Market Size and Trade in Medical Services

Jonathan I. Dingel
Joshua D. Gottlieb
Maya Lozinski
Pauline Mourot

University of Chicago
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Economies of scale and trade in medical services

Perpetual policy discussion of geographic variation in medical services:

- Less populous places have worse health outcomes...
- ...but US doctors are disproportionately in big cities (50% more per capita)

Evaluating this situation hinges on returns to scale and tradability

- Increasing returns $\rightarrow$ geographic concentration of production yields benefits
- Trade costs for services $\rightarrow$ proximity-concentration trade-off
- If patients vary in willingness to travel, efficiency and equity considerations

How do local increasing returns and trade costs govern the geography of US healthcare production and consumption? (18% of US GDP)
This paper

Approach:

- Setting: Medicare (regulated provider payments)
- Model: Trade costs & scale economies $\rightarrow$ home-market effect
- Implementation: Logit demand $\rightarrow$ gravity equation $\rightarrow$ quality estimates

Estimates:

- Domestic trade in medical services mimics trade in manufactures
  - 22% of production is exported; distance elasticity is about -1.7
- Home-market effects are pervasive; stronger in less common services
- Geographic concentration $\rightarrow$ ↑ service quality, ↑ specialization ($\alpha \approx 0.6$)
Counterfactual scenarios

Simple model generates rich depiction of proximity-concentration tradeoffs:

- Changes in output quality $\neq$ changes in patient market access
- Efficiency need not mean subsidizing *output* in markets with worst access
- Subsidizing production in one region generates “agglomeration shadow”
- Production subsidies and travel subsidies can impose contrasting spillovers on neighboring regions
- Lower-SES patients need larger travel subsidies to equalize access
Contributions

Medical care: trade & increasing returns

- Distribution of physicians/rural access Newhouse 1982a,b,c, 1990; Dranove, Shanley & Simon 1992; Buchmueller et al. 2006, Alexander & Richards, 2021; ...

- Studies mostly treat markets as local Dartmouth; Baumgardner 1988a,b; Bresnahan & Reiss 1991; Chandra & Staiger 2007; Finkelstein, Gentzkow & Williams 2016

Home-market effect for trade in services

- Market size and goods: Davis and Weinstein 2003; Hanson and Xiang 2004; Dingel 2017; Bartelme et al. 2019 Acemoglu and Linn 2004; Costinot et al. 2019

- Trade in services: Lipsey ’09 Eaton & Kortum ’19 Eilat & Einav ’04, Muñoz ’22

Central place theory and “spatial shopping” literature

- Central place theory: Christaller 1933; Hsu, Holmes and Morgan 2014; Schiff 2015

- Credit-card trade matrices: Agarwal et al. 2017; Dunn and Gholizadeh 2021
Roadmap

- Theoretical framework
- Data description
- Market-size effects
  - Larger markets are net exporters of medical services
  - Gravity-based empirics show strong HME
- Rare procedures have stronger market-size effects
  - Gravity-based empirics by procedure frequency
  - Population elasticities by procedure
- Estimating the scale elasticity
  - Scale improves quality
  - Scale facilitates the division of labor
- Tradeoffs and counterfactual scenarios
Theoretical framework

Data description

Market-size effects
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Tradeoffs and counterfactual scenarios
Partial-equilibrium competitive model of one procedure with a fixed price

$N_j$ potential patients in region $j$. Patient $k$ choosing care in region $i$ gets

$$U_{ik} = \ln \delta_i + \ln \rho_{ij(k)} + \epsilon_{ik}$$

Provider in region $i$ hiring $L$ inputs to produce quality $\delta$ takes productivity shifter $A_i$ and regional output $Q_i$ as given. Output quantity is

$$A_i \frac{H(Q_i)}{K(\delta)} L$$

Given government-set reimbursement rate $\overline{R}$ and factor price $w_i$, the free-entry condition defines an isocost curve in $(Q, \delta)$ space:

$$\overline{R} = \frac{w_i K(\delta_i)}{A_i H(Q_i)} \equiv C(Q_i, \delta_i; w_i, A_i)$$
Autarky

\[ C = \bar{R} \quad (\alpha = 0) \]
\[ C = \bar{R} \quad (\alpha > 0) \]

Demand

Higher Demand

(\( \Delta N > 0 \))

\[ \log \delta \]
\[ \log Q \]

\[ C = \bar{R} \]

\( \alpha > 0 \)

