Commuting, Migration, and Local Employment Elasticities

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Overview

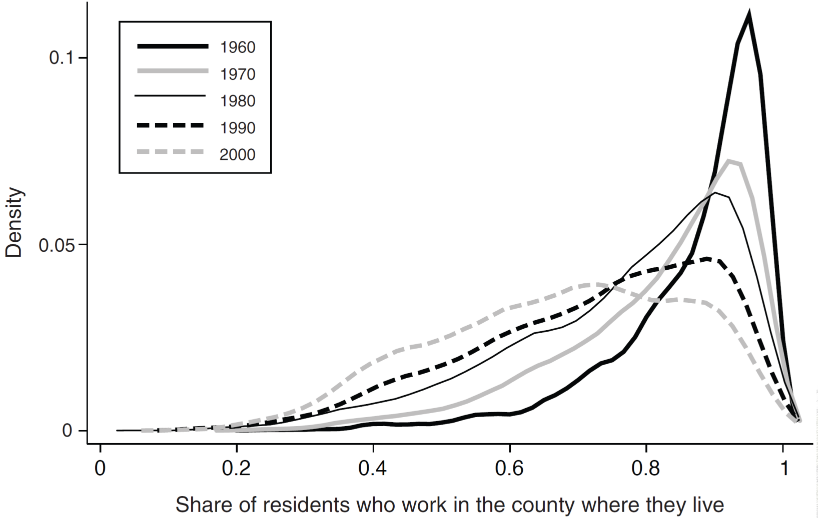
Introduction

The ability of firms to attract workers depends on the ability to attract

- local residents through migration,
- and commuters from other nearby locations.

$\Rightarrow$ Together, migration and commuting determine the response of local employment to local labor demand shocks (local employment elasticity).

The prevalence of commuting



What this paper does

1. Develop a quantitative GE model with spatial linkages in both goods markets and factor markets.

- The local employment elasticity is endogenous and differs, depending on their linkages to one another.
- A large part of the variation results from differences in commuting links between a location and its neighbors.

2. Provide empirical evidence for the importance of commuting for employment changes using the quasi-experiment of MDP.[1]

- **Finding:** Greater increases in employment from the positive labor demand shock in counties with more open commuting markets.

3. Evaluate the counterfactual effects of changes in trade and commuting costs. (Head & Ries (2001); DEK (2008))

[1] *"Million Dollar Plant"* following Greenstone, Hornbeck & Moretti (2010) (GHM)

Literature review

International trade

- Quantitative models of costly trade in goods since EK (2002).

Economic geography

- Costly trade in goods and factor mobility, with *variation across regions or systems of cities*.
- Krugman (1991); FKV (1999); Redding & Sturm (2008); Allen & Arkolakis (2014); Desmet & Rossi-Hansberg (2014); Redding (2016) ...

Urban economics

- Costly movement of people (commuting), with *variation within cities*.
- Alonso (1964); Mills (1967); Muth (1969); Lucas & Rossi-Hansberg (2002); Desmet & Rossi-Hansberg (2013); Ahlfeldt et al. (2015) ...

Literature review

Local labor markets

- Estimating the effects of local labor demand shocks, without the view of spatial linkages.
- Bartik (1991); GHM (2010); Autor, Dorn & Hanson (2013) ...

Contributions

Spatial economy

- Develop a tractable framework in which an arbitrary set of regions are linked in both goods markets and labor markets, with both within- and across-city interactions.
- Quantify with disaggregated data on trade and commuting for the US and conduct counterfactuals.
- Establish the importance of spatial interactions between locations in determining the effects of local labor demand shocks.

Local labor markets

- Show that understanding the spatial linkages is central to evaluating the local impact of economic shocks.

Preference and endowments

The preference of a worker ω who lives and consumes in location n and works in location i is defined by

$$U_{ni\omega} = \frac{b_{ni\omega}}{\kappa_{ni}} \left(\frac{C_{n\omega}}{\alpha}\right)^{\alpha} \left(\frac{H_{n\omega}}{1-\alpha}\right)^{1-\alpha}, \tag{1}$$

where

- $b_{ni\omega}$ is an idiosyncratic amenities shock
- $\kappa_{ni} \in [1, \infty)$ is an iceberg commuting cost
- $C_{n\omega}$ is final goods consumption
- $H_{n\omega}$ is residential land use.

