How much should we trust the American Hospital Association (AHA) survey?

New findings using Census Bureau data

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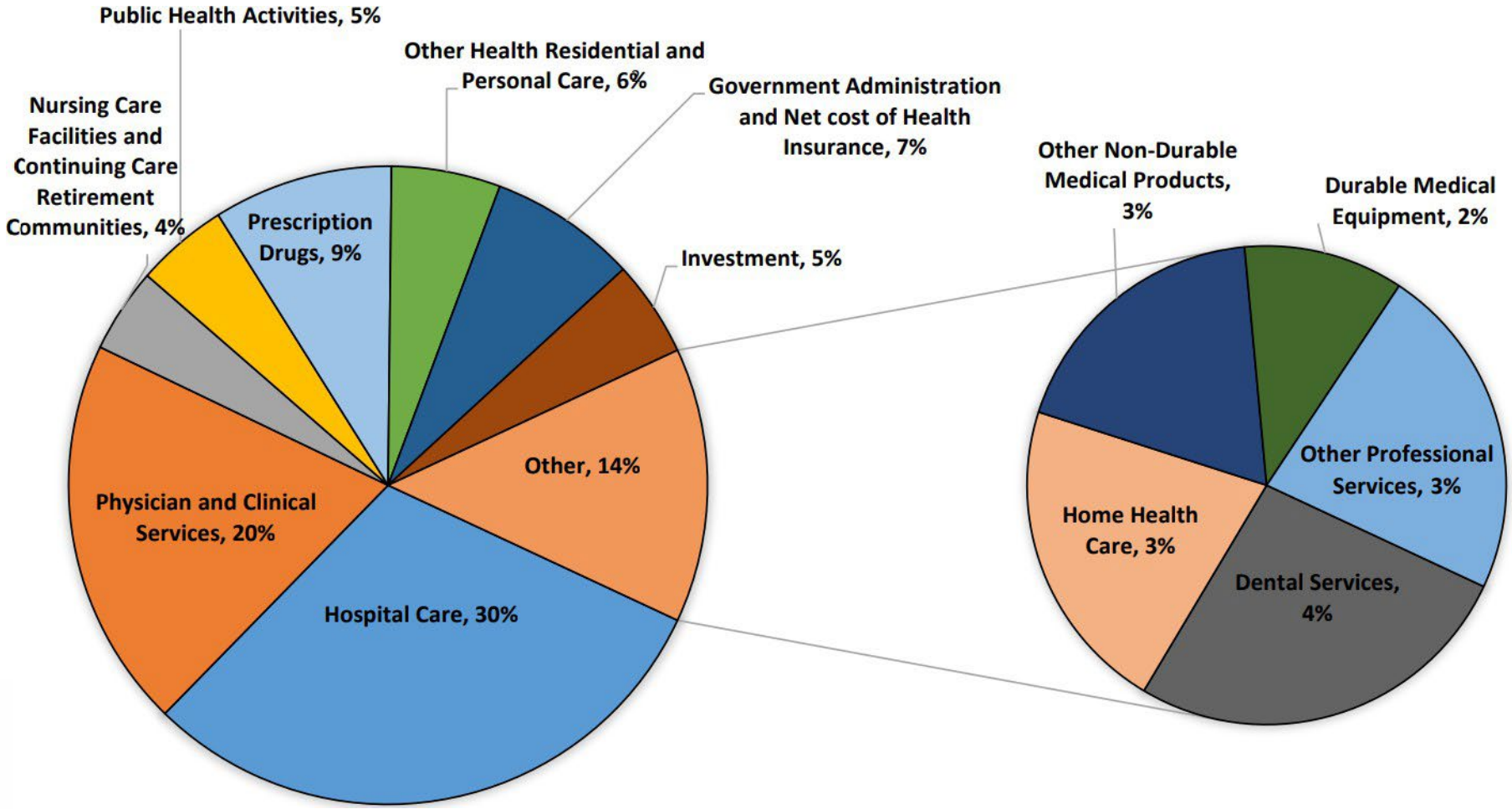
MOTIVATION

*In 2022, **healthcare sector** accounted for **17.3%** of gross domestic product*

***Hospital care** is its largest segment with **$1.3T** in annual spending and **6.5M** people employed in hospital care*



Source: *Centers for Medicare and Medicaid Services* (CMS) (2024)

