The Impact of Privatization: Evidence from the Hospital Sector

Mark Duggan, Stanford University and NBER
Atul Gupta, University of Pennsylvania and NBER
Emilie Jackson, Michigan State University
Zachary Templeton, University of Pennsylvania

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Make versus Buy

Should governments deliver services themselves or outsource to private firms?

- ▶ Privatization has been shown to improve efficiency and growth of government-owned firms, typically in *manufacturing* (Shleifer, 1998; Megginson and Netter, 2001)

- ▶ Little empirical evidence on effects for consumers: improved efficiency may be at the cost of quality of good or service
  - ▶ May cut costs on non-contractible and difficult-to-measure dimensions of quality (Hart, Shleifer, and Vishny, 1997; Knutsson and Tyrefors, 2022)

- ▶ The debate is now over the privatization of social services

Steady decline in government hospital care, mostly due to privatization
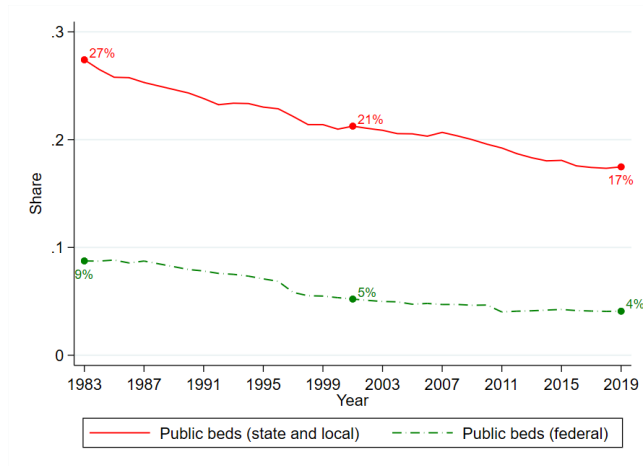
Note: The figure presents the share of bed capacity at public hospitals from 1983 through 2019.
Source: Survey data from the American Hospital Association (AHA).

The key trade-off in hospital privatization

Lower subsidy burden at the risk of lowering quality and/or access

Losses on nonfederal public hospitals in 2019 represented

- ▶ 35% of spending on housing by local govts.
- ▶ 54% of spending on jails
- ▶ 69% of spending on legal system

Overview on hospital privatization

- ▶ Quantify the causal effects of privatization between 2001 and 2018
    - ▶ $\approx 25\%$ of nonfederal govt. hospitals in 2000 privatized in this period

- ▶ Administrative patient- and hospital-level data, hospital surveys, vital statistics microdata
    - ▶ Inform the policy concerns outlined previously
    - ▶ Finances, patient volume, and quality of care

- ▶ Staggered difference-in-differences research design
    - ▶ Patient-, hospital-, and market-level analyses

Preview of results

- Access/Quality vs. Subsidy burden:
  - Profitability improves; need for subsidy is eliminated
  - Hospital access worsens for less profitable patients (e.g., Medicaid)
  - Quality worsens: Hospital mortality rates increase among Medicare patients

Preview of results

- ▶ Access/Quality vs. Subsidy burden:
    - ▶ Profitability improves; need for subsidy is eliminated
    - ▶ Hospital access worsens for less profitable patients (e.g., Medicaid)
    - ▶ Quality worsens: Hospital mortality rates increase among Medicare patients

- ▶ Labor consequences: 6% decrease in staff per bed at the privatized hospital; No effect detected at the market level

Outline

Background

Data and Research Design

Main results
    Profitability
    Patient volume and access
    Quality

Mechanisms

Discussion

Outline

Background

Reliance on government hospitals varies across states, somewhat counter intuitively

	(1) AL	(2) CA	(3) TX	(4) GA	(5) IL	(6) PA	(7) US Overall
Public (nonfederal)	44.4	22.9	15.8	11.7	8.0	3.8	17.3
							(12.5)
Public (federal)	4.4	3.6	5.8	3.4	3.7	3.6	4.2
							(2.1)
Non-profit	23.4	56.8	37.1	71.5	80.8	79.3	62.9
							(19.2)
For-profit	27.8	16.8	41.3	13.4	7.5	13.3	15.6
							(12.4)
# hospitals	116	419	588	172	208	235	6,090

<u>Note:</u> The table presents the percentage of hospital beds in a given state in 2019 that are classified as public (state and local), federal, non-profit, or for-profit. Source: AHA.

How do NW states compare?

	(1) WY	(2) WA	(3) ID	(4) OR	(5) MT	(6) US Overall
Public (non-federal)	70.8	27	25.2	19.8	10.1	17.3
						(12.5)
# hospitals	32	107	52	65	66	6,090

<u>Note:</u> The table presents the percentage of hospital beds in a given state in 2019 that are classified as public (state and local). Source: AHA.

Hospital privatization in the US

Who decides?

- ▶ Mostly at the county level or below; $< 5\%$ are state-owned hospitals
- ▶ County executive, city mayor, hospital district boards

Why?

- ▶ Philosophical: Governments should not run hospitals
- ▶ Reduce subsidy burden while continuing to offer services

How?

- ▶ A multitude of deal types and organizational forms
- ▶ About 30% (in our sample) involve sale of all assets
- ▶ The remainder involve the transfer of managerial control while retaining public ownership of assets

▸ Types of deals   ▸ Trade-offs

Conceptual Framework

- ▶ Framework: Hart, Shleifer, and Vishny (1997) model of differences in service between the government and a private contractor

- ▶ Key assumption: Govt. contract with the private firm is *incomplete*; several tasks are unstated or unenforceable

- ▶ Key predictions:
    1. Private contractor is *financially* more efficient
    2. The contractor will reduce costs more than is *socially* optimal

"..the pervasive concern is that private hospitals would find ways to save money by *shirking on the quality of care* or *rejecting the extremely sick and expensive-to-treat* patients."

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  3. Net effect on quality under a contractor is ambiguous since cost cutting may be offset by other improvements

"..In general, the bigger the adverse consequences of (noncontractible) cost cutting on (noncontractible) quality, the stronger is the case for in-house provision."

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▶ Guides our choices of outcomes: profitability, patient volume and access, and quality

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Data sources and applications

1. American Hospital Association annual surveys, 1996–2019
   - ▶ Identify privatizations**
   - ▶ Operating costs, patient volume, and staffing

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4. Administrative data from select states, 2003–2019
   - ▶ IN, FL, and WA (discharges); CA and MN (reports)
   - ▶ Granular payer and service mix

Data sources and applications

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Identifying privatizations

- ▶ Infer conversions and exits of public hospitals in AHA's data, 2001–18
  - ▶ Algorithm infers 355 privatizations; concern about false positives

- ▶ Manually validate via hospital websites, news articles, AHA summary of change files, and cross-reference against proprietary sources.

- ▶ Approximately 30% false positive rate, similar to Schmitt (2017)

- ▶ Final tally:
  - ▶ 254 public to private conversions
    - ▶ 182 (72%) conversions to nonprofit
    - ▶ 72 (28%) conversions to for-profit

Privatizations are more frequent in the South and Midwest
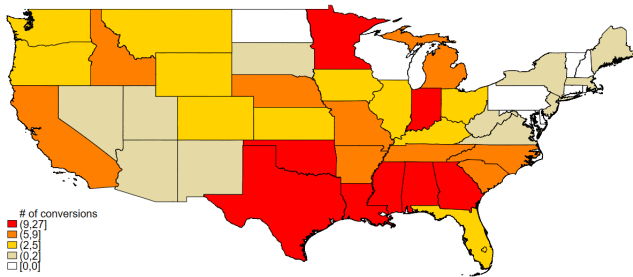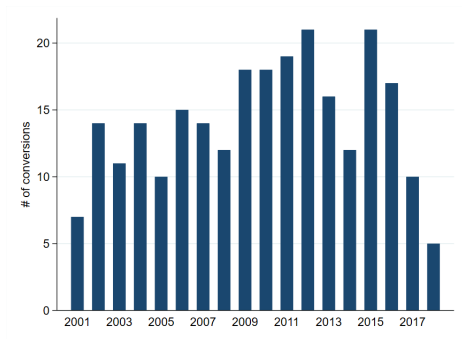
Note: The figure presents the number of privatizations by year (left) and state (right) during 2001-18. Source: manual validation of AHA ownership changes

Research Design

Staggered D-D design comparing patterns for privatized hospitals to those for never-treated government hospitals.

$$y_{ht} = \alpha_h + \alpha_t + \beta\, 1(\textit{privatized})_h\, 1(\textit{post})_{ht} + [X'_{hmt}\delta +]\epsilon_{ht}.$$

▶ Restrict treated and comparison hospitals to be "general medical and surgical"

▶ Comparison hospitals must be public throughout sample period and not located w/in 15 miles of any treated hospital

▶ 5 years pre- and post-privatization for treated hospitals; exclude year 0

▶ X'_{hmt} includes hospital 340B status; county-level population level, unemployment, poverty, ACA Medicaid expansion status, and uninsurance rates

▶ Equivalent patient-level model also adjusts for patient Xs

▶ Panel balance

Descriptive statistics in 2000

	(1) Privatized	(2) Remaining Public	(3) Private	(4) All
% Public	100.0	100.0	0.0	21.5
% For-profit	0.0	0.0	21.1	16.6
% Non-profit	0.0	0.0	78.9	62.0
Beds	93	116	186	170
Admissions	3,120	3,992	7,464	6,675
% Medicaid	15.5	16.3	12.9	13.6
% Medicare	49.0	47.7	44.6	45.4
% Others	35.5	36.0	42.4	41.0
Revenue per bed	408,618	393,639	657,830	603,089
Expense per bed	394,728	417,401	582,950	546,270
Personnel exp. per bed	210,344	223,964	294,976	279,041
Number of Hospitals	254	802	3,867	4,923

Note: General Acute Care Hospitals only. Revenue, expenses, and FTE are normalized by contemporaneous beds.