\( \alpha = 0 \)
Common and rare procedures: 2 examples

- Colonoscopy ($N=58,798$ in our sample)
- Implanting LVAD—pump for severe heart failure patients ($N=333$)
Autarky: Common vs rare procedures

\[ \log Q = \log \delta \]

**More Elastic Demand**

**Less Elastic Demand**

\[ C = \bar{R} \]

\[ (\alpha > 0) \]
Trade

Preference shocks $\epsilon_{ik} \overset{\text{iid}}{\sim} \text{T1EV} \implies Q_{ij}$ patients from $j$ choosing $i$:

$$\mathbb{E}[Q_{ij}] = \frac{\delta_i \rho_{ij}}{\Phi_j} N_j$$

where $\Phi_j \equiv \sum_{i'} \delta_{i'} \rho_{i'j}$ is patient market access in $j$

Trade follows gravity equation:

$$\ln \mathbb{E}[Q_{ij}] = \ln \delta_i + \ln \left( \frac{N_j}{\Phi_j} \right) + \ln \rho_{ij}$$

Market size and trade: $N_j, \delta_i, \Phi_j$

- Larger population (larger $N_j$) raises import demand
- With increasing returns ($\alpha > 0$): $\uparrow N_i \rightarrow \uparrow \delta_i \rightarrow \uparrow$ gross exports & $\uparrow \Phi_i$
- With sufficiently strong increasing returns ($\alpha \gg 0$):
  - $\uparrow N_i \rightarrow \ln \delta_i$ increases faster than $\ln \left( \frac{N_i}{\Phi_i} \right)$: region $i$ is net exporter
  - This effect is larger for rare services
Trade: Weak home-market effect

\[ \log Q = \log \delta C = R(\alpha \gg 0) \]

\[ \log Q = \log \delta C = R(\alpha > 0) \]

Demand

Exports \((\alpha > 0)\) \hspace{1cm} Imports \((\alpha > 0)\)
Trade: Strong home-market effect

\[ \log Q \]

\[ \log \delta \]

\[ \log C = R(\alpha > 0) \]

\[ \log C = R(\alpha \gg 0) \]

Demand

\[ \delta'' \]

\[ \delta' \]

\[ \delta \]

Exports

\[ (\alpha \gg 0) \]

Imports

\[ (\alpha > 0) \]

Exports

\[ (\alpha > 0) \]

Imports

\[ (\alpha \gg 0) \]
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Tradeoffs and counterfactual scenarios
Medicare

- Medicare insures almost all Americans > 65 years old or disabled
  - 59 million beneficiaries and about 23% of healthcare expenditure (in 2017)
  - 39 million in Traditional Medicare (physicians & facilities bill Medicare)
- All willing providers covered; vast majority of doctors/hospitals
  - cf. private insurance: limited network, opaque pricing → patients have different choice sets
- Medicare regulates payment (“reimbursement”) rates
  - Based on each procedure’s estimated average cost
  - Constant across physicians within a region
  - Limited geographic variation (89 regions)
- Separate professional and facility fees
  - Professional fee → physician (we study these)
  - Facility fee → hospital (see appendix)
Data

Medicare professional claims data for 2017

- Carrier (fee-for-service claims) file reports procedure, provider, date, payment
- Include all non-Emergency Department care provided by MD/DO
- 20% representative sample of patients contains ~230 million claim lines
- 12,000+ 5-digit procedures in Healthcare Common Procedure Coding System (HCPCS)
- ZIP codes of patient and place of service

National Plan and Provider Enumeration System (NPPES)

- Physician ID, name
- Physician specialization and location
Our benchmark unit is a hospital referral region

- 306 HRRs defined by 1996 *Dartmouth Atlas*
- Aggregate patient ZIP codes based on major cardiovascular surgical procedures & neurosurgery in 1992-93 Medicare claims
- Each HRR has $\geq 1$ hospital where both performed
- Most common unit used in health econ
- Definition could mechanically minimize trade
Theoretical framework

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Tradeoffs and counterfactual scenarios
Production, consumption, trade, and market size

Population elasticity (log–log regression slope) of transactions per resident Medicare beneficiary:
- Production: 0.13 (0.02)
- Consumption: 0.06 (0.01)
- Exports: −0.00 (0.05)
- Imports: −0.25 (0.03)
Trade declines with distance

Frequency

Distance (km)

Within HRR
Across HRR

Share of pairs with positive trade

Trade (log, residualized)

Distance (log, residualized)