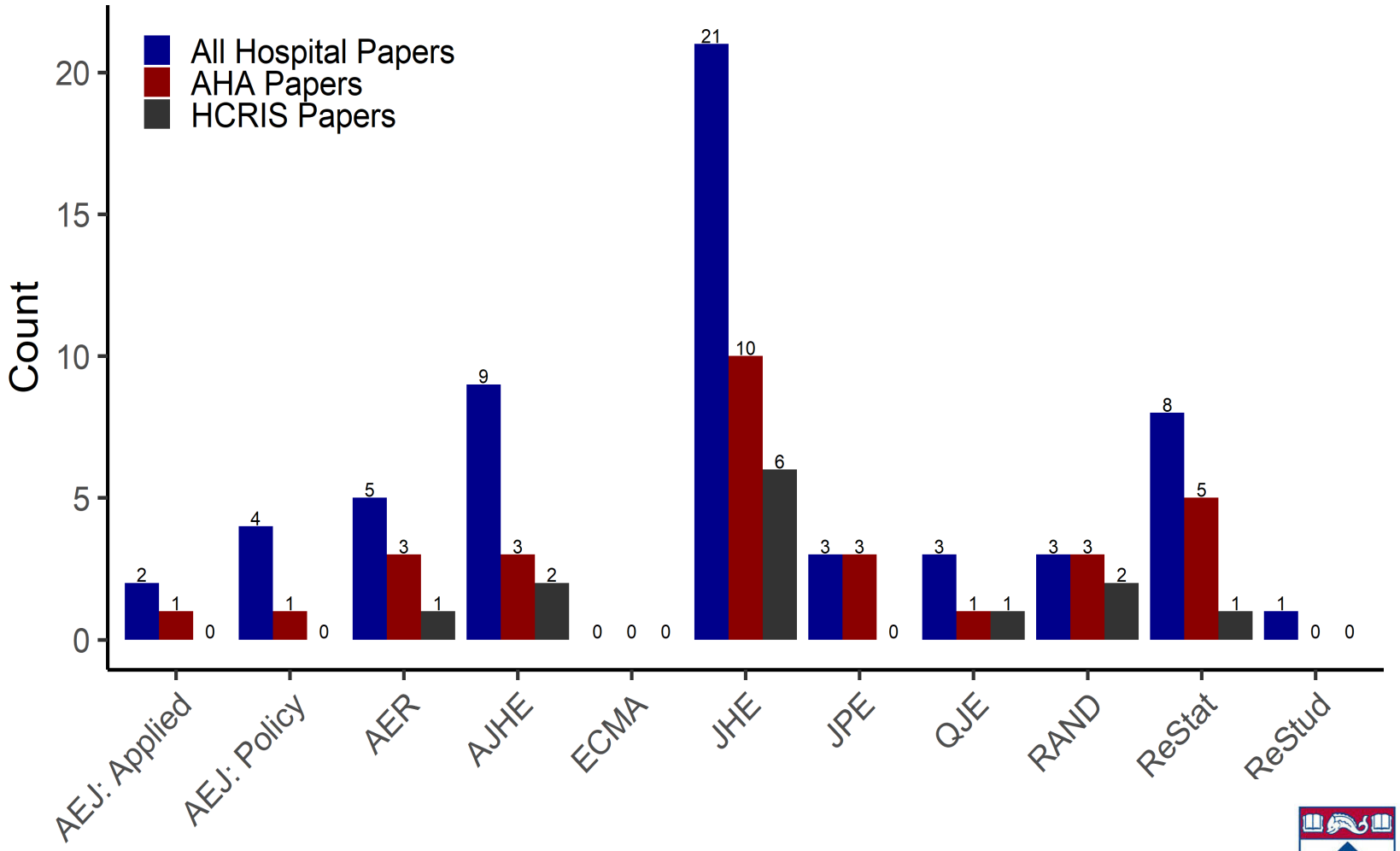
MOTIVATION

50% of 2020-2023 articles on hospitals use American Hospital Association (AHA) Annual Survey data (authors' analysis)

"Hospital Papers"
Use hospital operations either as a policy setting, outcome measure, or source of identification.

"AHA Papers"
Use AHA survey data.

"HCRIS Papers"
Use CMS Healthcare Cost Report Information System, respectively.



AEJ *American Economic Journal*. AER *American Economic Review*. (A)JHE *(American) Journal of Health Economics*. ECMA *Econometrica*. JPE *Journal of Political Economy*. QJE *Quarterly Journal of Economics.* RAND *RAND Journal of Economics*. ReStat *Review of Economics and Statistics*. ReStud *Review of Economic Studies*.

WHAT WE DO

MATCH HOSPITALS	Census Bureau's Longitudinal Business Database (LBD) and the AHA Annual Survey
BENCHMARK	Measures in matched LBD-AHA sample
DETERMINE	Any areas for caution

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WHAT WE DO

MATCH HOSPITALS

Census Bureau's Longitudinal Business Database (LBD) and the AHA Hospital Survey

What are the characteristics of unmatched hospitals?

Implications of sample characteristics for measuring entry and exit?

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Creating LBD-AHA Matched Sample

LBD SAMPLE

2002-2020
U.S. Census Bureau Longitudinal Business Database (LBD)
From survey data and tax filings
Select hospitals using industry code
Exclude federal hospitals (N=9,300)

2002-2020
U.S. Census Bureau Annual Capital Expenditures Survey (ACES)
57% LBD-ACES MATCH RATE

2002, 2007, 2012, 2017
U.S. Census Bureau Economic Census (EC)
90% LBD-EC MATCH RATE

2013 U.S. Department of Agriculture (USDA)
County population and density

Creating LBD-AHA Matched Sample

LBD SAMPLE	AHA SAMPLE
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YEAR-NAME-ADDRESS MATCHING

84.2%
OF LBD SAMPLE
MATCHES AHA SAMPLE

2002-2019
LBD-AHA GENERAL MEDICAL AND SURGICAL HOSPITAL DATABASE
N = 79,000

6,000 UNIQUE HOSPITALS

AHA SAMPLE

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Differences in Sample Balance

	SAMPLE (%)				
NUMBER OF YEARS ESTABLISHMENT APPEARS IN SAMPLE	LBD SAMPLE	AHA SAMPLE	LBD SAMPLE IN AHA	LBD SAMPLE NOT IN AHA	AHA SAMPLE NOT IN LBD
1-2	30.5	5.7	8.7	48.6	10.7
3-7	15.5	8	11.8	21.7	14
8-12	7.3	7.6	10	6.6	11.9
13-17	7.2	8.1	10.5	6.3	12.6
18	39.5	70.6	58.9	16.9	50.8
Total	9,300	5,800	6,000	4,900	2,000

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Hospitals can be matched between the LBD and AHA for some but not all years.

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After removing LBD hospitals appearing <3 year, almost all disparity in AHA and LBD entry and exit rates is removed.