Preference and endowments

The idiosyncratic amenities $b_{ni\omega}$ are drawn from an independent Fréchet distribution

$$G_{ni}(b) = e^{-B_{ni}b^{-\epsilon}}, \quad B_{ni} > 0,\ \epsilon > 1, \tag{2}$$

where

- the scale parameter B_{ni} determines the average amenities
- the shape parameter $\epsilon > 1$ controls the dispersion of amenities.

Preference and endowments

The goods consumption index in location n is a CES function of a continuum of tradable varieties from each location i,

$$C_n = \left[\sum_{i \in N} \int_0^{M_i} c_{ni}(j)^{\rho} \, dj \right]^{1/\rho}, \quad \sigma = \frac{1}{1-\rho} > 1. \tag{3}$$

Utility maximization $\Rightarrow$

$$c_{ni}(j) = \alpha X_n P_n^{\sigma-1} p_{ni}(j)^{-\sigma}, \tag{4}$$

where

- X_n is aggregate expenditure in location n
- $P_n = \left[\sum_{i \in N} \int_0^{M_i} p_{ni}(j)^{1-\sigma} \, dj \right]^{\frac{1}{1-\sigma}}$ is the price index
- $p_{ni}(j)$ is the price of a variety j produced in i and consumed in n.

Preference and endowments

Utility maximization $\Rightarrow$ A fraction $1-\alpha$ of worker income is spent on residential land.

Assumption: Land is owned by immobile landlords, who receive worker expenditure on land as income, and consume only goods where they live.

$$P_n C_n = \alpha \bar{v}_n R_n + (1-\alpha)\bar{v}_n R_n = \bar{v}_n R_n, \tag{5}$$

where

- $\bar{v}_n$ is the average labor income across employment locations
- R_n is the measure of residents.

Land market clearing condition

$$Q_n = (1-\alpha)\frac{\bar{v}_n R_n}{H_n}. \tag{6}$$

Production

Varieties are produced using labor under monopolistic competition and increasing returns to scale.

$$l_i(j) = F + x_i(j)/A_i. \tag{7}$$

Profit maximization $\Rightarrow$

$$p_{ni}(j) = \left(\frac{\sigma}{\sigma - 1}\right)\frac{d_{ni}w_i}{A_i}. \tag{8}$$

Profit maximization + **Zero profit condition** $\Rightarrow$

$$x_i(j) = A_i F(\sigma - 1). \tag{9}$$

The total measure of produced varieties is

$$M_i = L_i/(\sigma F). \tag{10}$$

Goods trade

The share of location n's expenditure on goods produced in location i is

$$\pi_{ni} = \frac{M_i p_{ni}^{1-\sigma}}{\sum_{k \in N} M_k p_{nk}^{1-\sigma}} = \frac{L_i (d_{ni} w_i / A_i)^{1-\sigma}}{\sum_{k \in N} L_k (d_{nk} w_k / A_k)^{1-\sigma}}. \tag{11}$$

Trade balance

$$w_i L_i = \sum_{n \in N} \pi_{ni} \bar{v}_n R_n. \tag{12}$$

The price index can be expressed as

$$\begin{aligned} P_n &= \left[\sum_{i \in N} \int_0^{M_i} p_{ni}(j)^{1-\sigma} \, dj \right]^{\frac{1}{1-\sigma}} \\ &= \frac{\sigma}{\sigma - 1} \left(\frac{1}{\sigma F} \right)^{\frac{1}{1-\sigma}} \left[\sum_{i \in N} L_i (d_{ni} w_i / A_i)^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \\ &= \frac{\sigma}{\sigma - 1} \left(\frac{L_n}{\sigma F \pi_{nn}} \right)^{\frac{1}{1-\sigma}} \frac{d_{nn} w_n}{A_n}. \end{aligned} \tag{13}$$