Log trade, residualized
Share of pairs with positive trade
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Tradeoffs and counterfactual scenarios
Estimating home-market effect: 1-step gravity regression

Test for HME using the gravity equation à la Costinot et al. 2019:

\[
\ln E[Q_{ij}] = \ln \delta_i + \ln \left( \frac{N_j}{\Phi_j} \right) + \gamma \ln \text{distance}_{ij}
\]

\[
\ln E(\overline{RQ}_{ij}) = \lambda_X \ln \text{population}_i + \lambda_M \ln \text{population}_j + \gamma \ln \text{distance}_{ij}
\]

- \( \lambda_X > 0 \) is a weak home-market effect: \( \uparrow N_i \implies \uparrow \) gross exports
- \( \lambda_X > \lambda_M > 0 \) is a strong home-market effect: \( \uparrow N_i \implies \uparrow \) net exports
- Estimate using Poisson pseudo-maximum likelihood (PPML) due to zeros

Two instruments:

- Population in 1940
- Depth to bedrock (data from Levy & Moscona, 2020)
Gravity regression: Strong HME for aggregate medical services

<table>
<thead>
<tr>
<th>Estimation method:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tr>
<td></td>
<td>PPML</td>
<td>PPML</td>
<td>PPML</td>
<td>IV</td>
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<tr>
<td>( \lambda_X ) Provider-market population (log)</td>
<td>0.638</td>
<td>0.643</td>
<td>0.645</td>
<td>0.597</td>
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<td>(0.0634)</td>
<td>(0.0610)</td>
<td>(0.0455)</td>
<td>(0.0732)</td>
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<tr>
<td>( \lambda_M ) Patient-market population (log)</td>
<td>0.377</td>
<td>0.376</td>
<td>0.406</td>
<td>0.360</td>
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<td>(0.0615)</td>
<td>(0.0587)</td>
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<tr>
<td>Distance (log)</td>
<td>-1.664</td>
<td>0.0996</td>
<td>0.0796</td>
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<tr>
<td></td>
<td>(0.0501)</td>
<td>(0.307)</td>
<td>(0.270)</td>
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<td>Distance (log, squared)</td>
<td>-0.178</td>
<td>-0.177</td>
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<td></td>
<td>(0.0299)</td>
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<td>93,636</td>
<td>93,636</td>
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<tr>
<td>Distance elasticity at mean</td>
<td>-2.46</td>
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<td>-2.46</td>
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<td>Distance deciles</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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HME stronger for rarer procedures

Market-size elasticity vs Procedure frequency decile

- Provider population
- Patient population
## HME stronger for rarer procedures (richer controls)

<table>
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<th>(5)</th>
<th>(6)</th>
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<td>0.638</td>
<td>0.624</td>
<td>0.623</td>
<td>0.630</td>
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<td>(0.0613)</td>
<td>(0.0614)</td>
<td>(0.0598)</td>
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<td>Patient-market population (log)</td>
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<td>(0.0615)</td>
<td>(0.0590)</td>
<td>(0.0591)</td>
<td>(0.0572)</td>
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<tr>
<td>Provider-market population (log) × rare</td>
<td>0.306</td>
<td>0.291</td>
<td>0.316</td>
<td>0.287</td>
<td></td>
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<tr>
<td></td>
<td>(0.0472)</td>
<td>(0.0455)</td>
<td>(0.0480)</td>
<td>(0.0458)</td>
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<tr>
<td>Patient-market population (log) × rare</td>
<td>-0.229</td>
<td>-0.219</td>
<td>-0.232</td>
<td>-0.211</td>
<td></td>
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<td></td>
<td>(0.0698)</td>
<td>(0.0671)</td>
<td>(0.0704)</td>
<td>(0.0658)</td>
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<td>Observations</td>
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<td>Distance controls</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Distance [quadratic] controls</td>
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<td></td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Patient-provider-market-pair FEs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</table>
### Strong HME for specific common & rare services

<table>
<thead>
<tr>
<th>Procedure:</th>
<th>(1) Colonoscopy</th>
<th>(2) Cataract surgery</th>
<th>(3) Brain tumor</th>
<th>(4) Brain radiosurgery</th>
<th>(5) LVAD</th>
<th>(6) Colon removal</th>
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</thead>
<tbody>
<tr>
<td>HCPCS code:</td>
<td>G0121</td>
<td>66982</td>
<td>61510</td>
<td>61798</td>
<td>33979</td>
<td>44155</td>
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</table>