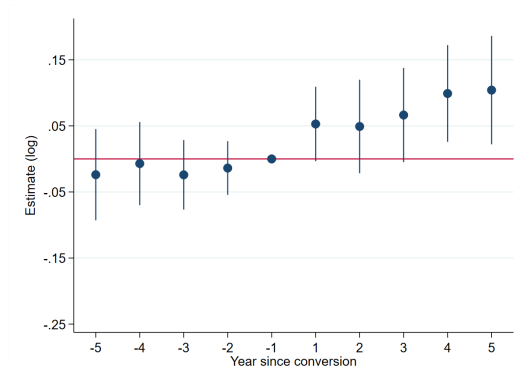# Outline
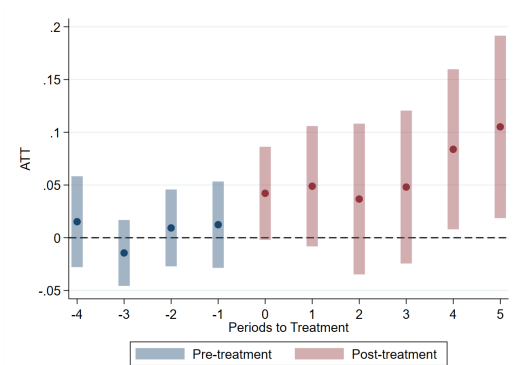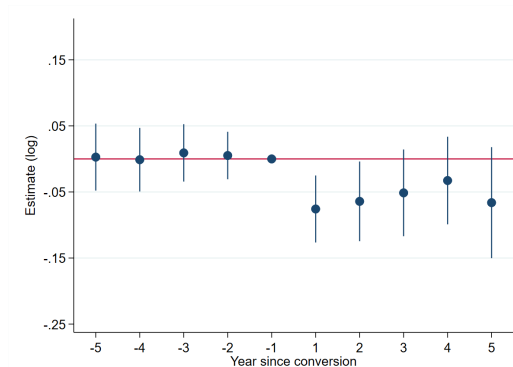
Mean revenue per bed increases 8%

(a): TWFE

(b): Callaway-Santanna

Note: Outcome is log mean revenue obtained from the Medicare cost report, per contemporaneous bed. Standard errors are clustered by hospital.
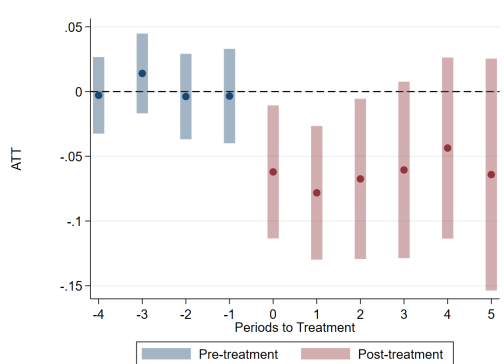
A similar magnitude decrease in personnel spending

(a): TWFE

(a): Callaway-Santanna

Note: Outcome is log personnel expenses per contemporaneous bed. Standard errors are clustered by hospital.

▶ Robustness

Interpretation: effects on finances

- ▶ Net income increases ≈ \$58,000 per bed, on average (9% of mean revenue)

- ▶ Average deficit in the year before privatization was \$18,000 per bed (3% of mean revenue)
  - ▶ Average deficit of \$1.7 mn per year eliminated

- ▶ Considering the additional tax revenues from hospitals converted to for-profit ownership, we estimate a \$2 mn increase in funds for the govt.
  - ▶ Upper bound of \$4.3 mn includes the surplus in deals where the govt. retains more control
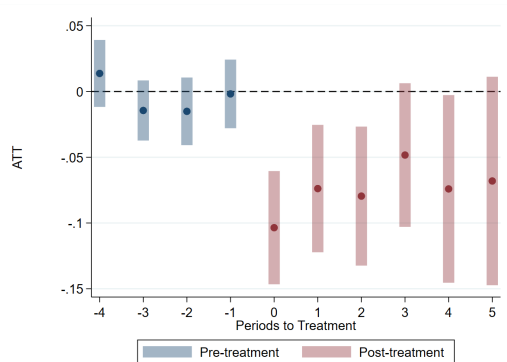
Hospital-Level Volume

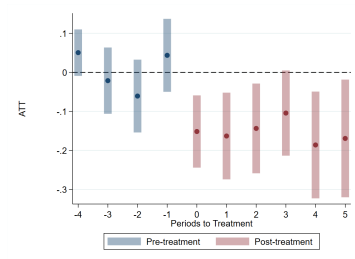# Immediate decline in total hospital volume
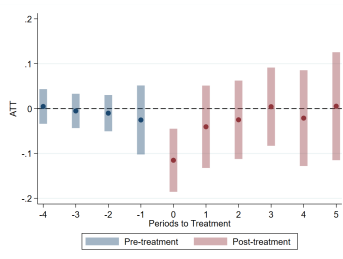
(a): TWFE
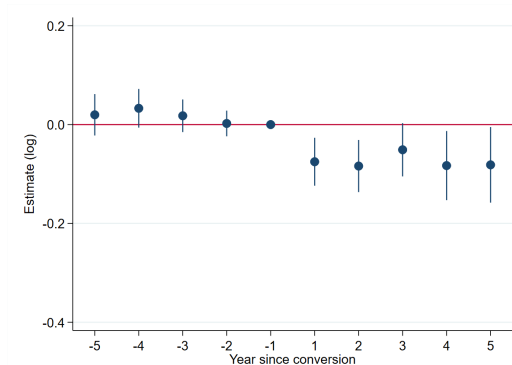
(b): Callaway-Santanna

Note: Model is estimated using all control hospitals. Year zero is the year of privatization and is excluded for the treated hospitals, since it represents partial treatment. The error bars present 95% confidence intervals.
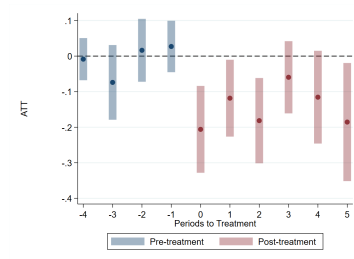
Volume by Payer

Medicaid   Medicare   Other

<u>Note:</u> Callaway Santanna models. Year zero is the year of privatization. The error bars present 95% confidence intervals.

▶ Table   ▶ Robustness: Medicaid   ▶ Robustness: Other

Unpacking the effect on "Other" using states' data

	(1) Total	(2) Medicaid	(3) Medicare	(4) Other:	(5) Private	(6) Uninsured	(7) Miscellaneous
A: Comparable categories as AHA							
DD	-0.117	-0.224	-0.071	-0.061			
	(0.041)	(0.091)	(0.048)	(0.071)			
B: Breakdown of "Other"							
DD							
Observations	8,721						
Mean values	6,093	1,147	2,722	2,224			

Note: Regressions use hospital-year level data for California, Florida, Indiana, Minnesota, and Washington, including 27 treated hospitals. We use the synthetic difference-in-differences estimator. "Other" comprises private, uninsured, and miscellaneous. Patient volume is in logs. Standard errors are clustered by hospital and estimated using the placebo method.

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B: Breakdown of "Other"							
DD					-0.046	-0.468	0.277
					(0.082)	(0.167)	(0.163)
Observations	8,721						
Mean values	6,093	1,147	2,722	2,224	1,702	383	139

Note: Regressions use hospital-year level data for California, Florida, Indiana, Minnesota, and Washington, including 27 treated hospitals. We use the synthetic difference-in-differences estimator. "Other" comprises private, uninsured, and miscellaneous. Patient volume is in logs. Standard errors are clustered by hospital and estimated using the placebo method.

▸ Private vs. Uninsured   ▸ Low income vs. all others
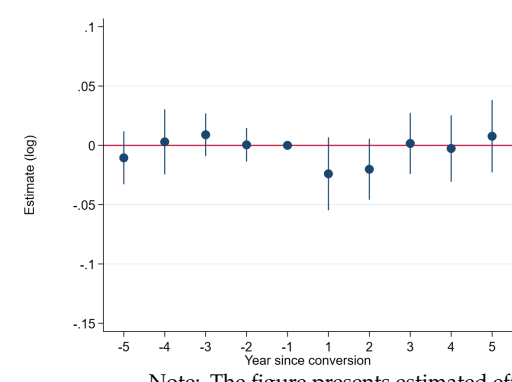
Market-level volume

Approach

Is there a decline in access to care, or do neighboring hospitals offset the decline in the privatized hospital?