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After removing LBD hospitals **appearing <3 year,** almost all disparity in AHA and LBD entry and exit rates is removed.

AHA sample has (i.e., appear every year 2002-2019) more continuers than the LBD sample and this leads to lower entry and exit rates relative to the LBD.

Hospitals can be matched between the LBD and AHA for some but not all years.

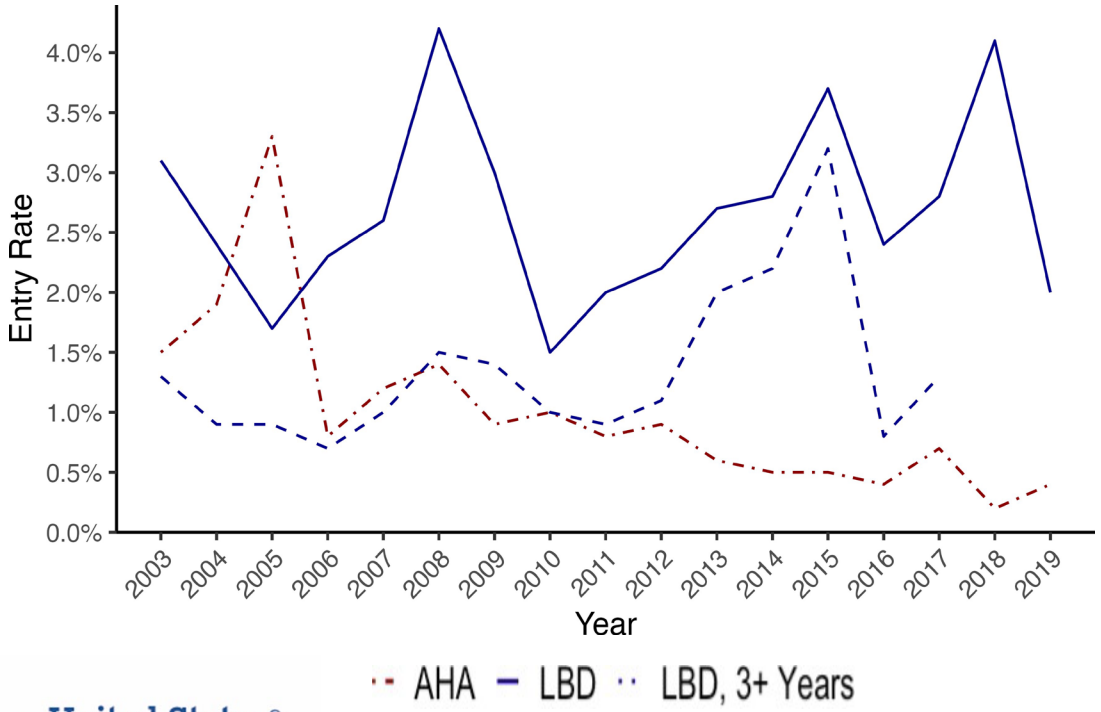
ENTRY RATES REFLECT DIFFERENCES IN SAMPLE BALANCE

ANNUAL ENTRY RATES

Average entry rate

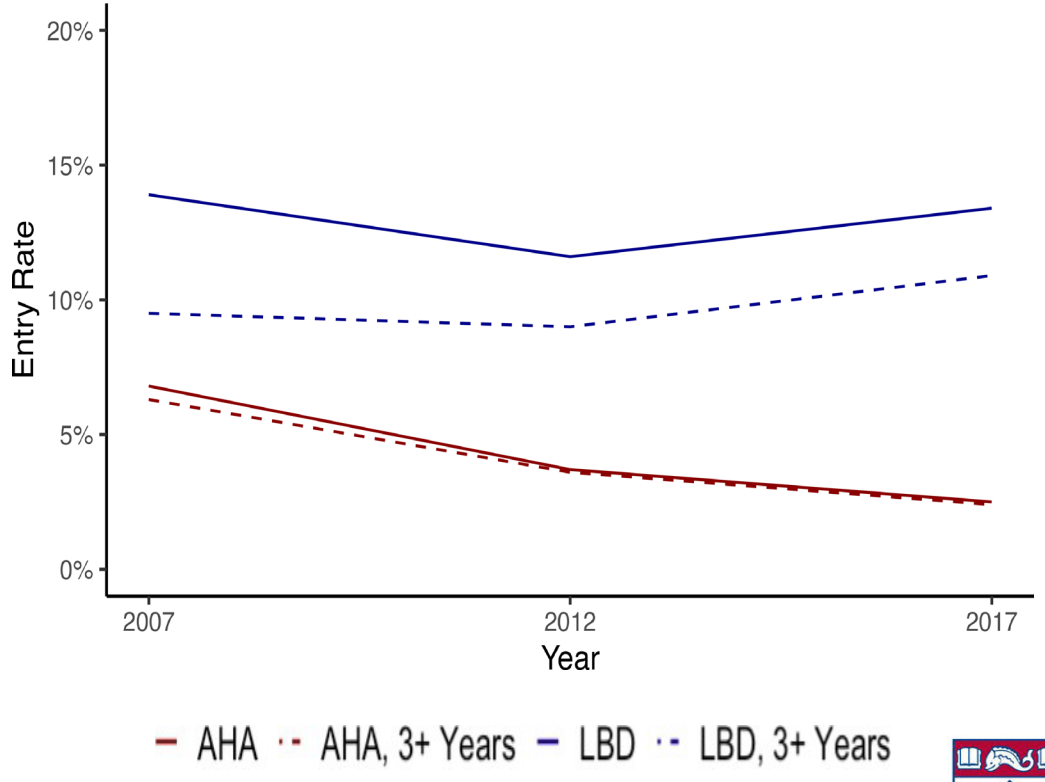
LBD 2.68%

AHA 1.00%



ENTRY RATES BETWEEN ECONOMIC CENSUS (EC) YEARS

Only hospitals from EC years.