Labor mobility and commuting

Indirect utility

$$U_{ni\omega} = \frac{b_{ni\omega} w_i}{\kappa_{ni} P_n^{\alpha} Q_n^{1-\alpha}}. \tag{14}$$

$\Rightarrow$ The probability that a worker chooses to live in n and work in i is

$$\lambda_{ni} = \frac{B_{ni} \left(\kappa_{ni} P_n^{\alpha} Q_n^{1-\alpha}\right)^{-\epsilon} w_i^{\epsilon}}{\sum_{r \in N} \sum_{s \in N} B_{rs} \left(\kappa_{rs} P_r^{\alpha} Q_r^{1-\alpha}\right)^{-\epsilon} w_s^{\epsilon}} \equiv \frac{\Phi_{ni}}{\Phi}. \tag{15}$$

$\Rightarrow$

$$\lambda_n^R = \frac{R_n}{\bar{L}} = \sum_{i \in N} \lambda_{ni} = \sum_{i \in N} \frac{\Phi_{ni}}{\Phi}, \quad \lambda_i^L = \frac{L_i}{\bar{L}} = \sum_{n \in N} \lambda_{ni} = \sum_{n \in N} \frac{\Phi_{ni}}{\Phi}. \tag{16}$$

Comparative statics: $(P_n, Q_n, w_i, \kappa_{ni}, B_{ni})$

Labor mobility and commuting

The probability that a worker commutes to i conditional on living in n is

$$\lambda^R_{ni|n} \equiv \frac{\lambda_{ni}}{\lambda^R_n} = \frac{B_{ni}(w_i/\kappa_{ni})^\epsilon}{\sum_{s\in N} B_{ns}(w_s/\kappa_{ns})^\epsilon}. \tag{17}$$

Labor market clearing condition

$$L_i = \sum_{n\in N} \lambda^R_{ni|n} R_n. \tag{18}$$

Expected worker income

$$\bar{v}_n = \sum_{i\in N} \lambda^R_{ni|n} w_i. \tag{19}$$

Labor mobility and commuting

Population mobility

$$\bar{U} = E\left[U_{ni\omega}\right]$$
$$= \Gamma\left(\frac{\epsilon - 1}{\epsilon}\right)\left[\sum_{r\in N}\sum_{s\in N} B_{rs}\left(\kappa_{rs} P_r^{\alpha} Q_r^{1-\alpha}\right)^{-\epsilon} w_s^{\epsilon}\right]^{1/\epsilon}, \quad \forall n, i \in N. \tag{20}$$

General equilibrium

The general equilibrium can be referenced by the following vector of six variables $\{w_n, \bar{v}_n, Q_n, L_n, R_n, P_n\}_{n=1}^{N}$ and a scalar $\bar{U}$.

$$w_i L_i = \sum_{n \in N} \pi_{ni} \bar{v}_n R_n$$

$$\bar{v}_n = \sum_{i \in N} \lambda^R_{ni|n} w_i$$

$$Q_n = (1-\alpha) \frac{\bar{v}_n R_n}{H_n}$$

$$\lambda^R_n = \frac{R_n}{\bar{L}} = \sum_{i \in N} \lambda_{ni} = \sum_{i \in N} \frac{\Phi_{ni}}{\Phi}, \quad \lambda^L_i = \frac{L_i}{\bar{L}} = \sum_{n \in N} \lambda_{ni} = \sum_{n \in N} \frac{\Phi_{ni}}{\Phi}$$

$$P_n = \frac{\sigma}{\sigma - 1} \left(\frac{L_n}{\sigma F \pi_{nn}} \right)^{\frac{1}{1-\sigma}} \frac{d_{nn} w_n}{A_n}$$

$$\bar{L} = \sum_{n \in N} R_n = \sum_{n \in N} L_n.$$

Data and Measurement

Variables	Source
Trade and distances	Commodity Flow Survey
Commuting	American Community Survey 2006-2010, US Census 1960-2000
Employment and wages	Bureau of Economic Analysis
...	GIS