- ▶ Use Health Service Areas to define hospital markets (National Center for Health Statistics/CDC)
  - ▶ Sets of contiguous counties where people consume healthcare
  - ▶ $\approx$ 930 HSAs in the US (much smaller than HRRs)
  - ▶ About 75% of Medicare patients choose a hospital in their HSA

- ▶ Designate a market as "treated" the first time a hospital is privatized

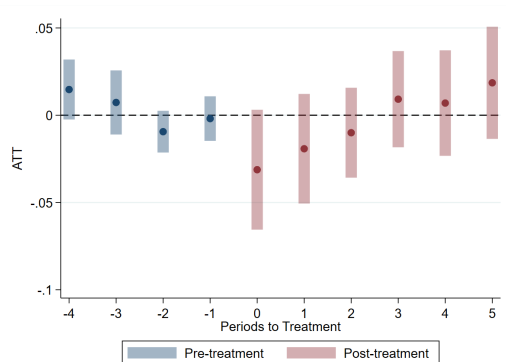- ▶ Equivalent staggered treatment design, applied at the HSA level instead

▶ Descriptive statistics

Total patient volume reverts to baseline

(a): TWFE

(b): Callaway-Santanna
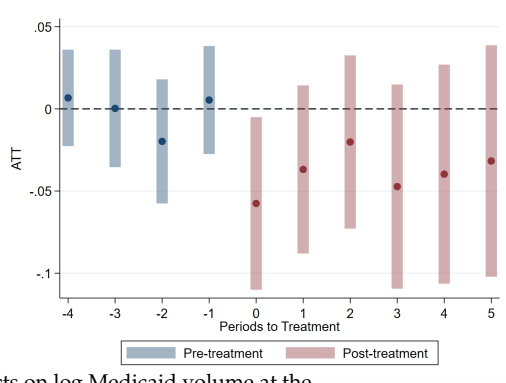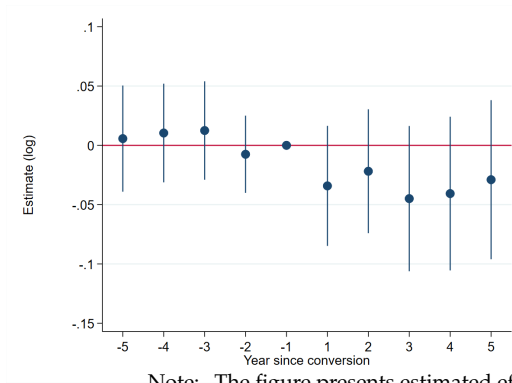

Note: The figure presents estimated effects on log total patient volume at the market-level. We define markets using Health Service Areas (HSAs).

▸ Regressions

However, the reduction in Medicaid volume persists

(a): TWFE

(b): Callaway-Santanna

Note: The figure presents estimated effects on log Medicaid volume at the market-level. We define markets using Health Service Areas (HSAs).

Aggregate Medicaid decline is driven by high-poverty markets

	Aggregate patient log volume			
	(1) Total	(2) Medicaid	(3) Medicare	(4) Other
A: Average effect				
DD	-.004	-.042	.009	.010
	(.015)	(.025)	(.016)	(.022)
Obs	19,288			
B: Heterogeneity by market poverty				
DD	.021	.042	.034	.016
	(.021)	(.029)	(.021)	(.031)
x 1(> med. poverty)	-.051	-.169	-.050	-.012
	(.027)	(.045)	(.030)	(.042)
Mean outcome (t-1)	40,699	7,838	16,904	15,957

Note: The table presents estimated effects on market-level log patient volume.
Market poverty level designated as of 2000.

Interpretation: effects on volume

▶ Immediate, *persistent* drop in hospital inpatient volume after privatization ⬤ Robustness

▶ 0.4% decline in total *market* patient volume is comparable to the effect following hospital closure reported in Petek (2022)

▶ Economically significant decline in Medicaid, minimal effect on other payers

▶ Decline in Medicaid about what we would expect if other hospitals do not offset the decline at the privatized hospital
  ▶ Privatized hospitals account for 21% of treated markets on average (1.3 out of 6.1 hospitals)
  ▶ Expect a 3.2% decline in Medicaid volume at the market-level if no offset by other hospitals ($0.21\times$ -15% on the privatized hospital)

Quality

Multiple channels for privatization to affect quality

Patients at the affected hospital

- ▶ Changes in staff availability and treatment choices may disrupt prevailing protocols and worsen quality (+ unobserved changes, like turnover)

- ▶ Data limitations preclude studying effects for Medicaid and uninsured patients

- ▶ Examine changes in mortality among Medicare patients

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▶ Examine changes in mortality among Medicare patients

Catchment area

▶ Some are directly affected due to lower quality care

▶ Some (e.g., low-income) experience a disruption in care

▶ Examine mortality rates of the 55-64 aged population in the HSA/county where the hospital is located ▸ Market Mortality

Hospital mortality rates increase 3% after privatization

A: Hospital-level effect	(1) All patients	(2) Nondeferrable	(3) Age 65 − 80	(4) Age> 80	(5) Medical	(6) Surgical
A1: Patient controls						
DD	0.0032	0.0043	0.0019	0.0047	0.0035	0.0019
	(0.0012)	(0.0018)	(0.0013)	(0.0016)	(0.0014)	(0.0013)
A2: Patient and mkt. controls						
DD	0.0038	0.0046	0.0022	0.0057	0.0040	0.0025
	(0.0013)	(0.0019)	(0.0013)	(0.0017)	(0.0015)	(0.0014)
Mean outcome (t-1)	0.118	0.176	0.089	0.152	0.130	0.071
Observations	13,017,104	3,168,233	7,368,823	5,648,281	10,030,657	2,885,706

Note: The outcome is 30-day all-cause mortality, computed from the date of discharge. Medicare fee-for-service (FFS) claims data. We exclude 55 hospitals privatized prior to 2005 to ensure at least 5 pretreatment years for each privatized facility. Patients are enrolled in Medicare FFS for at least 3 months prior to admission. Standard errors are clustered by hospital.

Implies an additional 3.4 deaths or 18.4 life-years lost per year on average

▸ By duration   ▸ By diagnostic category

Outline

Mechanisms: operational changes

1. Changes in Service Mix

- "Cream-skim" more profitable patients along multiple dimensions
  - Changes in payer mix account for 30% of the increase in revenue per patient
  - Shift focus away from unprofitable services (e.g. obstetrics)

Obstetrics: Case study of a less profitable service

	(1) Ob adm.	(2) Ob closure	(3) Ob adm. excluding clos.
DD	-0.768 (0.287)	0.133 (0.048)	0.287 (0.378)
Obs	5,746	5,746	5,627
Mean outcome (t-1)	1,024	0.188	1,642

Note: Regressions use hospital-year level data for California, Florida, Indiana, and Washington. We use the synthetic difference-in-differences estimator. The sample is restricted to hospitals providing Ob services in 2002, which includes 19 treated hospitals. Patient volume is in logs. Column 1 estimates the total effect on volume including the closure of Ob service. Columns 2 and 3 estimate the extensive and intensive margin effects, respectively. The mean value in column 2 reflects the proportion of treated hospitals that do not provide Ob service in event time t-1.

Mechanisms: operational changes
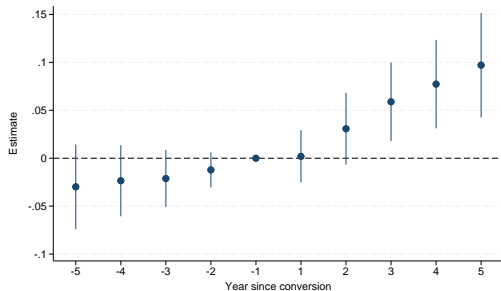
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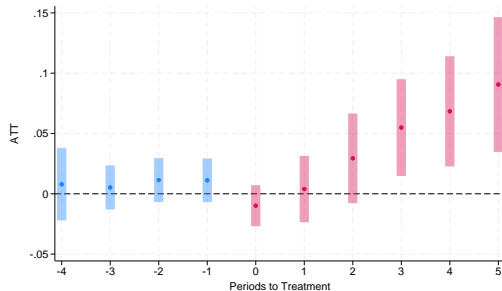
2. Price Setting
- ▶ Private management increase list prices (charges) by 6.5%
  - ▶ Affects privately insured and some smaller groups

Increase in mean (log) charges among Medicare FFS patients

(a): TWFE   (b): Callaway Santanna

Note: Outcome is log charges per patient. Standard errors are clustered by hospital.