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>(3)</th>
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<th>(5)</th>
<th>(6)</th>
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</thead>
<tbody>
<tr>
<td>$\lambda_X$: Provider-market population (log)</td>
<td>0.515</td>
<td>0.466</td>
<td>0.928</td>
<td>1.149</td>
<td>1.251</td>
<td>0.998</td>
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<td></td>
<td>(0.0692)</td>
<td>(0.0730)</td>
<td>(0.0885)</td>
<td>(0.119)</td>
<td>(0.168)</td>
<td>(0.164)</td>
</tr>
<tr>
<td>$\lambda_M$: Patient-market population (log)</td>
<td>0.351</td>
<td>0.437</td>
<td>0.192</td>
<td>0.166</td>
<td>0.182</td>
<td>-0.146</td>
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<td></td>
<td>(0.0694)</td>
<td>(0.0691)</td>
<td>(0.0726)</td>
<td>(0.0816)</td>
<td>(0.141)</td>
<td>(0.146)</td>
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<tr>
<td>Distance (log)</td>
<td>0.436</td>
<td>0.948</td>
<td>0.997</td>
<td>1.518</td>
<td>2.168</td>
<td>3.090</td>
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<td>(0.413)</td>
<td>(0.508)</td>
<td>(0.548)</td>
<td>(0.701)</td>
<td>(0.920)</td>
<td>(1.651)</td>
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<tr>
<td>Distance (log, squared)</td>
<td>-0.216</td>
<td>-0.268</td>
<td>-0.266</td>
<td>-0.307</td>
<td>-0.365</td>
<td>-0.499</td>
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<td></td>
<td>(0.0410)</td>
<td>(0.0503)</td>
<td>(0.0577)</td>
<td>(0.0712)</td>
<td>(0.0930)</td>
<td>(0.173)</td>
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<tr>
<td>Observations</td>
<td>93,636</td>
<td>93,636</td>
<td>93,636</td>
<td>93,636</td>
<td>93,636</td>
<td>93,636</td>
</tr>
<tr>
<td>Distance elasticity at mean</td>
<td>-2.66</td>
<td>-2.89</td>
<td>-2.81</td>
<td>-2.89</td>
<td>-3.06</td>
<td>-4.06</td>
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<tr>
<td>Total count</td>
<td>58,798</td>
<td>43,604</td>
<td>1,922</td>
<td>752</td>
<td>333</td>
<td>112</td>
</tr>
</tbody>
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Estimating procedure-level population elasticities

- \( Q_{pi} \) is the count of procedure \( p \) produced in region \( i \)
- \( Q_{pi}/M_i \) is production per Medicare beneficiary residing in region \( i \)
- Use Poisson PML to estimate the population elasticity of economic activity

\[
\ln E \left[ \frac{Q_{pi}}{M_i} \ln \text{population}_i \right] = \zeta_p + \beta_p \ln \text{population}_i
\]

- We estimate elasticities for production and consumption
- Then relate estimated population elasticity \( \hat{\beta}_p \) to \( p \)'s national frequency
Population elasticity of production declines with frequency

This plot depicts estimated population elasticities per Medicare beneficiary for 8,253 procedures produced at least 20 times nationally.

Production fitted line: $y = -0.024 (0.002) \times x + 0.391 (0.016)$
Population elasticity of consumption declines less with frequency

This plot depicts estimated population elasticities per Medicare beneficiary for 8,253 procedures produced at least 20 times nationally.

Production fitted line: \( y = -0.024 (0.002) \times x + 0.391 (0.016) \)
Consumption fitted line: \( y = -0.007 (0.002) \times x + 0.138 (0.014) \)
### Example procedures: Trade in colonoscopy & LVAD

<table>
<thead>
<tr>
<th></th>
<th>Colonoscopy</th>
<th>LVAD Insertion</th>
</tr>
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<tbody>
<tr>
<td>Code</td>
<td>G0121</td>
<td>33979</td>
</tr>
<tr>
<td>N</td>
<td>58,798</td>
<td>333</td>
</tr>
<tr>
<td>Physicians</td>
<td>13,475</td>
<td>177</td>
</tr>
<tr>
<td>$\hat{\beta}_{production}$</td>
<td>0.00</td>
<td>0.71</td>
</tr>
<tr>
<td>$\hat{\beta}_{consumption}$</td>
<td>-0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Share traded (HRR)</td>
<td>0.15</td>
<td>0.50</td>
</tr>
<tr>
<td>Share traded (CBSA)</td>
<td>0.15</td>
<td>0.48</td>
</tr>
<tr>
<td>Median distance traveled (km)</td>
<td>18.44</td>
<td>65.50</td>
</tr>
<tr>
<td>Share &gt; 100km</td>
<td>0.06</td>
<td>0.37</td>
</tr>
</tbody>
</table>
Imports play a larger role in less-common procedures