Data and Measurement

Goods Trade

$$w_i L_i - \sum_{n \in N} \frac{L_i (d_{ni} w_i / A_i)^{1-\sigma}}{\sum_{k \in N} L_k (d_{nk} w_k / A_k)^{1-\sigma}} [\bar{v} R_n + D_n] = 0, \tag{21}$$

Commuting Flows

$$\lambda_{ni} = \frac{\mathcal{B}_{ni} \left(\frac{L_n}{\pi_{nn}}\right)^{-\frac{\alpha\epsilon}{\sigma-1}} A_n^{\alpha\epsilon} w_n^{-\alpha\epsilon} \bar{v}_n^{-\epsilon(1-\alpha)} \left(\frac{R_n}{H_n}\right)^{-\epsilon(1-\alpha)} w_i^{\epsilon}}{\sum_{r \in N} \sum_{s \in N} \mathcal{B}_{rs} \left(\frac{L_r}{\pi_{rr}}\right)^{-\frac{\alpha\epsilon}{\sigma-1}} A_r^{\alpha\epsilon} w_r^{-\alpha\epsilon} \bar{v}_r^{-\epsilon(1-\alpha)} \left(\frac{R_r}{H_r}\right)^{-\epsilon(1-\alpha)} w_s^{\epsilon}}, \tag{22}$$

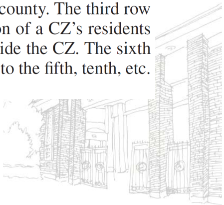
where $\mathcal{B}_{ni} \equiv B_{ni} \kappa_{ni}^{-\epsilon}$ captures the ease of commuting.

Data and Measurement

Commuting across Counties and Commuting Zones (Unweighted)

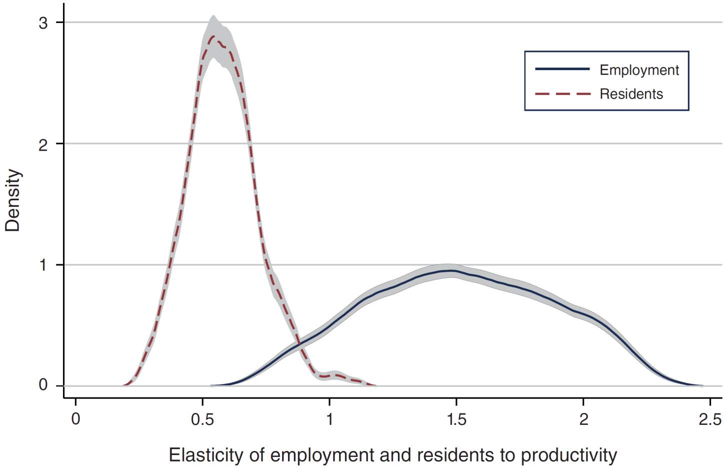
	Min. (1)	p5 (2)	p10 (3)	p25 (4)	p50 (5)	p75 (6)	p90 (7)	p95 (8)	Max. (9)	Mean (10)
Commuters from residence county	0.00	0.03	0.06	0.14	0.27	0.42	0.53	0.59	0.82	0.29
Commuters to workplace county	0.00	0.03	0.07	0.14	0.20	0.28	0.37	0.43	0.81	0.22
County employment/residents	0.26	0.60	0.67	0.79	0.92	1.02	1.11	1.18	3.88	0.91
Commuters from residence CZ	0.00	0.00	0.01	0.03	0.07	0.12	0.18	0.22	0.49	0.08
Commuters to workplace CZ	0.00	0.00	0.01	0.03	0.07	0.10	0.13	0.15	0.25	0.07
CZ employment/residents	0.63	0.87	0.91	0.97	1.00	1.01	1.03	1.04	1.12	0.98

Notes: Tabulations on 3,111 counties and 709 commuting zones. The first row shows the fraction of residents who work outside the county. The second row shows the fraction of workers who live outside the county. The third row shows the ratio of county employment to county residents. The fourth row shows the fraction of a CZ's residents who work outside the CZ. The fifth row shows the fraction of a CZ's workers who live outside the CZ. The sixth row shows the ratio of CZ employment to CZ residents across all 709 CZs. p5, p10, etc. refer to the fifth, tenth, etc. percentiles of the distribution.



