Physician Behaviors and Hospital Influence

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Background

Physician Agency

Physician with decision-making authority for treatment

- Information asymmetry (what's wrong and how to fix it)
- Regulatory restrictions (I can't prescribe to or operate on myself)

Physician Agency

Differential financial incentives between physician and hospital

- More procedures = more revenue, but location of procedure may matter to hospital
- Hospital wants less cost with fixed payment, but physician dictates resource use

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$\longrightarrow$ Incentives for hospitals to try to influence physician behaviors

Most direct way to influence physician behavior is by purchasing the physician practice

How are hospitals and physicians related?

1. “Traditional” private practice with admitting privileges
2. Administrative support with or without admitting restrictions
3. Practice owned by hospital or hospital system

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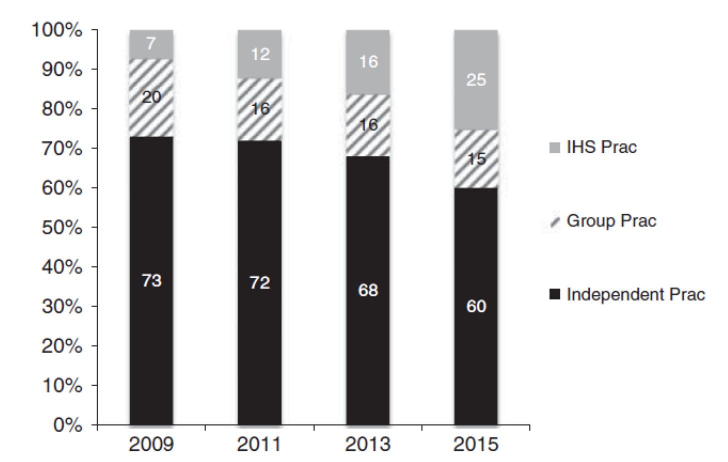

Richards *et al.*, Medical Care, 2016

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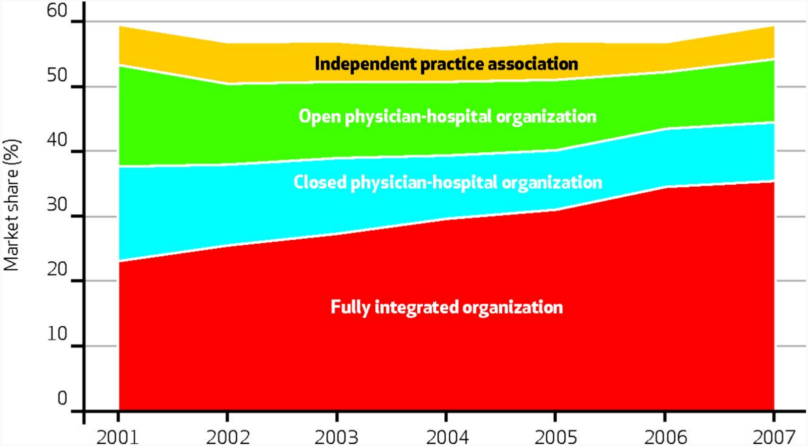

Baker, Bundorf, and Kessler, Health Affairs, 2014

Why would a physician practice integrate?

Financial security

- Salaried arrangement
- Potential RVU incentives

Why would a physician practice integrate?

Reduce administrative burden (maybe)

- Billing and insurance approvals
- Electronic Health Records
- Data collection/reporting

What do we expect from integration?