- Imported share of consumption varies widely across procedures
- Imported share of consumption larger for less-common procedures
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Tradeoffs and counterfactual scenarios
Estimating the scale elasticity: 2-step estimator

1. Estimate exporter fixed effects from gravity regression:

\[
\ln E(RQ_{ij}) = \ln \delta_i + \ln \theta_j + \gamma \ln \text{distance}_{ij}
\]

2. Isocost curve implies estimating equation for \( \hat{\alpha} \):

\[
\hat{\ln \delta_i} = \alpha \ln Q_i + \ln \bar{R} - \ln w_i + \ln A_i
\]

- High-quality locations can be:
  - large \((Q_i \uparrow)\),
  - cheap \((w_i \downarrow)\),
  - or idiosyncratic \((A_i \uparrow)\) [e.g., Mayo Clinic's historical investment in quality or reputation]

- 3 instruments for \( \ln Q_i \): population, 1940 population, bedrock depth
Exporter fixed effects are correlated with other quality measures

HRRs with more USNWR-ranked hospitals export more, especially rare services

\[ Y = -0.8787 + 0.0670 [0.0141] X + \varepsilon \]
\[ N = 306; \ R^2 = 0.2000 \]

\[ Y = -1.6549 + 0.1193 [0.0248] X + \varepsilon \]
\[ N = 306; \ R^2 = 0.2789 \]

- Further support for clinical quality: Fischer et al., 2022; Battaglia, 2022; Petek, 2022
Scale improves quality: $\alpha \approx 0.6$

Panel A: All services

<table>
<thead>
<tr>
<th>OLS</th>
<th>No Diag</th>
<th>Diag</th>
<th>Controls No Diag</th>
<th>Diag</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLS</td>
<td>0.804</td>
<td>0.778</td>
<td>0.884</td>
<td>0.793</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
<td>(0.030)</td>
<td>(0.046)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>2SLS: population (log)</td>
<td>0.799</td>
<td>0.716</td>
<td>0.871</td>
<td>0.721</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.030)</td>
<td>(0.052)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>2SLS: population (1940, log)</td>
<td>0.660</td>
<td>0.550</td>
<td>0.640</td>
<td>0.559</td>
</tr>
<tr>
<td></td>
<td>(0.093)</td>
<td>(0.069)</td>
<td>(0.082)</td>
<td>(0.059)</td>
</tr>
</tbody>
</table>

Panel B: Rare services

<table>
<thead>
<tr>
<th>OLS</th>
<th>No Diag</th>
<th>Diag</th>
<th>Controls No Diag</th>
<th>Diag</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLS</td>
<td>1.089</td>
<td>0.945</td>
<td>1.124</td>
<td>0.956</td>
</tr>
<tr>
<td></td>
<td>(0.045)</td>
<td>(0.030)</td>
<td>(0.046)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>2SLS: population (log)</td>
<td>1.033</td>
<td>0.910</td>
<td>1.072</td>
<td>0.920</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.037)</td>
<td>(0.051)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>2SLS: population (1940, log)</td>
<td>0.951</td>
<td>0.832</td>
<td>0.940</td>
<td>0.832</td>
</tr>
<tr>
<td></td>
<td>(0.081)</td>
<td>(0.061)</td>
<td>(0.073)</td>
<td>(0.055)</td>
</tr>
</tbody>
</table>

Control is HRR’s Medicare geographic adjustment factor
• Theoretical framework
• Data description

• Market-size effects
  - Larger markets are net exporters of medical services
  - Gravity-based empirics show strong HME

• Rare procedures have stronger market-size effects
  - Gravity-based empirics by procedure frequency
  - Population elasticities by procedure

• Estimating the scale elasticity
  - Scale improves quality
  - Scale facilitates the division of labor

• Tradeoffs and counterfactual scenarios
Trade expands access to specialists and experience

- Larger markets produce greater set of procedures
- Rare specialties are more concentrated in larger markets
- Traded procedures are specialist-intensive...
- ...especially smaller markets’ imports
- Small markets’ locally-produced care may be from “non-standard specialties”
- Larger regions & imported care have more experienced physicians
Larger markets produce greater set of procedures