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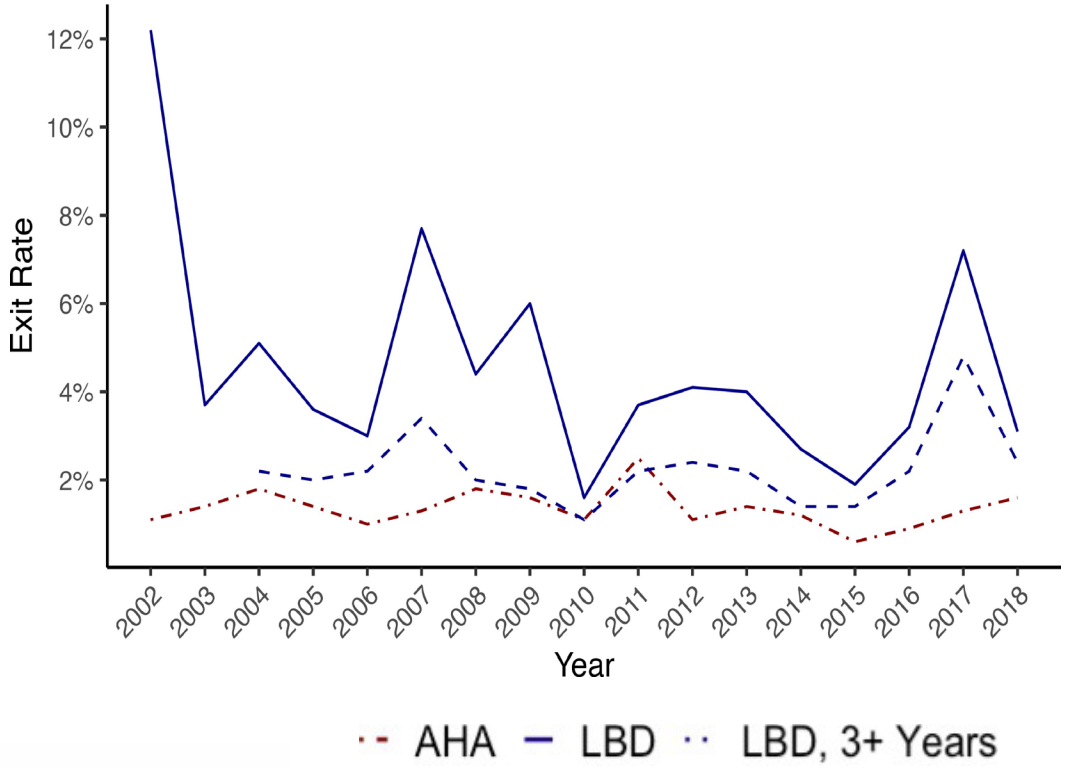
EXIT RATES REFLECT DIFFERENCES IN SAMPLE BALANCE

ANNUAL EXIT RATES

Average exit rate
LBD 4.54%
AHA 1.36%



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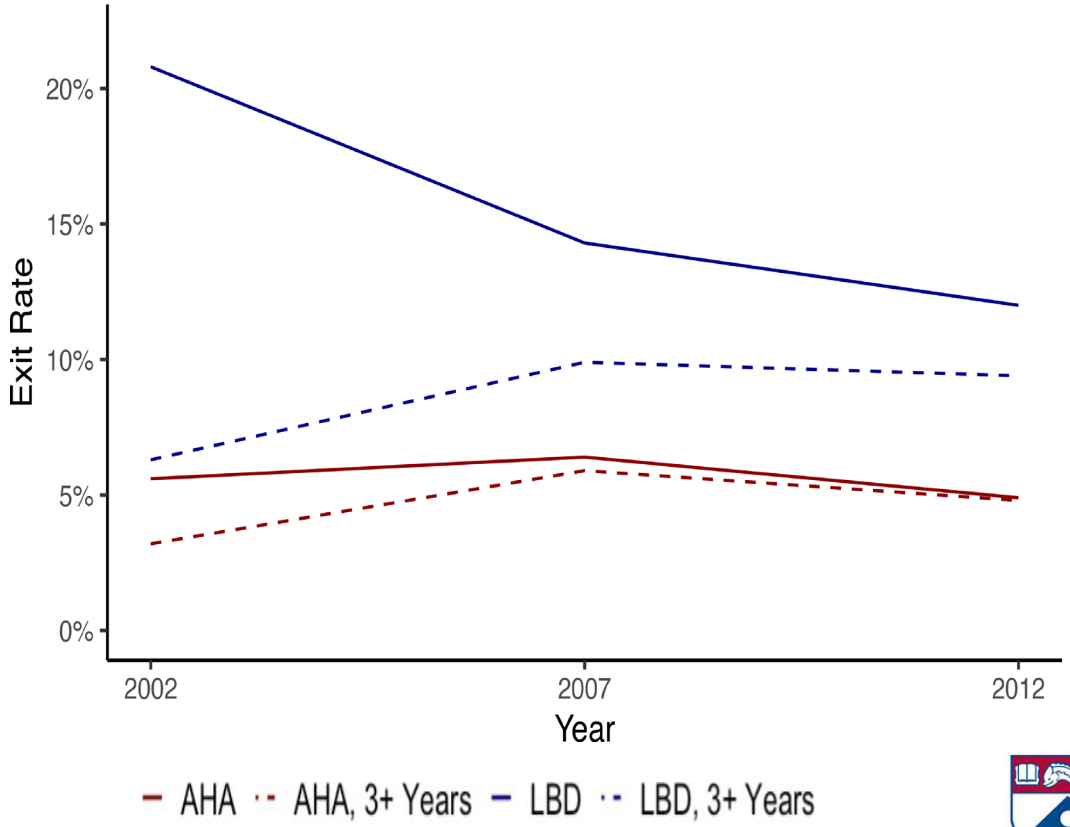