Mechanisms: operational changes

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2. Price Setting

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3. Care Inputs

- ▶ 6% reduction in total FTE staff per contemporaneous bed
  - ▶ Changes in staff availability and treatment choices may disrupt prevailing protocols and worsen quality (+ unobserved changes, like turnover or experience)
- ▶ Can leverage gray zones in clinical guidelines to discharge patients sooner ▸ LOS

Total staff per bed decreases after privatization

	(1) Total	(2) Physician	(3) Nurse	(4) Other	(5) Contract
A: No controls					
DD	-33.0	-2.6	-1.7	-29.1	0.1
	(12.9)	(0.8)	(3.3)	(9.7)	(1.4)
Obs	20,387	20,387	20,387	20,387	8,693
B: Market controls					
DD	-24.2	-2.7	-0.0	-21.8	0.0
	(13.0)	(0.8)	(3.3)	(9.8)	(1.4)
Obs	19,559	19,559	19,559	19,559	8,687
Mean outcome (t-1)	513.9	10.3	139.0	364.1	13.6

<u>Note:</u> We normalize the number of FTEs so that it is expressed per 100 contemporaneous hospital beds. Column 5 presents results for contract FTEs, which come from Medicare cost reports and include management and patient care staff. Standard errors are clustered by hospital.

▸ Event study   ▸ Baseline occupation shares

Outline

Quantify the trade-off in hospital privatization

▶ Compare the additional revenue (or avoided deficits) for governments to the additional deaths or lost years of life

▶ Does not consider longer term benefits (e.g., reduced pension liability) or effects other than on mortality

Baseline   Optimistic

Cost-benefit estimate (per privatization per year)

Baseline

Optimistic

- Baseline savings: $2.0 mn

- Baseline deaths: 3.4

- OR of life-years lost: 18.4

- $0.59 mn per death OR $111k per LYL

Cost-benefit estimate (per privatization per year)

Baseline

- Baseline savings: $2.0 mn

- Baseline deaths: 3.4

- OR of life-years lost: 18.4

- $0.59 mn per death OR $111k per LYL

Optimistic

- Upper-bound of savings: $4.3 mn

- Baseline deaths: 3.4

- OR of life-years lost: 18.4

- $1.26 mn per death OR $236k per LYL

Savings do not meet federal cost-effectiveness thresholds

Baseline

$0.59 mn per death OR
$111k per LYL

Optimistic

$1.26 mn per death OR
$236k per LYL

US Dept. of Health & Human Services stipulates VSL=$10mn and VSLY = $369K (HHS, 2017; Kniesner and Viscusi, 2019)

Thanks!

✉ Email: emiliej@msu.edu

# Hospital control and service types, 2019

	State	County	City	Hospital district	NP church	NP other	FP corp	FP ind/part	Federal	Total
General medical/surgical	48	315	101	483	477	2249	494	147	192	4506
Psychiatric	174	18	0	2	3	89	232	39	10	567
Acute long-term care	8	0	1	6	10	63	225	47	0	360
Rehabilitation	2	2	1	2	7	48	167	60	1	290
Other	41	2	1	3	8	144	88	75	5	367
Total	273	337	104	496	505	2593	1206	368	208	6090

Note: The table presents the distribution of hospitals by control and service types. Control is defined as the type of authority responsible for establishing a policy concerning the overall operation of the hospital. FP ind/part refers to individual or partnership. Source: American Hospital Association survey data.
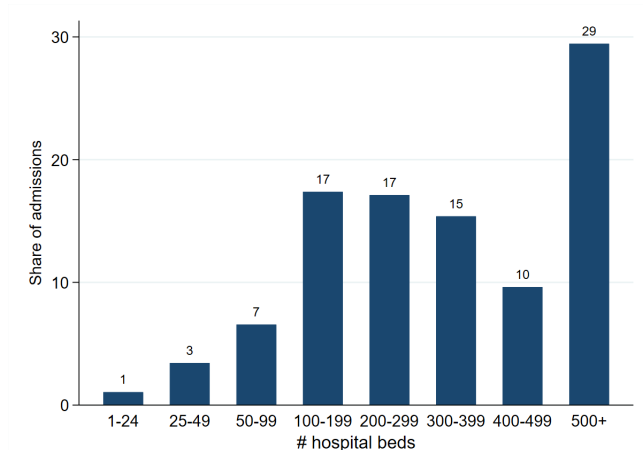
▸ Back ▸ Bed distribution ▸ Admission distribution

Distribution of hospital bed capacity, 2019
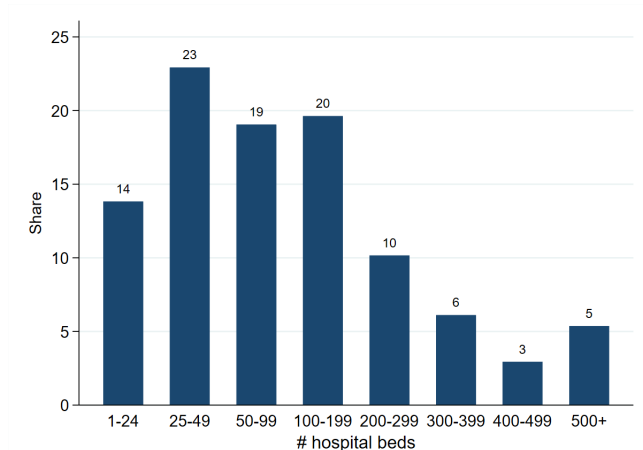
Note: The figure presents the distribution of hospitals by total bed capacity. Source: American Hospital Association survey data.

Distribution of admissions by hospital bed capacity, 2019

Note: The figure presents the distribution of admissions by total bed capacity.

Source: American Hospital Association survey data.

Hospital finances, 2019

	(1) Public	(2) Private
Total income (millions)	143	199
	(332)	(335)
Net patient revenue (millions)	121	183
	(281)	(301)
Total costs (millions)	143	189
	(310)	(309)
Margin (%)	-0.3	4.1
	(18.9)	(16.3)
# hospitals	1,265	4,711

Source: Medicare cost reports data. Public includes state, local, and federal hospitals. Total income is the sum of net patient revenue and other income. Net patient revenue includes inpatient and outpatient revenues minus allowances and discounts. ▸ Back

Types of privatization deals

	(1) Non-profit	(2) For-profit	(3) Total
A. Less control	117	24	141
- Contract Management	68	9	77
- Miscellaneous	49	15	64
B. More control	65	48	113
- Sale	36	33	69
- Lease/Joint venture	29	15	44
Total	182	72	254

<u>Note:</u> Except in the case of sales, the government continued to own the real estate and buildings, but transferred operational control to the new private firm. Miscellaneous includes cases where a new private firm was incorporated subject to oversight by the previous government owners specifically to operate the hospital, and cases where the modality could not be identified.

▸ Back

The trade-offs in privatization

Pros

Cons

- ▶ Reduces political interference (Shleifer, 1998)

- ▶ Alleviates agency problems and soft budget constraints with govt. firms

- ▶ Eases capital and credit constraints (Ehrlich et al., 1994)

- ▶ Reduces the subsidy burden

▸ back

The trade-offs in privatization

Pros

- ▶ Reduces political interference (Shleifer, 1998)

- ▶ Alleviates agency problems and soft budget constraints with govt. firms

- ▶ Eases capital and credit constraints (Ehrlich et al., 1994)

- ▶ Reduces the subsidy burden

Cons

- ▶ Incomplete contracts could lead to socially inefficient cost cutting by the private provider (Hart, Shleifer & Vishny, 1998)

- ▶ Hospitals may exclude less profitable services and/or patients

- ▶ Privatization in concentrated markets may worsen matters (Vickers & Yarrow, 1991)

# The sample is an unbalanced panel of hospitals: 1995-2019
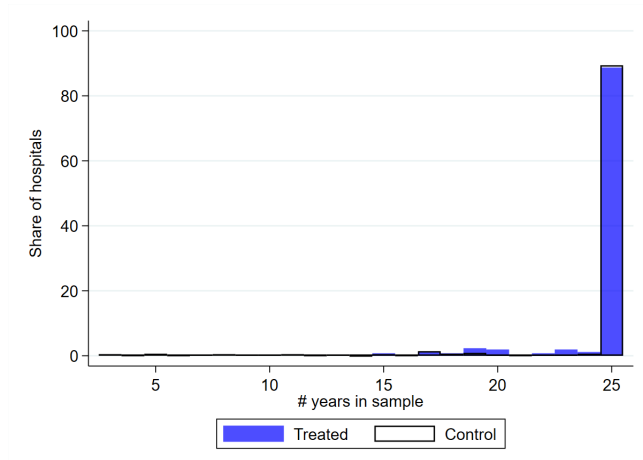
Note: The figure presents the proportion of hospitals by number of years they are observed in the analysis sample.

Log patient volume estimates

|	(1) Total	(2) Medicaid	(3) Medicare	(4) Other	(5) Adjusted
A: No controls					
DD	-0.089	-0.156	-0.053	-0.142	-0.063
	(0.028)	(0.043)	(0.030)	(0.044)	(0.026)
Obs	20,387				
B: Market controls					
DD	-0.101	-0.179	-0.078	-0.142	-0.070
	(0.028)	(0.042)	(0.031)	(0.044)	(0.026)
Obs	19,559				
Mean outcome (t-1)	3,038	622	1,361	1,054	7,087

<u>Note:</u> Patient volume is in logs. The mean values pertain to privatized hospitals in the year before privatization. Standard errors are clustered by hospital. Panel A reports coefficients from a two-way fixed effects specification with no covariates. Panel B includes time-varying hospital 340B status and county-level controls. The outcome in col. 5 is adjusted admissions, which incorporates outpatient visits.