- Hospitals claim efficiency gains, reduced fragmentation, increased coordination, etc.
- Financial incentives for cost increases and decreases
  - Lower costs with fixed payment
  - Substituting locations of care more efficiently
  - Spillovers from private insurance
  - More resources due to pay-for-performance

Theoretical Framework

Physician Agency

Observed care at time t is

$$y_{ijk} = \arg\max_{y} \theta_u \tilde{u}\left(y; \Gamma_j, \kappa_i\right) + \theta_\pi \pi\left(y; \Gamma_k, \Gamma_j\right).$$

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$$y_{ijk} = \alpha_i + x_i\beta + \Gamma_{jk} + \epsilon_{ijk}$$

Estimation Strategy

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2. Estimate $\hat{\Gamma}_{jkt} = \gamma_j + \gamma_k + \tau_t + z_{jkt}\delta + \eta_{jkt}$ with physician-hospital panel

Estimation Strategy

- Draws from “match values” in labor literature (Abowd *et al.*, 2002; Card *et al.*, 2013, QJE)
- Exploits variation across inpatient stays and splits the separation of match value into two steps
- Identifies effects on match value from within-physician variation across hospitals (e.g., patient movers in Finkelstein *et al.*, 2016, QJE)

Data

Data Sources

- CMS: 100% inpatient Medicare claims data (2008-2015)
- SK&A: Hospital ownership of physician practices
- AHA, HCRIS, POS: Hospital characteristics
- Annual IPPS Impact Files: Hospital cost-to-charge ratios (CCR)
- ACS: County-level demographics, education, income, and employment

Sample Construction

- Planned inpatient stays (elective admissions initiated by a physician, clinic, or HMO referral) and outpatient procedures with observed NPI for the operating physician

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- Drop lowest/highest 1% of charges and patients $<$ 65 years old

$\longrightarrow$ 518,398 unique observations at the physician/hospital/year
$\longrightarrow$ 7.5mm inpatient stays (47% of total) and 24mm outpatient procedures

Estimation of Match Values

Specification

Two-step estimation strategy:

1. Estimate $y_{ijk} = \alpha_i + x_i\beta + \Gamma_{jk} + \epsilon_{ijk}$ at patient level (separately by year)
2. Estimate $\hat{\Gamma}_{jkt} = \gamma_j + \gamma_k + \tau_t + z_{jkt}\delta + \eta_{jkt}$ with physician-hospital panel

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$$y_{ijk} = \alpha_i + x_i\beta + \Gamma_{jk} + \epsilon_{ijk},$$

Outcomes

$$y_{ijk} = \alpha_i + x_i\beta + \Gamma_{jk} + \epsilon_{ijk},$$

- Total inpatient and outpatient Medicare payments
- Total inpatient and outpatient hospital costs (from cost-to-charge ratios)
- Inpatient hospital costs
- Inpatient length of stay
- Outpatient hospital costs

Independent Variables

$$y_{ijk} = \alpha_i + x_i\beta + \Gamma_{jk} + \epsilon_{ijk},$$

- Quartiles of total “other” Medicare payments and procedures
- Covers 2008 through 2015 period
- Beneficiary-specific measure of “utilization”

Independent Variables

$$y_{ijk} = \alpha_i + x_i\beta + \Gamma_{jk} + \epsilon_{ijk},$$

- Age, gender, race
- Indicators for ICD9 diagnosis code groups (18 diagnosis groups per variable plus missing group)
- Indicators for primary DRGs (with at least 1000 observations in a given year)
- Minor differences between total, inpatient, and outpatient specifications

Summary of Match Values

1. Calculate Cost Differential

Apply minimum cost physician-hospital combination to all of physician j's patients:

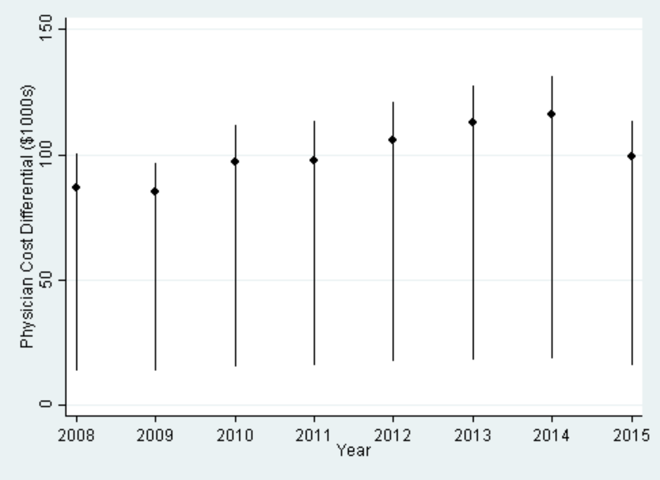
$$\begin{aligned}\Delta_k y_{ij} &= \hat{y}_{ijk} - \hat{y}_{ij\underline{k}} \\ &= \hat{\alpha}_i + x_i\hat{\beta} + \hat{\Gamma}_{jk} - \hat{\alpha}_i - x_i\hat{\beta} - \min\left\{\Gamma_{j1}, ..., \Gamma_{jK}\right\} \\ &= \hat{\Gamma}_{jk} - \min\left\{\Gamma_{j1}, ..., \Gamma_{jK}\right\}.\end{aligned}$$

Summary of Match Values

2. Summarize

- Total cost differential for each physician
- Limit to pairs with 5 or more procedures
- Limit to physicians with 2 or more hospitals in a year
- Present interquartile range and mean

Within-physician Variation in Costs



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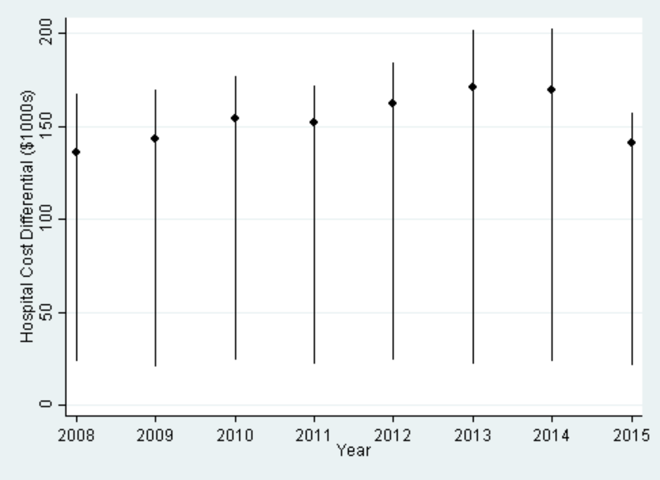

Estimation of Hospital Influence

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Main Outcomes

$$\hat{\Gamma}_{jkt} = \gamma_j + \gamma_k + \tau_t + z_{jkt}\delta + \eta_{jkt},$$

	2008	2012	2013	2014	2015	Overall
Total Payments	6446.6	7405.5	7753.0	8137.8	8282.3	7329.6
	(5459.4)	(6396.5)	(6574.1)	(6664.7)	(6851.9)	(6226.6)

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Inpatient LOS	5.984	6.021	6.002	6.062	6.031	5.960
	(2.427)	(2.493)	(2.494)	(2.513)	(2.613)	(2.449)

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Outpatient Costs	3006.7	3805.5	4013.6	4189.6	4433.9	3698.7
	(2135.0)	(2781.5)	(2925.1)	(3095.8)	(3275.4)	(2758.9)

Independent Variables

$$\hat{\Gamma}_{jkt} = \gamma_j + \gamma_k + \tau_t + z_{jkt}\delta + \eta_{jkt},$$

	2008	2012	2013	2014	2015	Overall
Integrated	0.130	0.206	0.233	0.255	0.332	0.196
	(0.336)	(0.404)	(0.422)	(0.436)	(0.471)	(0.397)

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Physician FTE	24.23	28.59	31.14	31.74	33.13	28.43
	(99.28)	(109.8)	(120.5)	(120.0)	(119.5)	(110.9)

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Nurse FTE	340.8	365.7	369.1	384.9	402.7	364.8
	(446.8)	(487.8)	(494.8)	(519.1)	(550.7)	(487.3)