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CHARACTERISTICS OF UNMATCHED HOSPITALS

	2002-2020 AVERAGE				
	EMPLOYMENT (#)	PAYROLL ($Millions)	RURAL (%) (2010)	MULTI-LOCATION FIRM (%)	FIRM/SYSTEM [a] ANNUAL REVENUE ($Millions)
FULL LBD SAMPLE	955	50	7.1	72	495
LBD MATCHED TO AHA	1028	53	7.6	71.2	506
LBD NOT MATCHED TO AHA	**555**	**30**	**2.5**	**78.3**	**1,670**
FULL AHA SAMPLE	822	57	7.2		274
AHA SAMPLE NOT IN LBD	**570**	**38**	**3.7**		**116**

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[a] LBD firms can own or operate one or more business locations.
An AHA system can include 2+ hospitals or 1 hospital & 3+ pre-/post-acute health care organizations.

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WHAT WE DO

MATCH HOSPITALS Census Bureau's LBD and the AHA Annual Survey

BENCHMARK Measures in matched LBD-AHA sample

How do measures of employment size and payroll expenditures compare?

Are revenues and capital expenditures comparable?

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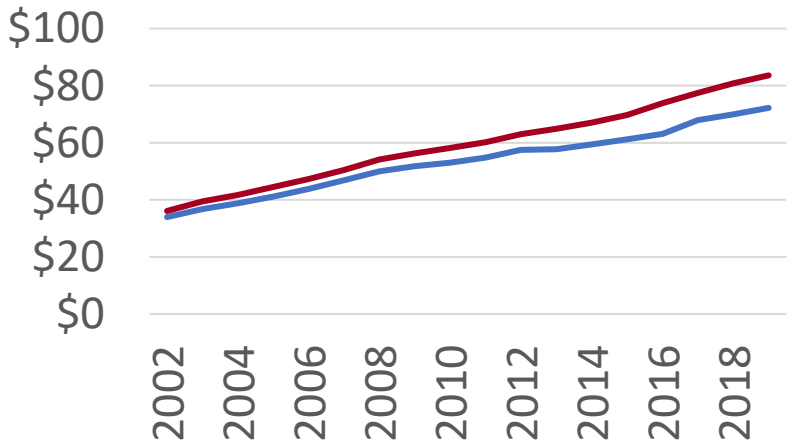
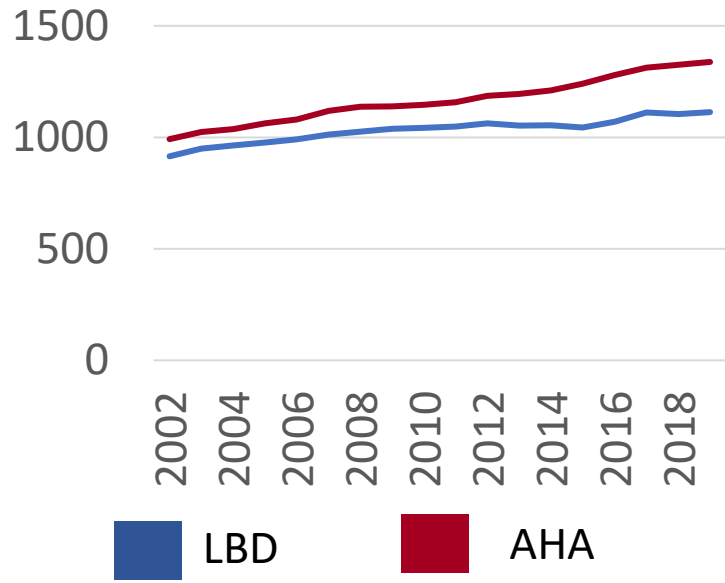
PAYROLL, EMPLOYMENT, AND AVERAGE WAGES

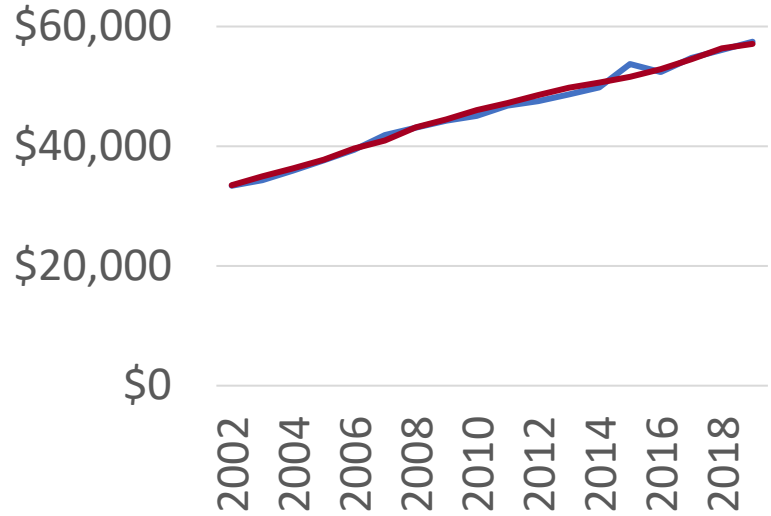
ANNUAL PAYROLL ($Millions)



NUMBER OF EMPLOYEES



PAY/EMPLOYEE ($)



MEANS

LBD	AHA	T-Test
$53.2	$59.2	p<0.001

LBD	AHA	T-Test
1,031	1,164	p<0.001

LBD	AHA	T-Test
$45,570	$45,760	P<0.08

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All values inflation adjusted to 2018 dollars.