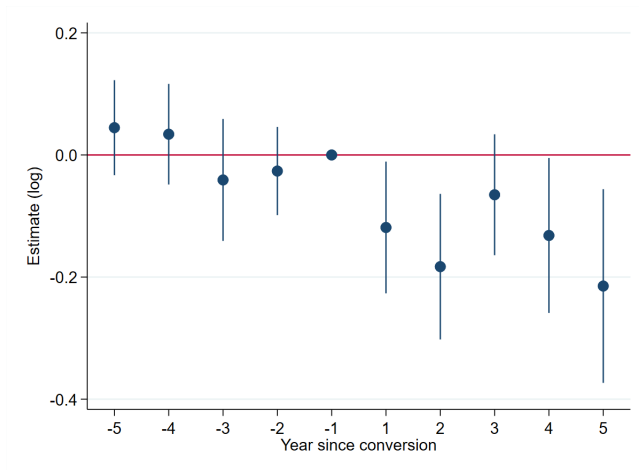▸ Back total   ▸ Back Payer

Little effect on Medicare
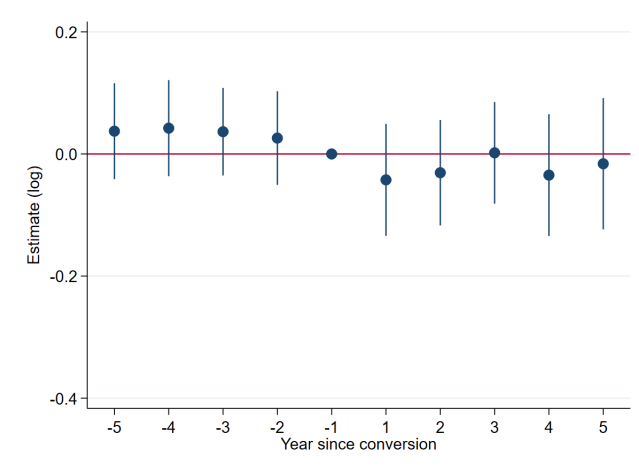
Note: Model is estimated using all control hospitals. Year zero is the year of privatization and is excluded for the treated hospitals since it represents partial treatment. The error bars present 95% confidence intervals.

A disproportionate decline in Medicaid
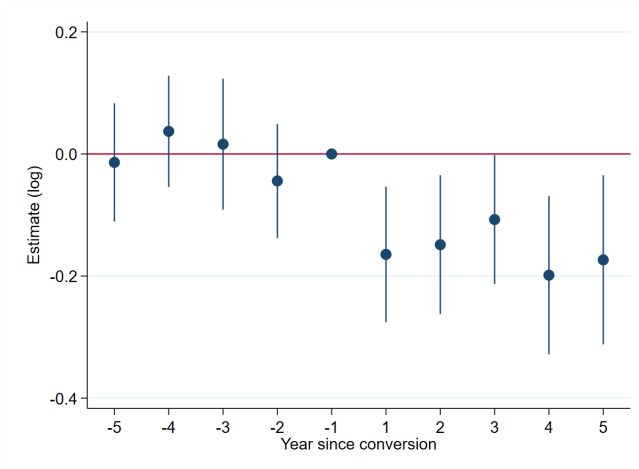
Note: Model is estimated using all control hospitals. Year zero is the year of privatization and is excluded for the treated hospitals since it represents partial treatment. The error bars present 95% confidence intervals.

Decline in "Other" as well - unpack using state data

Note: Model is estimated using all control hospitals. Year zero is the year of privatization and is excluded for the treated hospitals since it represents partial treatment. The error bars present 95% confidence intervals.
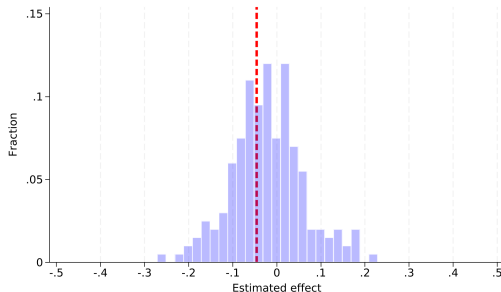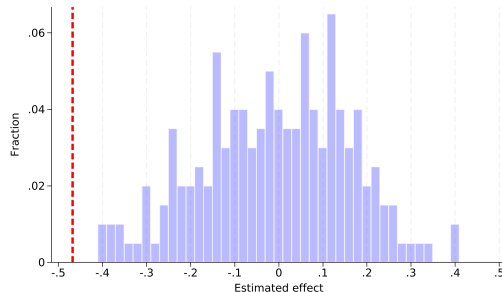
Randomization inference: Privately insured versus uninsured

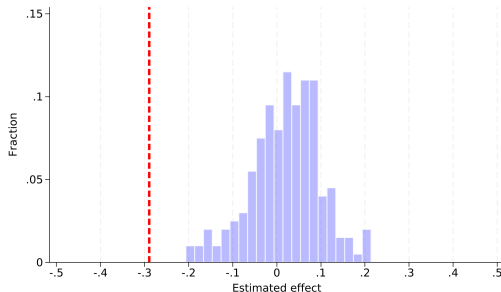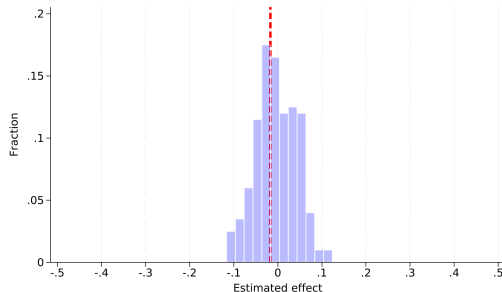
(a) Privately insured   (a) Uninsured

<u>Note:</u> Outcomes are log private and uninsured discharges, respectively. Distribution obtained using the placebo inference method in SDiD with 200 replications. The red dashed line indicates the effect on the treated hospitals.

Randomization inference: Low income versus all others

(a) Medicaid + Uninsured   (a) All remaining

<u>Note:</u> Outcomes are log (medicaid + uninsured) and all remaining discharges, respectively.
Distribution obtained using the placebo inference method in SDiD with 200 replications. The red
dashed line indicates the effect on the treated hospitals.

Market level descriptive statistics in 1999

	(1) Treated HSAs	(2) Control HSAs	(3) Total
# treated hospitals	1.3	0.0	0.3
Total hospitals	6.1	4.6	4.9
Total beds	976	805	842
Total admissions	37,723	31,641	32,977
% Medicaid adm	15.6	14.1	14.4
% Medicare adm	44.9	47.2	46.7
% other adm	39.5	38.7	38.8
% in poverty	14.1	13.0	13.3
% unemployment	4.9	4.7	4.8
% uninsurance	20.6	19.1	19.4
HHI (admissions)	4,574	5,565	5,347
All-cause mortality (ages 55–64)	1084.7	1036.0	1046.7
# HSAs	204	725	929

Note: The table presents descriptive statistics for the market-level sample, defined by Health Service Areas (HSA). Treated HSAs have at least one privatized hospital. Control HSAs do not have any.

▸ Back

Market level utilization: Point estimates

	Aggregate patient log volume			
	(1) Total	(2) Medicaid	(3) Medicare	(4) Other
A: No controls				
DD	-.004	-.038	.008	.009
	(.014)	(.024)	(.016)	(.022)
Obs	19985			
B: Market controls				
DD	-.021	-.053	-.012	-.011
	(.015)	(.024)	(.016)	(.022)
Obs	18522			
Mean outcome (t-1)	40587	7792	16885	15909

Note: The table presents estimated effects on patient (log) volume. Panel B includes time-varying HSA-level controls and has fewer observations since some covariates are not available in 1995 and 1996. ▶ Back

Robustness

I: Specification checks:

- ▶ Weight by beds `▸ table`
- ▶ Allow hospital-specific linear trend `▸ table`
- ▶ Include state-year f.e. `▸ table`

II: Alternate estimators

- ▶ Callaway Santanna `▸ table`
- ▶ De Chaisemartin D'Haultfoeuille `▸ table`

III: Alternate samples (treated group)

- ▶ Balanced panel `▸ table`
- ▶ Retain all observations `▸ table`

IV: Alternate samples (comparison group)

- ▶ Propensity score matching `▸ PSM model` `▸ Balance after PSM` `▸ table`
- ▶ Include switchers `▸ table`

Propensity score matching

- Use propensity score matching (nearest neighbor, without replacement) to match on levels of the following variables in t-1, t-2, and t-3:
  - Hospital beds
  - Total inpatient admissions
  - Medicaid inpatient admissions
  - Operating expense
  - % in poverty (county)
  - % unemployment (county)
  - Health Service Area (HSA) population (only t-1)

