Owning the Agent: Hospital Influence on Physician Behaviors

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Motivation

Hospital in Physician Agency Problem

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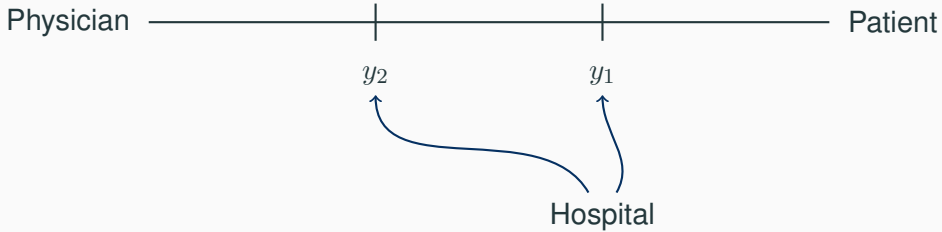
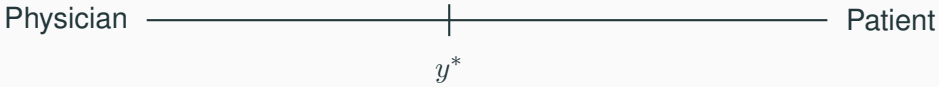


Hospital in Physician Agency Problem



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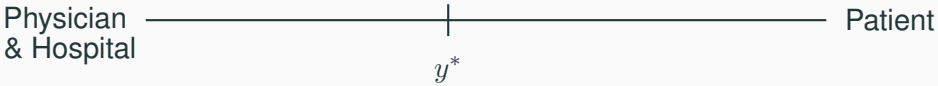

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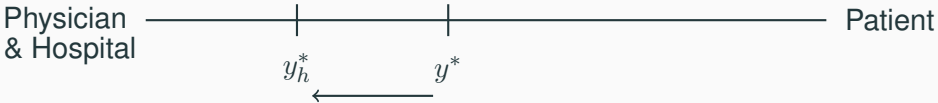
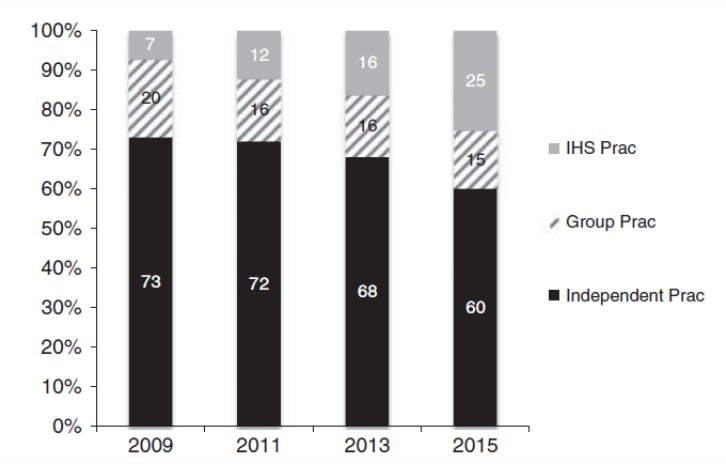


Changing Physician Relationships



Richards *et al.*, Medical Care, 2016

In context

- Physician agency (Clemens & Gottlieb 2014, AER; Afendulis & Kessler 2007, AER; Gruber & Owings 1996, RAND; Iizuka 2012, AER)
- Supply-side variation (Finkelstein *et al.* 2016, QJE; Molitor 2018, AEJ: Policy)
- Vertical integration (Cuellar & Gertler 2006, JHE; Ciliberto & Dranove 2006, JHE; Baker *et al.* 2016, JHE; Koch *et al.* 2017, JHE)

Outline

1. Estimation strategy
2. Initial Results
3. Event Study, DDD, Quantile, IV
4. Treatment intensity vs reallocation
5. Other Outcomes

Estimation Strategy

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Observed care at time t is

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Patient Preferences

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Patient Preferences

Physician and hospital characteristics

Physician-hospital “match value”

Two-step approach:

1. Estimate patient-level regression (separately by year):

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

2. Estimate physician/hospital-level regression in panel:

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

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Physician, hospital, and match effect (jointly)

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Physician effect

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Physician, hospital, and match effect (jointly)

Physician effect

Hospital effect

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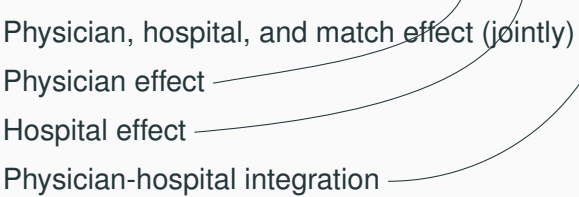

Physician-hospital “match value”

- 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

Data

Data Sources

- CMS: 100% inpatient and institutional outpatient Medicare claims data (2008-2015)
- SK&A: Hospital ownership of physician practices and practice characteristics

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- SK&A: Hospital ownership of physician practices and practice characteristics
- 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

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$\longrightarrow$ 518,398 unique observations at the physician/hospital/year

$\longrightarrow$ 7.5mm inpatient stays (47% of total) and 24mm outpatient procedures

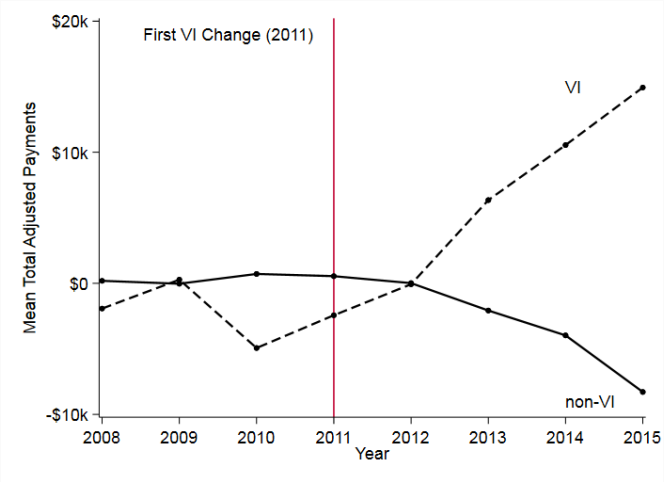
Preliminary Evidence

Total Spending by Integration Status

Estimate and plot residual from:

$$y_{jkt} = \beta x_{jt} + \delta z_{kt} + \lambda_k + \lambda_j + \lambda_t + \varepsilon_{jkt}$$

Total Spending by Integration Status



Vertical Integration and Match Values

Estimated Effects of Vertical Integration

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

Estimated Effects of Vertical Integration

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

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Total Hospital Costs	133.063***	(42.099)
Total Procedures	0.014***	(0.004)

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Threats to Identification and Interpretation

Two-way fixed effects estimator with time varying treatment...

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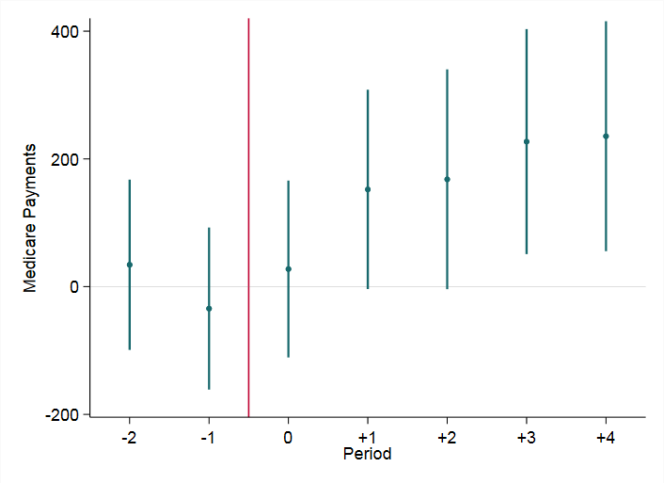
Potential Problems