Elasticity heterogeneity

We compute 3111 counterfactual exercises, imposing each county with a 5% productivity shock.



Explain the GE local employment elasticities

The counterfactual exercises solve for the full GE effect of the productivity shock to each county.

To provide intuition for the determinants of these local employment elasticities, we examine the relationship between these GE elasticities and a range of observed variables $\Rightarrow$

Explain the GE local employment elasticities

	Elasticity of employment								
	1	2	3	4	5	6	7	8	9
$\log L_i$		−0.003	0.009	−0.054				0.037	0.033
		(0.014)	(0.012)	(0.006)				(0.004)	(0.004)
$\log w_i$			−0.201	−0.158				−0.257	−0.263
			(0.059)	(0.039)				(0.016)	(0.016)
$\log H_i$			−0.288	−0.172				0.003	0.009
			(0.021)	(0.015)				(0.009)	(0.009)
$\log L_{-i}$				0.118				−0.027	−0.027
				(0.017)				(0.009)	(0.009)
$\log \bar{w}_{-i}$				0.204				0.163	0.207
				(0.083)				(0.037)	(0.038)
$\lambda^R_{ii\mid i}$					−2.047				
					(0.042)				
$\sum_{n\in N}(1-\lambda_{Rni})\vartheta_{ni}$						2.784		2.559	
						(0.192)		(0.178)	
$\vartheta_{ii}\left(\frac{\lambda_{ii}}{\lambda_{Ri}}-\lambda_{Li}\right)$						0.915		0.605	
						(0.210)		(0.175)	
$\frac{\partial w_i}{\partial A_i}\frac{A_i}{w_i}$						−1.009		−0.825	
						(0.123)		(0.150)	
$\frac{\partial w_i}{\partial A_i}\frac{A_i}{w_i}\cdot\sum_{r\in N}(1-\lambda_{rn\mid r})\vartheta_{rn}$							1.038		1.100
							(0.090)		(0.091)
$\frac{\partial w_i}{\partial A_i}\frac{A_i}{w_i}\cdot\vartheta_{ii}\left(\frac{\lambda_{ii}}{\lambda_{Ri}}-\lambda_{Li}\right)$							−0.818		−0.849
							(0.098)		(0.092)
Constant	1.515	1.545	5.683	1.245	2.976	0.840	1.553	1.861	2.064
	(0.034)	(0.158)	(0.632)	(0.797)	(0.022)	(0.201)	(0.087)	(0.404)	(0.352)
R^2	0.00	0.00	0.40	0.51	0.89	0.93	0.93	0.95	0.95
Observations	3,111	3,111	3,111	3,081	3,111	3,111	3,111	3,081	3,081

LATE of the productivity shock

We construct a regression sample including both treated and untreated counties from the 3111 counterfactuals ($3111^2 = 9678321$ observations).

For each of these separate exercises, estimate a DID specification

$$\Delta \ln Y_{it} = a_0 + a_1 I_{it} + a_2 X_{it} + a_3 \left(I_{it} \times X_{it} \right) + u_{it}, \tag{23}$$

where

- i denotes the 3111 counties, t indexes the 3111 counterfactuals;
- $\Delta \ln Y_{it}$ is the change in log employment between the counterfactual and actual equilibria;
- I_{it} is a dummy for whether a county is shocked;
- X_{it} are controls: model-suggested linkages measures v.s. more standard county controls.

A brief summary

- The heterogeneity in PE elasticities is not well explained by standard county controls.
- In contrast, adding the measures of the openness to commuting, or the derived PE elasticities, can better explain this heterogeneity.

$\Rightarrow$ While capturing the full GE effects of productivity shocks requires solving the counterfactuals, augmenting DID regressions with commuting linkages captures in a reduced-form way the elasticity heterogeneity.

Robustness: positive land supply elasticities

We now interpret the non-traded good as "developed" land and allow for a positive developed land supply elasticity that can differ across locations.