- Matched treated and control hospitals must be in the same propensity score decile

- Control hospitals must be public throughout sample period and not located w/in 15 miles of any treated hospital

Balance in the full and matched AHA samples

|	(1) All treated	(2) All comparison	(3) Std. difference	(4) Matched comparison	(5) Std. difference
# hospitals	258	802		258	
Beds	87	119	-0.20	80	0.06
Total admissions	3,014	4,324	-0.18	2,598	0.09
Medicaid admissions	617	1,140	-0.24	539	0.07
Expenses (mn)	61	107	-0.24	54	0.07
HSA population	570,563	698,706	-0.09	562,126	0.01
% in poverty (county)	16.8	15.7	0.19	16.6	0.03
% Unemployment (county)	7.0	6.3	0.23	7.1	-0.06

Note: The table presents means for treated hospitals (col. 1, 258 in number), all comparison hospitals, (col. 2, 802), and matched comparison hospitals (col. 4, 258). We use 1:1 matching without replacement and present mean values for the variables used in propensity score matching. Col. 3 presents the standardized difference in means between the full sample of treated and comparison hospitals. We compute the standardized difference as the difference in means divided by the standard deviation of the pooled sample. Col. 5 presents the standardized difference in means in the matched sample.
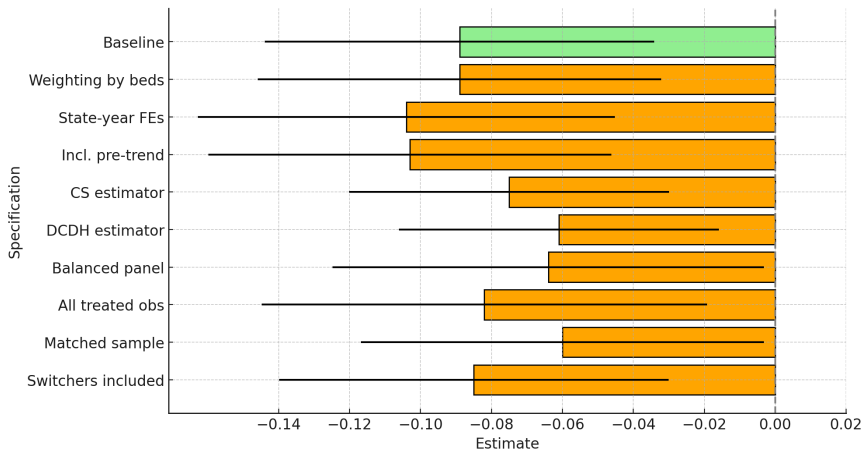
Total revenue per bed: robustness checks
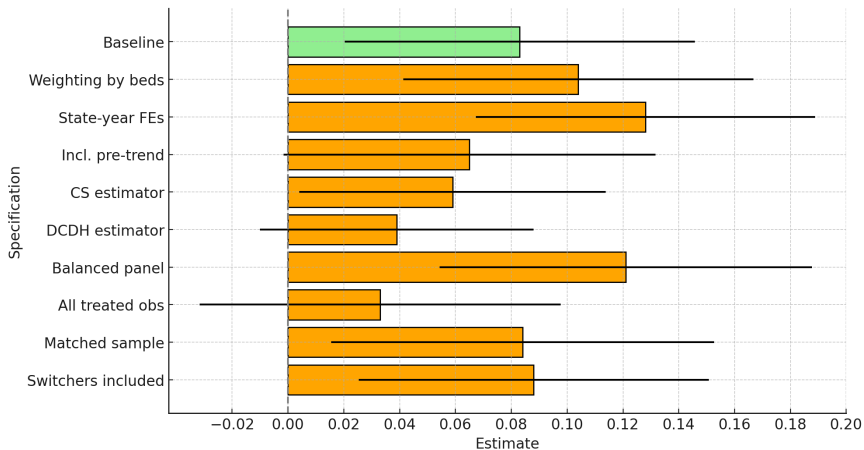
Note: The figure presents robustness of the estimated effect on log revenue per bed to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

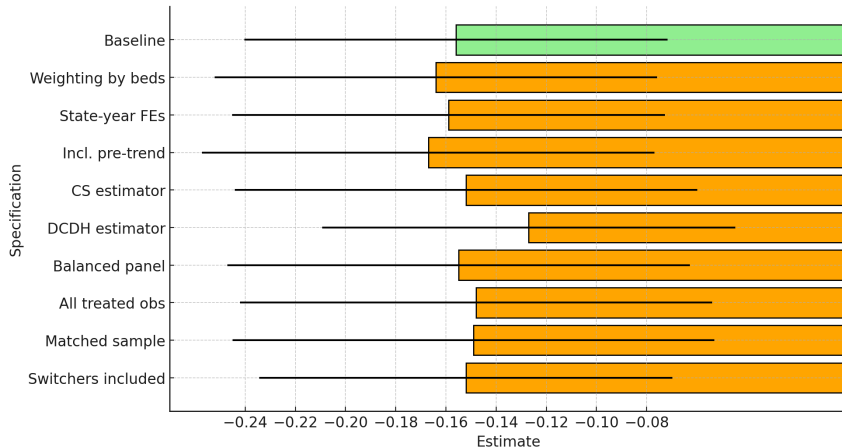# Personnel expenses per bed: robustness checks
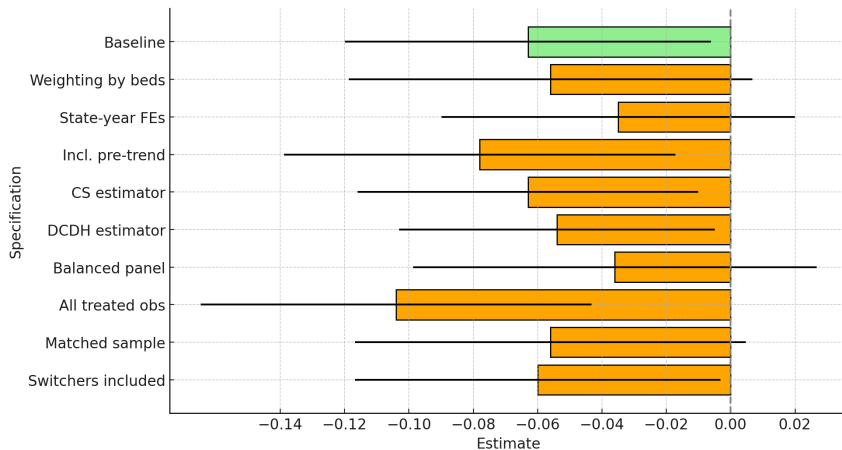
Note: The figure presents robustness of the estimated effect on log personnel expenses per bed to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

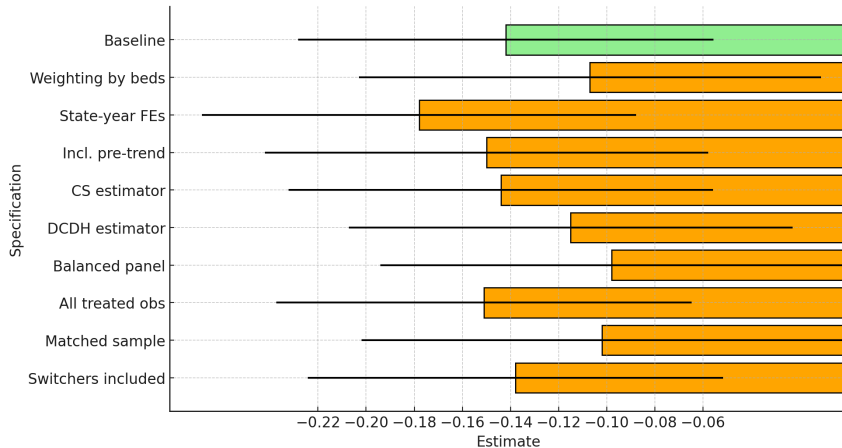# Hospital-level total inpatient volume: robustness checks

Note: The figure presents robustness of the estimated effect on log total hospital-level inpatient volume to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

▸ Back

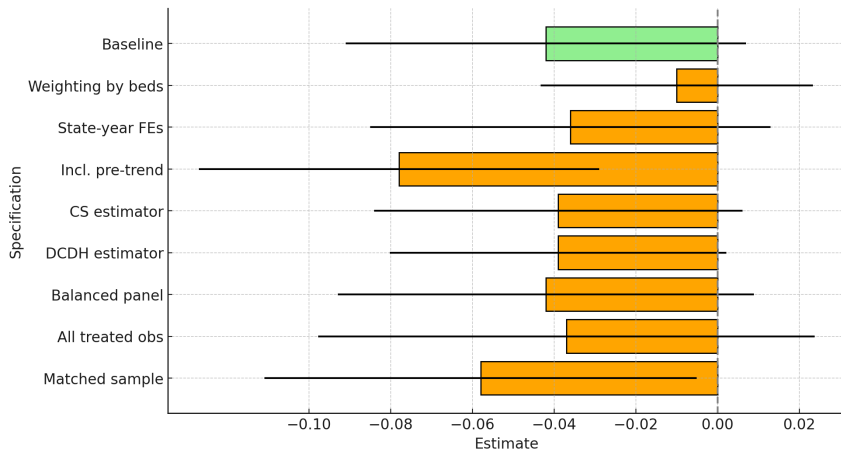# Hospital-level Medicaid volume: robustness checks