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MISSING FINANCIAL DATA (%)

	LOCATION LEVEL		FIRM/SYSTEM LEVEL	
	ACES	**AHA**	**ACES**	**AHA**
Firm annual capital expenditures	0.7	**26.3**	0.9	**15.9**
Firm accumulated depreciation expense	2.5	**23.1**	2.9	**14.3**
Firm IT expenditures	9.4	**88.0**	7.3	**87.7**
Firm fixed asset value	0.7	**23.1**	0.9	**14.3**

ACES Use firm-level expenditure data from ACES matched to the LBD hospital locations.

AHA Use AHA location-level survey data.

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Availability of data conditional on

Whether in the ACES sampling frame

Whether in 2005-2019 when AHA collected these data

Possible reporting factors

Different data collection processes ~ ACES mandates response

Firm-level expenditures not necessarily reported in location-level surveys → Potential downward bias

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MOSTLY STRONG CORRELATIONS IN FINANCIAL MEASURES

LOG MEASURE	CORRELATION COEFFICIENT	
	ALL HOSPITALS	INDEPENDENT HOSPITALS
Firm/system revenue	0.9099	0.9173
Firm fixed asset value	0.8406	0.8992
Firm annual capital expenditures	0.7999	0.8296
Firm accumulated depreciation expense	0.7999	0.8296
Firm IT spending	***0.5894***	***0.4445***

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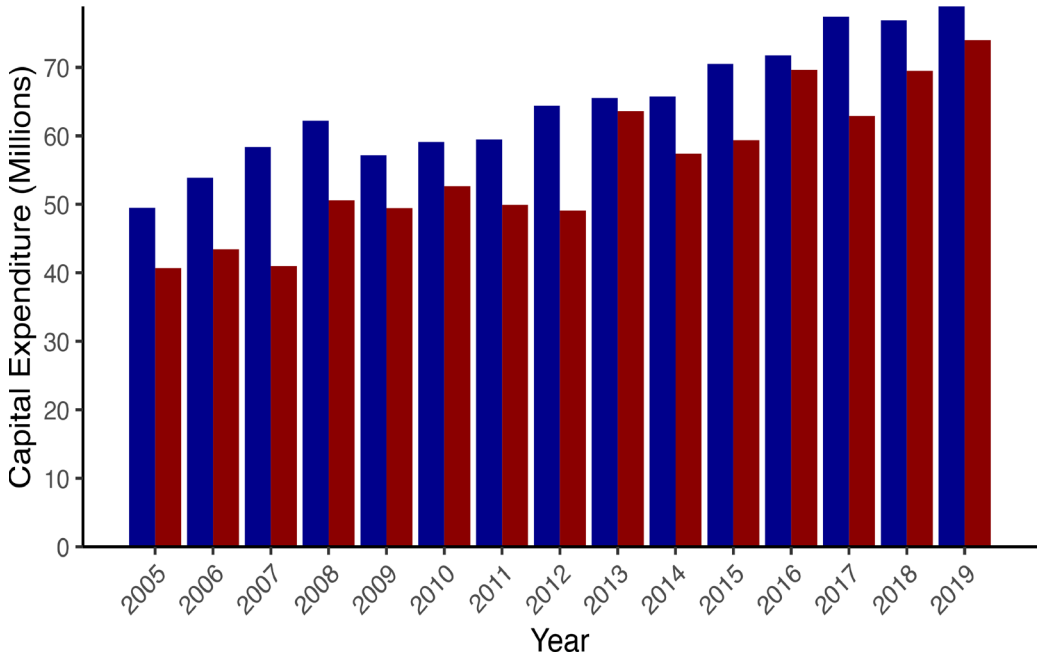
CAPITAL EXPENDITURES

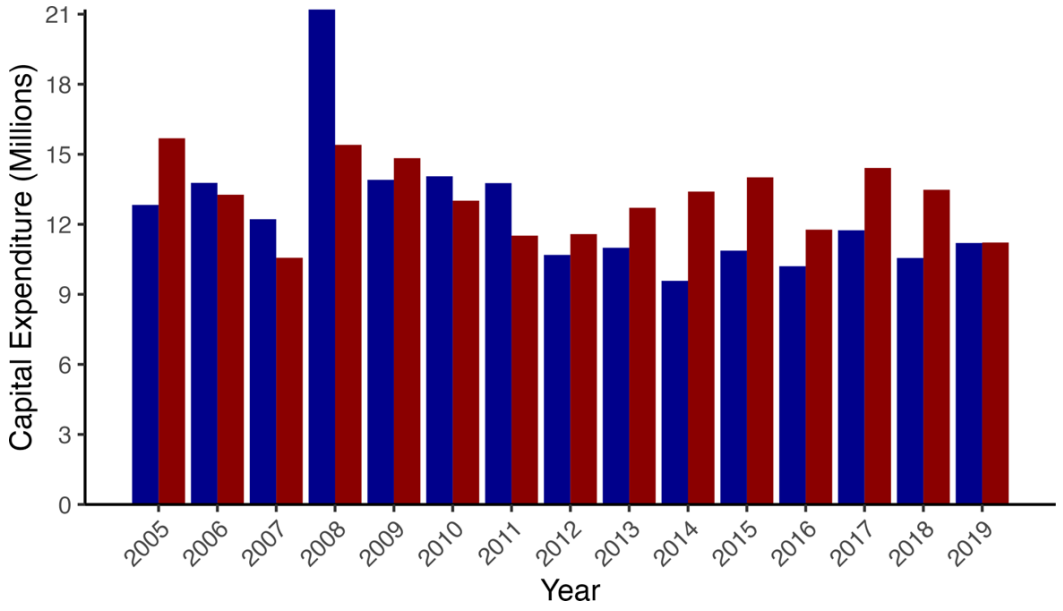
ALL HOSPITALS

ACES firm estimate larger than sum of capital expenditures across AHA hospital locations by 17%.