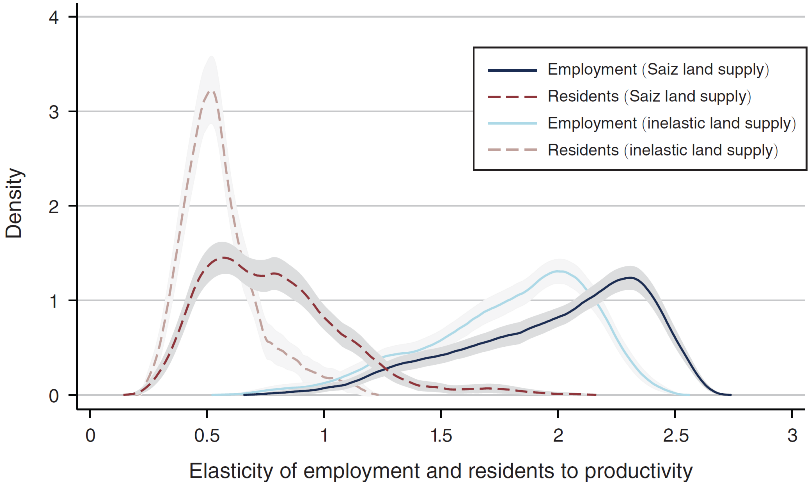
Assumption (Saiz, 2010)

The supply of land H_n for each residence n depends on the endogenous land price Q_n as well as on the exogenous characteristics of locations $\bar{H}_n$.

Criterion: Physical and regulatory constraints

$\Rightarrow$ When we undertake counterfactuals for productivity shocks, we focus on the subsample of counties within MSAs for which Saiz housing supply elasticities are available.

Robustness: positive land supply elasticities



Robustness: positive land supply elasticities

Findings

Both distributions are shifted to the right.

- **Intuition:** The productivity shock induces an increase in the land supply, which relieves the rise in land prices and wages.

The heterogeneity in the elasticity of residents increases while the heterogeneity in the elasticity of employment changes little.

- **Intuition:** Commuting allows individuals to work in locations with inelastic housing supplies without living there. Therefore, housing supply elasticity impacts residence more than employment.

> Improvement in commuting technologies is an alternative to relaxing land supply elasticities in enabling people to access high productivity locations.

Background

We provide separate empirical evidence for the importance of commuting in shaping the employment response to local labor demand shocks.

GHM setting

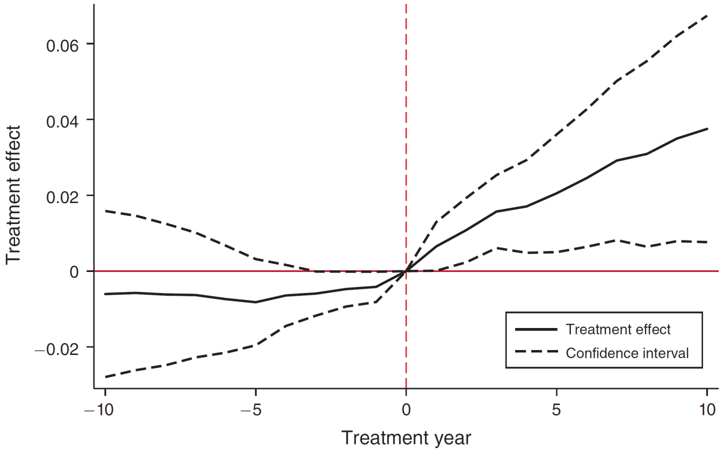
- Use the location decisions of million dollar plants (MDP) as a source of variation in local labor demand.
- GHM use the revealed rankings of profit-maximizing firms.
- The losers are counties that narrowly lost the competition, which form a valid counterfactual for the winners.

Data

- The sample includes 166 winner and runner-up counties from 39 states from 1972 to 2003, where each case can have more than 2 counties (more than one runner up).