Note: The figure presents robustness of the estimated effect on hospital-level log inpatient volume for Medicaid patients to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

▸ Back

# Hospital-level "Other" volume: robustness checks

Note: The figure presents robustness of the estimated effect on hospital-level log inpatient volume for "Other" patients to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

Market-level Medicaid volume: robustness checks

Note: The figure presents robustness of the estimated effect on market level log Medicaid inpatient volume to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

◂ Back

Hospital 30-day mortality: robustness checks
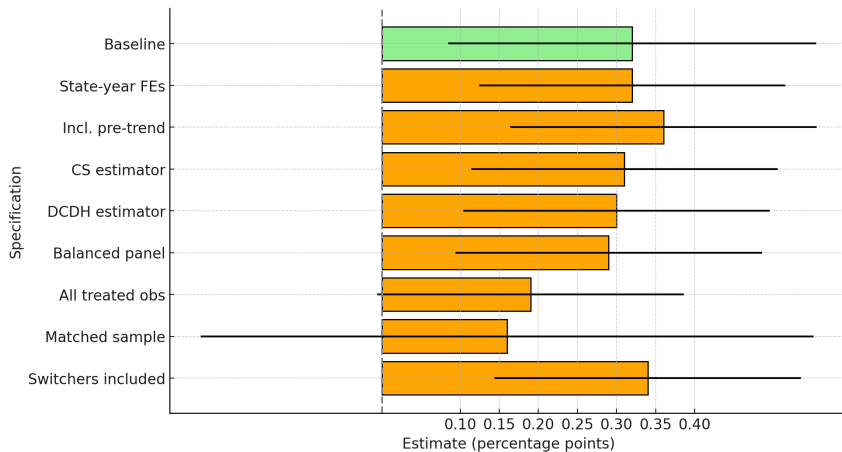
Note: The figure presents robustness of the estimated effect on 30-day mortality to different specifications, estimators, and sample restrictions. The top bar presents the baseline estimate. The line bars represent 95% confidence intervals. Standard errors are clustered by hospital.

▸ Back

Effects on mortality by duration for Medicare patients

A: By duration	(1) 30-day	(2) 60-day	(3) 90-day	(4) 180-day	(5) 365-day
A1: Patient controls					
DD	0.0033	0.0045	0.0054	0.0063	0.0072
	(0.0012)	(0.0015)	(0.0016)	(0.0018)	(0.0021)
A2: Patient and mkt. controls					
DD	0.0038	0.0052	0.0063	0.0074	0.0088
	(0.0013)	(0.0015)	(0.0017)	(0.0020)	(0.0022)
Mean outcome (t-1)	0.119	0.157	0.184	0.242	0.323
Observations	13,097,798	13,097,798	13,097,798	13,097,798	13,097,798

Note: The table presents the average effect on mortality among all Medicare FFS, 65+ patients at different durations from 30 days through 365 days following discharge from the index hospital stay. We exclude 55 hospitals privatized prior to 2005 to ensure at least 5 pretreatment years for each privatized facility. Patients are enrolled in Medicare FFS for at least 3 months prior to admission. Standard errors are clustered by hospital.

▸ Back

Effects on mortality by diagnostic category for Medicare patients

B: By Diagnostic category	(1) Circulatory	(2) Respiratory	(3) Digestive	(4) Musculoskeletal	(5) Kidney	(6) Miscellaneous
B1: Patient controls						
DD	0.0027	0.0017	0.0048	0.0020	0.0053	0.0044
	(0.0019)	(0.0024)	(0.0021)	(0.0013)	(0.0028)	(0.0017)
B2: Patient and mkt. controls						
DD	0.0033	0.0034	0.0059	0.0027	0.0060	0.0049
	(0.0021)	(0.0026)	(0.0021)	(0.0013)	(0.0029)	(0.0018)
Mean outcome (t-1)	0.097	0.16	0.086	0.051	0.119	0.147
Observations	3,079,206	2,226,683	1,419,222	1,412,489	936,939	4,023,246

Note: This table presents the estimated effects on 30-day mortality for Medicare FFS, 65+ patients in the top 5 major diagnostic categories (MDCs) by volume in columns 1–5 and the effect for all remaining patients in column 6. These 5 categories together contribute nearly 70% of total patient volume. We exclude 55 hospitals privatized prior to 2005 to ensure at least 5 pretreatment years for each privatized facility. Patients are enrolled in Medicare FFS for at least 3 months prior to admission. Standard errors are clustered by hospital.
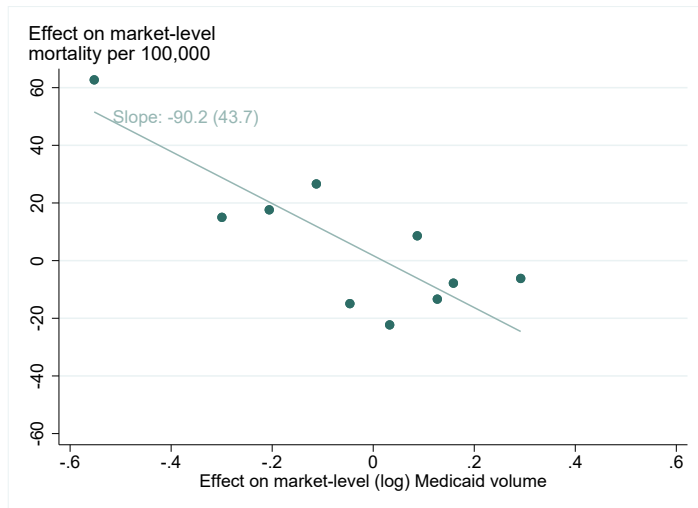
▸ Back

Effects on the 55–64 population

▶ Follow previous studies and focus on people aged 55–64 since they are relatively high hospital users and ≈ 20% are Medicaid/uninsured

▶ Estimate an imprecise increase of 5.2 deaths per 100,000 (0.5%) in treated HSAs
  ▶ *Intent-to-treat* effect (only 13% of age 55+ experience a hospital stay in a year)

▶ Three patterns suggest there is an increase in local mortality rates:
  ▶ Effect on mortality is (linearly) correlated with the corresponding effect on Medicaid hospital stays
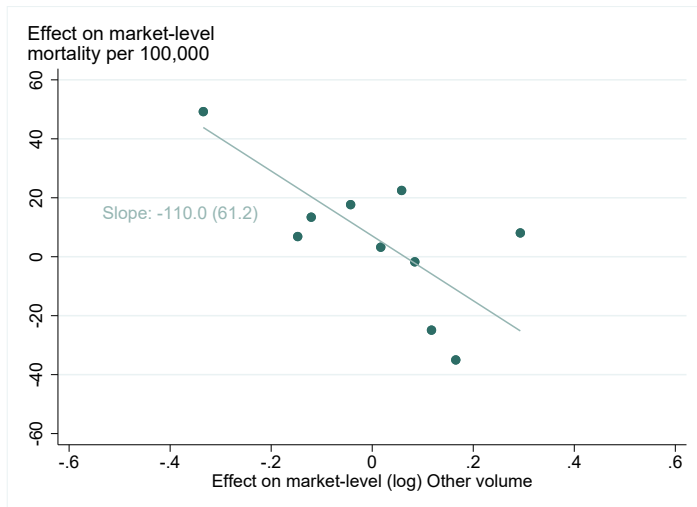
Effect on mortality increases as Medicaid volume declines

Note: The X and Y axes plot the mean effect on market-level Medicaid volume and mortality for 55-64 olds in each decile, respectively. We present the slope coefficient obtained from an OLS fit of the market-level data.

Similar relationship with "Other" volume decline

Effect on market-level
mortality per 100,000

Slope: -110.0 (61.2)

Effect on market-level (log) Other volume

Note: The X and Y axes plot the mean effect on market-level "Other" volume and mortality for 55-64 olds in each decile, respectively. We present the slope coefficient obtained from an OLS fit of the market-level data. ▸ Back

Effects on the 55–64 population

▶ Follow previous studies and focus on people aged 55–64 since they are relatively high hospital users and $\approx$ 20% are Medicaid/uninsured

▶ Estimate an imprecise increase of 5.2 deaths per 100,000 (0.5%) in treated HSAs
  ▶ *Intent-to-treat* effect (only 13% of age 55+ experience a hospital stay in a year)

▶ Three patterns suggest there is an increase in local mortality rates:
  ▶ Effect on mortality is (linearly) correlated with the corresponding effect on Medicaid hospital stays
  ▶ Market-level effect is *entirely* due to a 2% increase in the affected county

Effects on the 55–64 population

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▶ Three patterns suggest there is an increase in local mortality rates:
  ▶ Effect on mortality is (linearly) correlated with the corresponding effect on Medicaid hospital stays
  ▶ Market-level effect is *entirely* due to a 2% increase in the affected county
  ▶ Which, in turn, is *entirely driven* by affected counties with above-median poverty rates

Effects on mortality among 55-64 year olds at the market level

	(1) All	(2) Affected county	(3) Other counties	DD	(4) x 1(> med. poverty)
A: No controls					
DD	5.2	17.3	-5.0	-2.2	38.8
	(6.6)	(11.7)	(8.4)	(13.6)	(22.9)
Obs	19,985	19,985	19,833	19,985	
B: Market controls					
DD	6.5	18.8	-3.3	3.1	31.2
	(6.6)	(11.8)	(8.5)	(13.6)	(23.0)
Obs	18,522	18,522	18,371	18,522	
Mean outcome (t-1)	1,022.4	1,026.5	1,011.5		1,026.5

Note: This table presents market-level effects on all-cause mortality (per 100,000) for ages 55–64. Column 1 presents mortality effects in which all counties that comprise an HSA are included. Columns 2 and 3 present mortality effects for counties in which a privatization occurred and all remaining counties in the HSA, respectively. Column 4 presents results from a triple difference version of column 2 which includes an interaction term with an indicator for treated counties located in markets with above-median poverty.