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Other FTE	749.9	763.0	761.8	776.4	806.0	762.8
	(975.5)	(1032.4)	(1076.2)	(1101.5)	(1157.2)	(1037.4)

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Beds (100s)	1.980	1.967	1.958	1.982	2.009	1.976
	(2.160)	(2.142)	(2.137)	(2.172)	(2.235)	(2.154)

Independent Variables

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	2008	2012	2013	2014	2015	Overall
Practice Size	13.73	17.31	17.31	17.82	18.41	16.10
	(32.10)	(30.70)	(29.28)	(28.46)	(28.02)	(30.05)

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Experience	22.55	23.00	23.94	23.65	24.77	23.17
	(6.496)	(6.703)	(6.950)	(6.902)	(6.989)	(6.746)

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Experience	22.55	23.00	23.94	23.65	24.77	23.17
	(6.496)	(6.703)	(6.950)	(6.902)	(6.989)	(6.746)
% Multi-Specialty	0.249	0.248	0.266	0.284	0.344	0.264
% with Surgery	0.452	0.501	0.507	0.508	0.454	0.480

Estimated Effects of Vertical Integration

Outcome	Estimate	St. Error

* p-value <0.1, ** p-value <0.05, *** p-value <0.01

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Outcome	Estimate	St. Error
Total Medicare Payments	72.68**	(33.88)

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Estimated Effects of Vertical Integration

Outcome	Estimate	St. Error
Total Medicare Payments	72.68**	(33.88)
Total Hospital Costs	140.39***	(45.36)

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Estimated Effects of Vertical Integration

Outcome	Estimate	St. Error
Total Medicare Payments	72.68**	(33.88)
Total Hospital Costs	140.39***	(45.36)
Inpatient Hospital Costs	264.48***	(54.71)

* p-value $<$0.1, ** p-value $<$0.05, *** p-value $<$0.01

Estimated Effects of Vertical Integration

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Total Medicare Payments	72.68**	(33.88)
Total Hospital Costs	140.39***	(45.36)
Inpatient Hospital Costs	264.48***	(54.71)
Inpatient Length of Stay	-0.015	(0.019)

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Inpatient Hospital Costs	264.48***	(54.71)
Inpatient Length of Stay	-0.015	(0.019)
Outpatient Hospital Costs	-48.94**	(20.38)

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Threats to Identification and Interpretation

Estimator is effectively a two-way fixed effects DD with time varying treatment

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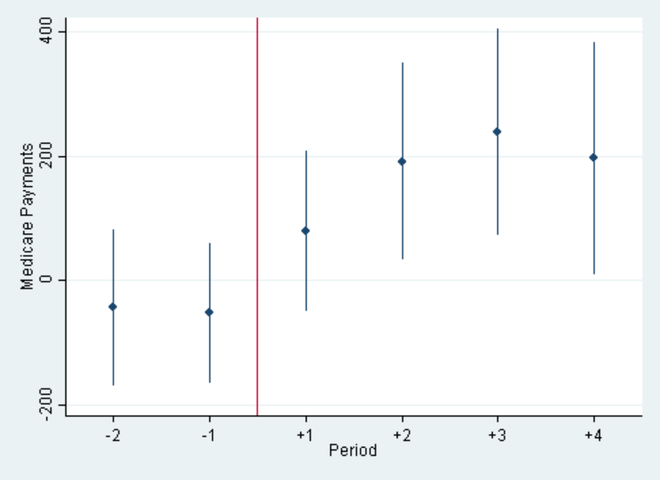
Potential Problems

1. Vertical integration due to time-varying unobservables & outcomes
2. Weighted average of all 2×2 DD estimates, with some potentially negative weights