Replication of GHM (2010)

$$\ln L_{it} = \kappa I_{j\mathcal{T}} + \sum_{\tau=-10}^{10} \theta_\tau (T_\tau \times W_i) + \alpha_i + \eta_j + \mu_t + \varepsilon_{it} \qquad (24)$$



Estimated MDP treatment and commuting openness

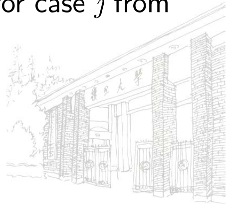
Key prediction

The treatment effect of the MDP should be heterogeneous depending on openness to commuting.

$$\ln L_{it} = \kappa I_{j\tau} + \theta(I_{j\tau} \times W_i) + \beta(I_{j\tau} \times \lambda^R_{ii|i}) + \gamma(I_{j\tau} \times W_i \times \lambda^R_{ii|i}) + \alpha_i + \eta_j + \mu_t + \varepsilon_{it}, \quad (25)$$

where

- $I_{j\tau}$ is an indicator for the treatment, which equals 1 for case j from the treatment year onward and 0 otherwise,
- W_i is an indicator for the winner county,
- $\lambda^R_{ii|i}$ is the residence own commuting share in 1990.



Estimated MDP treatment and commuting openness

Variable	Coefficient	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$I_{j\tau} \times W_i$	θ	0.057	0.250	0.191	0.244	0.260	0.223	0.177	0.182
		(0.018)	(0.078)	(0.065)	(0.068)	(0.078)	(0.078)	(0.066)	(0.063)
$I_{j\tau} \times W_i \times \lambda_{ii\|i}^{R}$	γ		−0.242				−0.219	−0.190	−0.195
			(0.078)				(0.096)	(0.077)	(0.073)
$I_{j\tau} \times W_i \times \lambda_{ii\|i}^{L}$	γ			−0.177					
				(0.087)					
$I_{j\tau} \times W_i \times \lambda_{ii\|i}^{ARL}$	γ				−0.241				
					(0.088)				
$I_{j\tau} \times W_i \times \lambda_{ii\|i}^{MRL}$	γ					−0.281			
						(0.110)			
$I_{j\tau} \times \lambda_{ii\|i}^{R}$	β		0.012				−0.048	−0.203	−0.213
			(0.135)				(0.108)	(0.075)	(0.082)
$I_{j\tau} \times \lambda_{ii\|i}^{L}$	β			0.243					
				(0.129)					
$I_{j\tau} \times \lambda_{ii\|i}^{ARL}$	β				0.124				
					(0.160)				
$I_{j\tau} \times \lambda_{ii\|i}^{MRL}$	β					0.133			
						(0.145)			
$I_{j\tau}$	κ	−0.015	−0.024	−0.200	−0.113	−0.113	0.021	0.160	0.159
		(0.008)	(0.096)	(0.096)	(0.125)	(0.106)	(0.086)	(0.060)	(0.066)
County fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects		Yes	Yes	Yes	Yes	Yes			
Industry-year fixed effects							Yes		
Census-region-year fixed effects								Yes	
State-year fixed effects									Yes
Observations		4,431	4,431	4,431	4,431	4,431	4,431	4,430	4,186
R^2		0.991	0.991	0.991	0.991	0.991	0.992	0.994	0.996

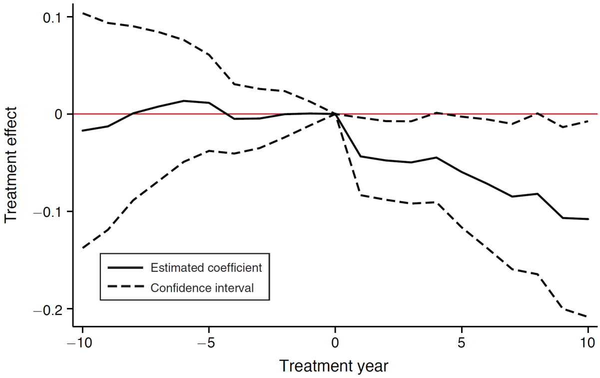
Estimated MDP treatment and commuting openness

Findings

- $\gamma < 0$: the increases in employment is greater in response to the positive labor demand shock in counties with more open local labor markets (lower $\lambda^R_{ii|i}$).
- The opening of a MDP has little effect on employment in counties that are completely closed to commuting $(\lambda_{ii|i} \to 1 \Rightarrow \theta + \gamma \approx 0)$.
- The increase in employment in the treated counties comes at the expense of reduced employment in neighboring counties.

