	-11.4%	5.6%	4.6%
(east, high)	21	2.5%	-25.2%	-22.9%	8.0%	3.2%
(east, mid)	51	2.1%	-7.4%	-7.4%	1.1%	6.3%
(east, low)	25	6.3%	-6.0%	-6.8%	7.6%	10.9%
(inland, high)	2	3.1%	-4.6%	-5.3%	3.3%	8.1%
(inland, mid)	50	4.2%	-8.4%	-7.7%	5.1%	9.7%
(inland, low)	76	4.0%	-7.4%	-7.0%	0.7%	8.3%

▶ [Back to Main](#)