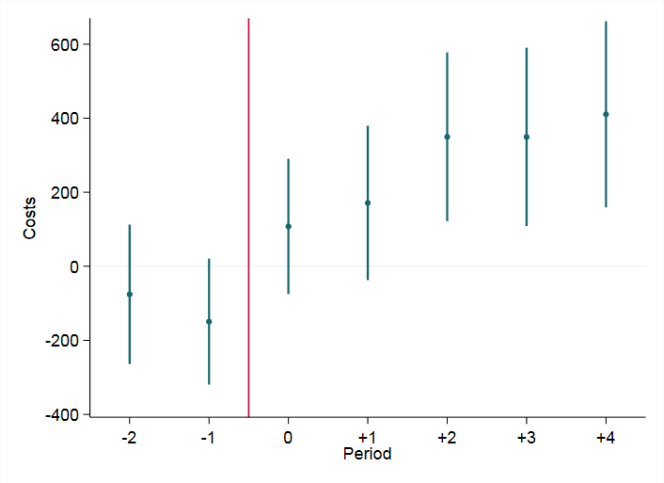
1. **Endogeneity:** Vertical integration due to time-varying unobservables & outcomes (standard DD/2WFE concern)
2. **Interpretation:** Weighted average of all 2×2 DD estimates, with some potentially negative weights

Event Studies

Total Medicare Payments



Total Hospital (IP & OP) Costs



Takeaways

- Increase in payments and costs
- Evidence consistent with common trends assumption for total payments and costs
- Concerns about limited pre-period data

Triple Difference

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$$\hat{\Gamma}_{jkt} = \gamma_j + \gamma_k + \tau_t + \underbrace{1\left(VI_j\right)\delta_1 \; + \; 1\left(VI_{j,k}\right)\delta_2 \; + \; z_{jkt}\mu}_{z_{jkt}\delta} + \eta_{jkt}$$

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Outcome	Integration, (j,k) Estimate	Integration, (j,k) St. Error	Integration, j Estimate	Integration, j St. Error

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Outcome	Integration, (j,k) Estimate	St. Error	Integration, j Estimate	St. Error
Total Medicare Payments	185.041**	(79.809)	-18.611	(103.835)

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Outcome	Integration, (j,k) Estimate	St. Error	Integration, j Estimate	St. Error
Total Medicare Payments	185.041**	(79.809)	-18.611	(103.835)
Total Hospital Costs	32.362	(109.502)	309.161***	(147.166)

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Outcome	Integration, (j,k) Estimate	St. Error	Integration, j Estimate	St. Error
Total Medicare Payments	185.041**	(79.809)	-18.611	(103.835)
Total Hospital Costs	32.362	(109.502)	309.161***	(147.166)
Total Procedures	0.023**	(0.010)	-0.014	(0.011)

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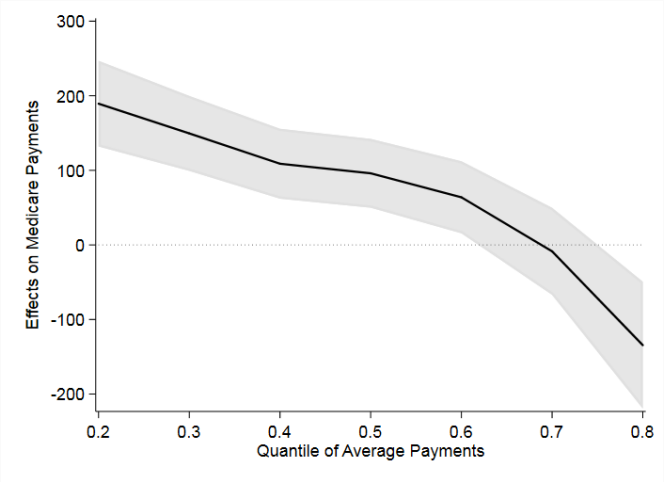
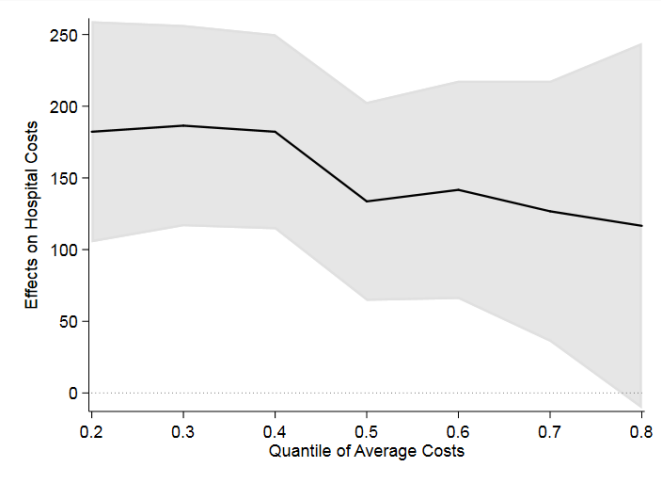
Heterogeneous Effects