Event Study: Total Medicare Payments



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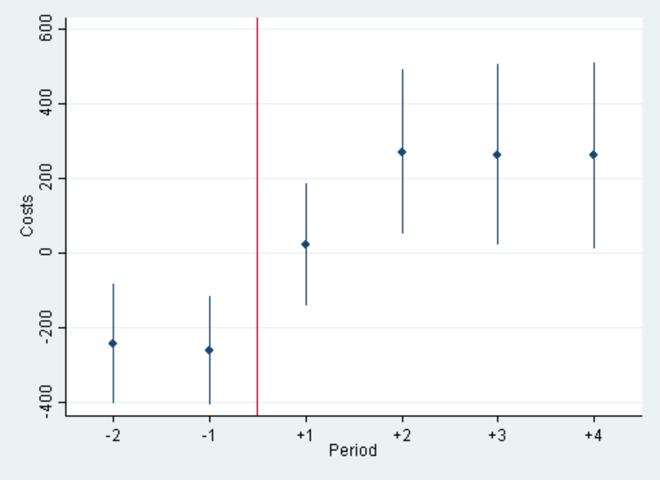

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- Evidence of increase in payments and costs
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- Some concern about common trends for costs

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Allocation of Procedures and Patients

Other Effects

Other ways integration posited to affect physician behavior:

- More procedures overall (not per patient)
- Reallocating procedures from other hospitals
- Reallocating procedures across inpatient and outpatient settings

Results on Other Outcomes

Outcome	Estimate	St. Error

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Results on Other Outcomes

Outcome	Estimate	St. Error
Physician's inpatient share	0.065***	(0.003)

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Results on Other Outcomes

Outcome	Estimate	St. Error
Physician's inpatient share	0.065***	(0.003)
Physician's outpatient share	0.046***	(0.003)

* p-value $<$0.1, ** p-value $<$0.05, *** p-value $<$0.01

Results on Other Outcomes

Outcome	Estimate	St. Error
Physician's inpatient share	0.065***	(0.003)
Physician's outpatient share	0.046***	(0.003)
Total patients	6.070***	(0.508)

* p-value <0.1, ** p-value <0.05, *** p-value <0.01

Results on Other Outcomes

Outcome	Estimate	St. Error
Physician's inpatient share	0.065***	(0.003)
Physician's outpatient share	0.046***	(0.003)
Total patients	6.070***	(0.508)
Inpatient procedures	0.738***	(0.162)

* p-value <0.1, ** p-value <0.05, *** p-value <0.01

Results on Other Outcomes

Outcome	Estimate	St. Error
Physician's inpatient share	0.065***	(0.003)
Physician's outpatient share	0.046***	(0.003)
Total patients	6.070***	(0.508)
Inpatient procedures	0.738***	(0.162)
Outpatient procedures	8.367***	(1.028)

* p-value <0.1, ** p-value <0.05, *** p-value <0.01

Summary of Results

Effects per Patient

- Increase in Medicare payments and hospital costs
- Small effects per patient but meaningful effects in scope of cost reduction efforts
- Extrapolates to \$47 and \$91 million per year (about 0.17% of observed Medicare spending)

Summary of Results

Sensitivity

- Calculation of 2×2 DD weights suggests relatively small portion of negative weights
- Event study consistent with common trends for Medicare payments but not for hospital costs
- As falsification test, no effects on payments or DRG weights per inpatient stay

Summary of Results

Effects on Total Patients and Allocation of Procedures

- More procedures going to acquiring hospital
- New procedures predominantly coming from outpatient side (8 new outpatient procedures versus 1 inpatient)

Thank You

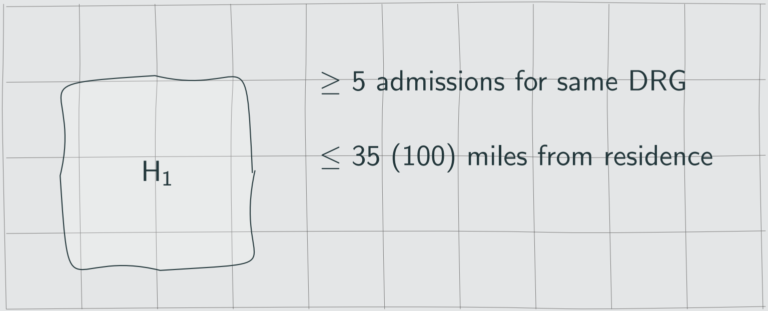
Endogeneity of physician-hospital integration