![Graph showing the relationship between population and distinct procedures produced across different fields.](image-url)
Rare specialties have higher population elasticities

One source of increasing returns could be division of labor among physicians

Pearson correlation: -0.446.
Fitted line: \( y = -0.072(0.010) \ln x + 0.798(0.065) \)
Plot excludes 2 observations with elasticity greater than 1.60.
Traded procedures are specialist-intensive

- Classify a procedure as “generalist” if performed by Internal Medicine, Family Medicine, and General Practice $\geq 70\%$ (2,492 procedures)
- Classify as “specialist” if top two specializations do $\geq 70\%$ (7,533 procedures)
- Imports are more likely to be specialty care than locally produced consumption
Smaller places more likely to import specialty procedures

Imports: $y = -0.021 (0.005) \times x + 0.837 (0.071)$
Domestic: $y = -0.002 (0.004) \times x + 0.510 (0.060)$
In smaller regions,

- domestically produced care less likely performed by “standard” specialist
- imports more likely performed by “standard” specialist

Imports: $y = -0.002 (0.001) * x + 0.966 (0.017)$
Domestic: $y = 0.005 (0.002) * x + 0.873 (0.022)$
Larger regions & imported care have more experienced physicians

- Physician experience: number of times billing the service code over past year (scaled by code’s mean)
- Average experience across codes, weighted by spending
- Imported care provided by more experienced physicians than locally provided care, at any population size

**Graph: Mean normalized experience vs. Population (Log)**

- Imports: $y = 0.032 (0.011) \times x + 0.523 (0.142)$
- Domestic: $y = 0.030 (0.015) \times x + 0.446 (0.200)$
Theoretical framework

Data description

Market-size effects
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Rare procedures have stronger market-size effects
- Gravity-based empirics by procedure frequency
- Population elasticities by procedure

Estimating the scale elasticity
- Scale improves quality
- Scale facilitates the division of labor

Tradeoffs and counterfactual scenarios
Counterfactual scenarios

1. Increase reimbursements nationally
   - Spatial impacts on quality and access

2. Increase reimbursements in one region
   - Spatial impacts on quality and access
   - Spillovers on neighbors
   - Heterogeneity by income

3. Subsidize imported care in one region
   - Spillovers on neighbors
   - Differences by population size
   - Subsidies required by income
Counterfactual scenario: Increase reimbursements in all HRRs

Change (%) in output quality $\delta_i$

Change (%) in patient market access $\Phi_i$

- "Patient market access": patients’ value of all the care in their choice set
- $\Phi_j \equiv \sum_i \delta_i \rho_{ij}$

Cutoffs: Percentiles 25, 50, 75.
Counterfactual: Increase reimbursements in Rochester, MN

Change (%) in output quality $\delta_i$

Change (%) in patient market access $\Phi_i$

MN–ROCHESTER = 61.3%

MN–ROCHESTER = 45.4%
Counterfactual: Increase reimbursements in Paducah, KY

Change (%) in output quality $\delta_i$

Change (%) in patient market access $\Phi_i$

- Spillover negative with exports to Paducah
- Net spillovers depend on whether market is net exporter
Higher-SES patients are more willing to travel

- Gain from nationwide reimbursement increase is 20% larger for highest- vs. lowest-income tercile
- This difference is explained by baseline trade patterns (outside option)

Note: Coefficient on log distance estimated separately for each decile of the national ZIP-level median-household-income distribution. 95% CIs using standard errors clustered by both patient HRR and provider HRR.
Counterfactual: Increase reimbursements in one region at a time

- Net spillovers depend on whether market is net exporter
- Lower-income patients disproportionately live in smaller markets...
- ...so benefit disproportionately from reimbursement increases in smaller markets
Counterfactual: Subsidize imports for Paducah residents

- Paducahans’ imports → agglomeration benefits in neighboring regions
- Positive spillovers correlated with baseline exports to Paducah
Conclusions
Market Size and Trade in Medical Services

Findings:

- Domestic trade in medical services mimics trade in manufactures
  - But larger distance elasticity
  - High-SES patients less sensitive to distance
- Scale economies $\rightarrow$ large markets are net exporters
- Market-size effects largest in lower-volume services

Counterfactual outcomes:

- Spillovers of production subsidies depend on net trade flows
- For net importers, travel subsidies have opposite spillovers
- Aggregate return highest in larger regions, but lower-income patients benefit from subsidizing smaller regions
Thank you