INDEPENDENT HOSPITALS

Estimates are more closely correlated.



ACES AHA

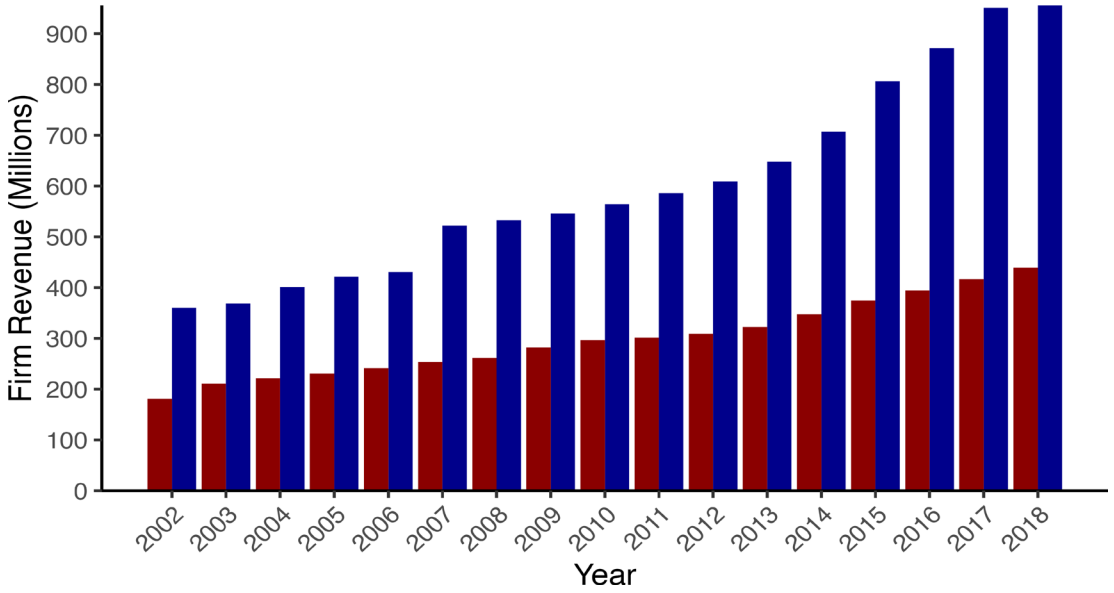
Mean annual capital expenditures ACES: $51.5 million AHA: $47.7 million

All values inflation adjusted to 2018 dollars. AHA data not available before 2005.

REVENUES

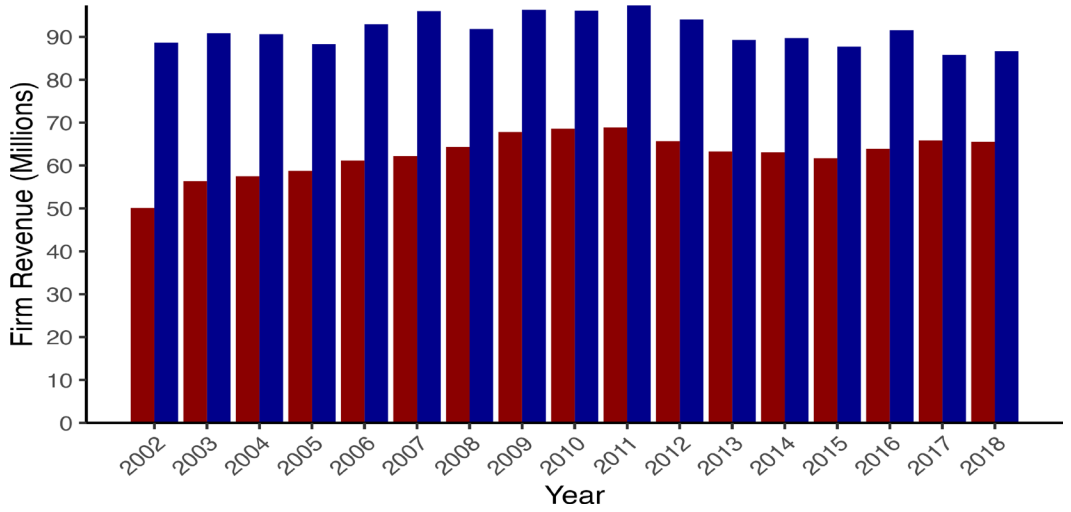
ALL HOSPITALS

Non-hospital revenue share grows from 49.8% to 54%



INDEPENDENT HOSPITALS

On average, 68.5% of firm revenue is captured by HCRIS



HCRIS LBD

All values inflation adjusted to 2018 dollars.