Check for pre-trend

$$\ln L_{it} = \kappa I_{j\tau} + \sum_{\tau=-10}^{10} \theta_\tau (T_\tau \times W_i) + \sum_{\tau=-10}^{10} \beta_\tau (T_\tau \times \lambda^R_{ii|i}) + \sum_{\tau=-10}^{10} \gamma_\tau (T_\tau \times W_i \times \lambda^R_{ii|i}) + \alpha_i + \eta_j + \mu_{st} + \varepsilon_{it} \tag{26}$$



Nonparametric specification

$$\ln L_{it} = \kappa I_{j\tau} + \sum_{j=1}^{J} \theta_j (I_{j\tau} \times W_i) + \alpha_i + \eta_j + \mu_t + \varepsilon_{it} \qquad (27)$$

where θ_j captures the relative increase in employment in the winner county in case j following the MDP announcement.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\lambda^{R}_{jj\|j}$	−0.666				−0.875			
	(0.183)				(0.198)			
$\lambda^{L}_{jj\|j}$		−0.456				−0.832		
		(0.239)				(0.359)		
$\lambda^{ARL}_{jj\|j}$			−0.690				−1.078	
			(0.226)				(0.279)	
$\lambda^{MRL}_{jj\|j}$				−0.625				−1.005
				(0.222)				(0.271)
ln population$_j$					0.045	0.014	0.028	0.030
					(0.022)	(0.028)	(0.023)	(0.022)
ln land area$_j$					0.078	0.092	0.115	0.121
					(0.038)	(0.061)	(0.047)	(0.047)
Observations	82	82	82	82	82	82	82	82
R^2	0.18	0.05	0.13	0.13	0.25	0.08	0.20	0.21

Changes in commuting costs

Commuting linkages also matter for the aggregate spatial distribution of economic activity and welfare.

Setting: We use the observed commuting data to back out implied values of $\mathcal{B}_{ni}$ ($\equiv B_{ni}\kappa_{ni}^{\epsilon}$) capturing the ease of commuting.

$$\tilde{\mathcal{B}}_{ni} \equiv \left(\frac{\mathcal{B}_{ni}\mathcal{B}_{in}}{\mathcal{B}_{nn}\mathcal{B}_{ii}}\right)^{1/2} = \left(\frac{L_{ni}L_{in}}{L_{nn}L_{ii}}\right)^{1/2}. \tag{28}$$

We compute with data in 1990 and 2010, and calculate the change rate:

$\hat{\tilde{\mathcal{B}}}_{ni}$	Percentile
0.96	25%
0.88	50%
0.79	75%

Welfare implications

We assume a common reduction or increase in the costs of commuting for all counties equal to percentiles of this distribution $\{\hat{\hat{\mathcal{B}}}_{ni}\}$.

The welfare change from the shock to commuting costs can be decomposed as follows:

$$\hat{\hat{U}} = \left(\frac{1}{\hat{\lambda}_{ii}}\right)^{1/\epsilon} \left(\frac{1}{\hat{\pi}_{ii}}\right)^{\frac{\alpha}{\sigma-1}} \left(\frac{\hat{w}_i}{\hat{\hat{v}}_i}\right)^{1-\alpha} \frac{\hat{L}_i^{\frac{\alpha}{\sigma-1}}}{\hat{R}_i^{1-\alpha}}. \tag{29}$$

	Decrease by p75	Decrease by p50	Decrease by p25	Increase by 1/p50
Implied $\hat{\hat{\mathcal{B}}}_{ni}$	0.79	0.88	0.96	1.13
Welfare change (%)	6.89	3.26	0.89	−2.33

Conclusion

- We develop a quantitative spatial GE model that incorporates spatial linkages between locations in both goods markets and factor markets.
- We find substantial heterogeneity across both counties and CZs in the elasticity of local employment to a productivity shock.
- The quasi-experiment shows larger increases in employment in response to labor demand shocks in counties with more open commuting markets, consistent with the predictions of our model.
- Commuting also matters in the aggregate for the spatial distribution of economic activity and welfare.

The End