Integration could be driven by:

- Existing physician behaviors
- Unobserved, time-varying practice characteristics

Endogeneity of physician-hospital integration

1. Set of possible physician-hospital pairs



Endogeneity of physician-hospital integration

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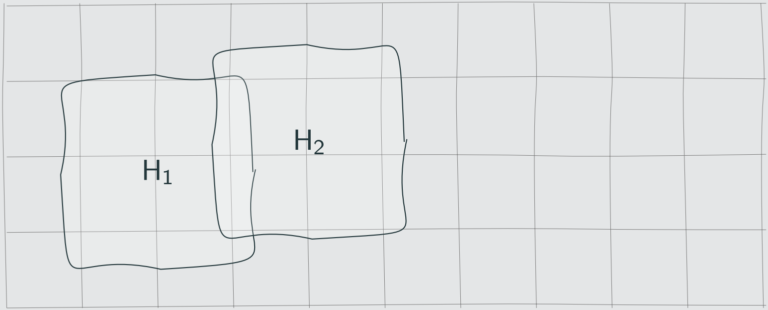

Endogeneity of physician-hospital integration

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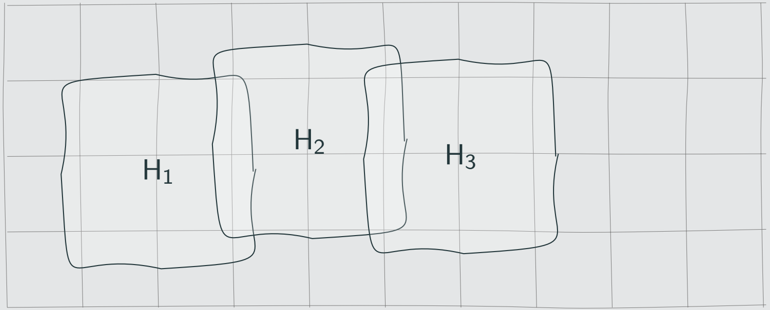

Endogeneity of physician-hospital integration

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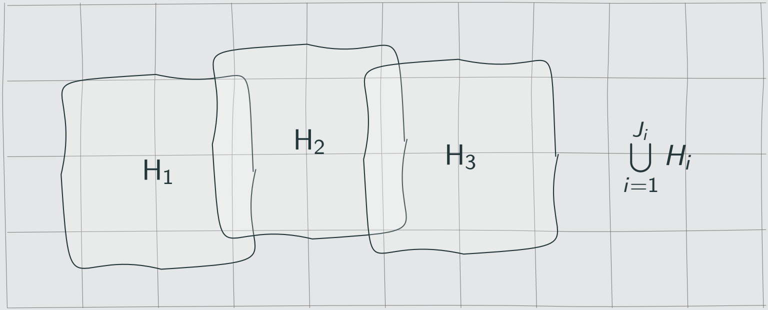

Endogeneity of physician-hospital integration

2. Estimate probability of integration (at practice level)

$$I_{pk} = \lambda z_{pk} + \omega_{pk}$$

- Average choice set size
- Average differential distance (relative to nearest hospital)
- Differential distance interacted with hospital characteristics

Endogeneity of physician-hospital integration

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$$\hat{\Gamma}_{jkt} = \gamma_j + \gamma_k + \tau_t + \underbrace{I_{jkt}}_{\hat{I}_{jkt} = \Pr(I_{jkt}=1)} \delta_1 + \tilde{z}_{jkt}\delta_2 + \eta_{jkt},$$

Back to presentation