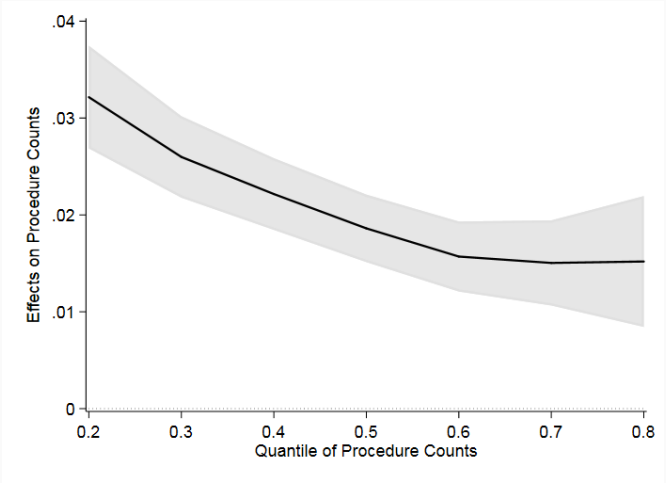
Unconditional Quantile Results: Payments



Unconditional Quantile Results: Hospital Costs



Unconditional Quantile Results: Procedures



Treatment Intensity vs Reallocation

Want to isolate treatment intensity effect

1. Focus on patients with no change in physician/hospital pairs over time
2. Examine outcomes within an inpatient stay

Aggregate Outcomes without Reallocation

Outcome	Estimate	St. Error

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

Aggregate Outcomes without Reallocation

Outcome	Estimate	St. Error
Total Medicare Payments	64.134**	(30.858)

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

Aggregate Outcomes without Reallocation

Outcome	Estimate	St. Error
Total Medicare Payments	64.134**	(30.858)
Total Hospital Costs	122.894***	(42.130)

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

Aggregate Outcomes without Reallocation

Outcome	Estimate	St. Error
Total Medicare Payments	64.134**	(30.858)
Total Hospital Costs	122.894***	(42.130)
Total Procedures	0.013**	(0.004)

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

Effects on Components of Inpatient Stay

Outcome	Estimate	St. Error
Charges for:		
Total Inpatient	180.997***	(49.771)
Medical Supplies	40.564	(30.024)
Operating Room	-11.029	(22.928)
Anesthesia	5.278	(4.999)
Labs	9.286	(8.826)
Radiology	-5.943	(6.058)
MRI	-0.514	(1.359)

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

Effects on Components of Inpatient Stay

Outcome	Estimate	St. Error
Counts of:		
ICU Days	0.021	(0.013)
Procedures	0.030***	(0.009)

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

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
- Changing patient profile

Main Takeaways

Summary of Results

Sensitivity

- Event study, triple difference, unconditional quantile, IV
- Effects not driven by reallocation
- No improvement in quality (mortality)
- No effects on payments or DRG weights per inpatient stay (falsification test)

Summary of Results

Overall Results

- Increase in Medicare payments ($75-$200) and hospital costs ($130-$350)
- Extrapolates to between $55mm and $146mm in additional Medicare payments per year
- 4-10% of within-physician variation across hospitals explained by vertical integration

Thank You