▸ Back

Medicare payments unchanged; list prices increase

	(1) Log LOS	(2) Pr(stay< 2 days)	(3) Log (payment)	(4) Log (charges)
A: Patient controls				
DD	-0.0174	0.0075	0.0014	0.0641
	(0.0067)	(0.0029)	(0.0135)	(0.0190)
B: Patient and mkt. controls				
DD	-0.0213	0.0083	0.0020	0.0506
	(0.0070)	(0.0030)	(0.0134)	(0.0206)
Mean outcome (t-1)	5.724	0.129	8,902	31,357
Observations	13,097,798	13,097,798	12,960,951	13,097,165

<u>Note:</u> The table shows the results of tests using regressions estimated on patient-level data during 2000–19. There are 203 hospitals treated. The sample is limited to Medicare FFS patients enrolled in Parts A and B for min. 3 months at the time of focal hospital admission. Outcomes are: (1) log length of stay; (2) the probability of being discharged on the same or next day after admission; (3) log of total Medicare payment for the stay; and (4) log of hospital charges for the admission. Standard errors are clustered by hospital.

▶ Event Studies   ▶ back

Care inputs

Staff availability declines, particularly of physicians

|	(1) Total	(2) Physician	(3) Nurse	(4) Other
A: No controls				
DD	-33.0	-2.6	-1.7	-29.1
	(12.9)	(0.8)	(3.3)	(9.7)
Obs	20,387	20,387	20,387	20,387
B: Market controls				
DD	-24.2	-2.7	-0.0	-21.8
	(13.0)	(0.8)	(3.3)	(9.8)
Obs	19,559	19,559	19,559	19,559
Mean outcome (t-1)	513.9	10.3	139.0	364.1

<u>Note:</u> We normalize the number of FTEs so that it is expressed per 100 contemporaneous hospital beds. Column 1 presents results for total FTE, which comprises physicians, nurses, and others (all remaining), presented in columns 2, 3, and 4, respectively. Standard errors are clustered by hospital.

Total staff decreases at the privatizing hospital

(a): TWFE
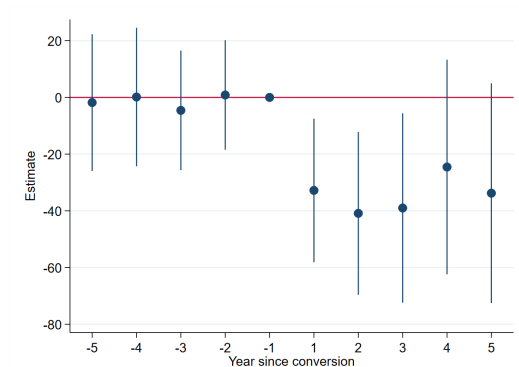
(b): Callaway Santanna
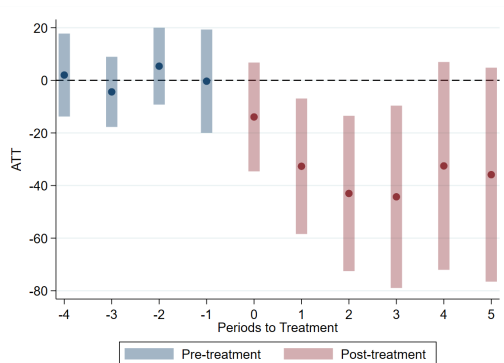
Note: Outcome is total full-time equivalent employees (FTEs) per bed. Standard errors are clustered by hospital.

▸ Results table

Baseline differences in occupations between public and private hospitals

| Occupation name | Share of employment | | Major sub-occupations |
| | Local | Private | |
(1)	(2)	(3)	(4)
Nurses	30.0	32.6	RNs, LPNs
Physicians	3.6	2.9	Family & general internal medicine, other non-pediatric
Other healthcare practitioner & technical	20.0	21.4	Therapists, lab technicians
Office and administrative support	13.2	11.5	Information and record clerks, secretaries
Healthcare support	12.5	12.5	Nursing assistants, medical assistants
Management	4.0	3.7	Medical and health service managers, operation specialty managers
Building and grounds cleaning	3.5	3.1	Maids and housekeeping, janitors
Community and social service	2.4	1.9	Social workers, counselors
Food preparation and serving	2.3	2.2	Cooks and food prep, food and beverage servers
Business and financial operations	2.2	2.2	Financial specialists, HR workers
All remaining	6.3	6.0	Computer occupations, maintenance & repair
Total	100.0	100.0	

Note: This table presents 2019 data on hospital occupation shares for local government hospitals (Col. 1) and private hospitals (Col. 2) obtained from the BLS industry-occupation matrix files.

▶ Back

Conditioning on risk, patients are discharged sooner

|	(1) Log LOS	(2) Pr(stay< 2 days)	(3) Log (payment)	(4) Log (charges)
A: Patient controls				
DD	-0.0174	0.0075		
	(0.0067)	(0.0029)		
B: Patient and mkt. controls				
DD	-0.0213	0.0083		
	(0.0070)	(0.0030)		
Mean outcome (t-1)	5.724	0.129		
Observations	13,097,798	13,097,798		

<u>Note:</u> The table shows the results of tests using regressions estimated on patient-level data during 2000–19. There are 203 hospitals treated. The sample is limited to Medicare FFS patients enrolled in Parts A and B for min. 3 months at the time of focal hospital admission. Outcomes are: (1) log length of stay; (2) the probability of being discharged on the same or next day after admission; (3) log of total Medicare payment for the stay; and (4) log of hospital charges for the admission. Standard errors are clustered by hospital.

▸ Event Studies ▸ back
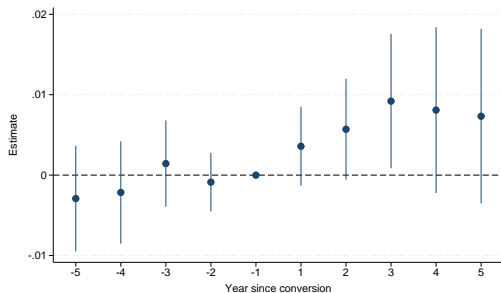
Decline in patient length of stay
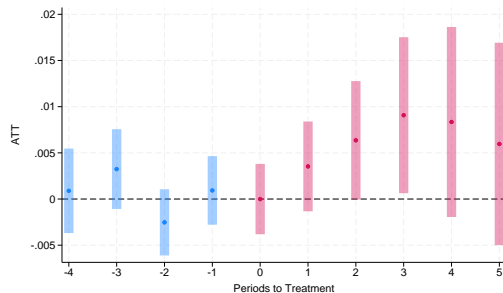
(a): TWFE
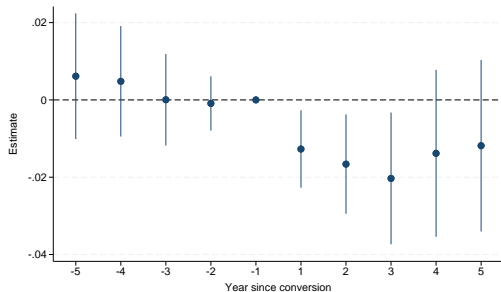
(b): Callaway Santanna
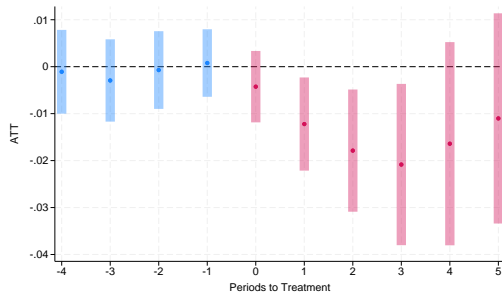
Note: Outcome is log length of stay for Medicare patients aged 65–99. Standard errors are clustered by hospital.

Increase in short stays

(a): TWFE

(b): Callaway Santanna

Note: Outcome is an indicator for length of stay less than equal to two days for Medicare patients aged 65–99. Standard errors are clustered by hospital.

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