WHAT WE DO

MATCH HOSPITALS	Census Bureau's LBD and AHA's Hospital Survey
BENCHMARK	Measures in matched LBD-AHA sample
DETERMINE	Areas for caution
	Measuring mergers and acquisitions

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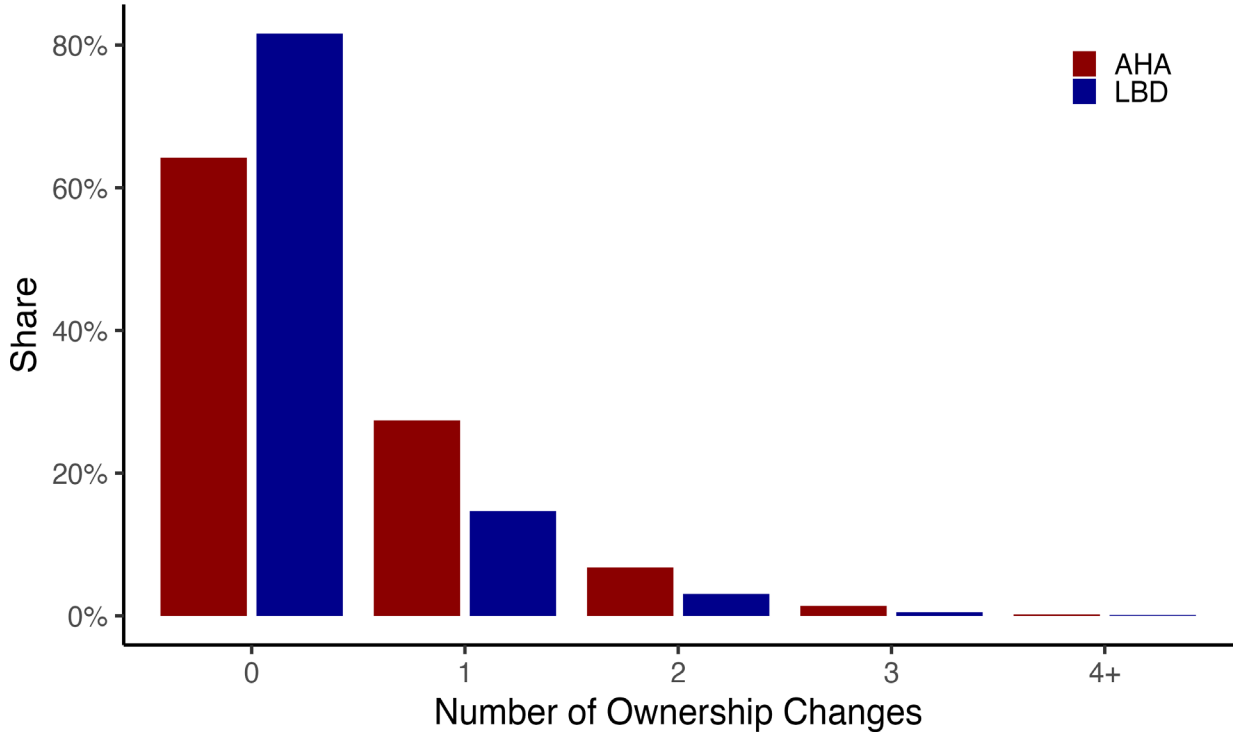
MERGERS AND ACQUISITIONS

2002-2019
SHARE OF HOSPITALS THAT CHANGED OWNERSHIP



Majority of hospitals have no ownership change.

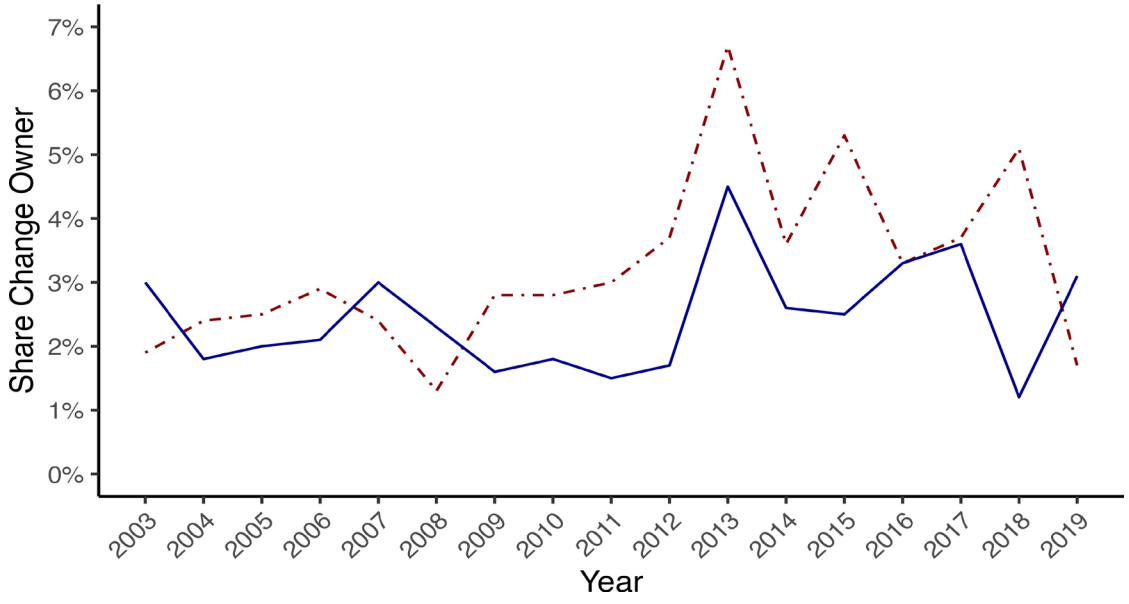
AHA hospitals report more mergers and acquisitions than the LBD

LBD change in ownership = firm identifier change,
AHA change in ownership = system identifier change.
Use establishment identifier if system identifier is missing.

MERGERS AND ACQUISITIONS (M&A)

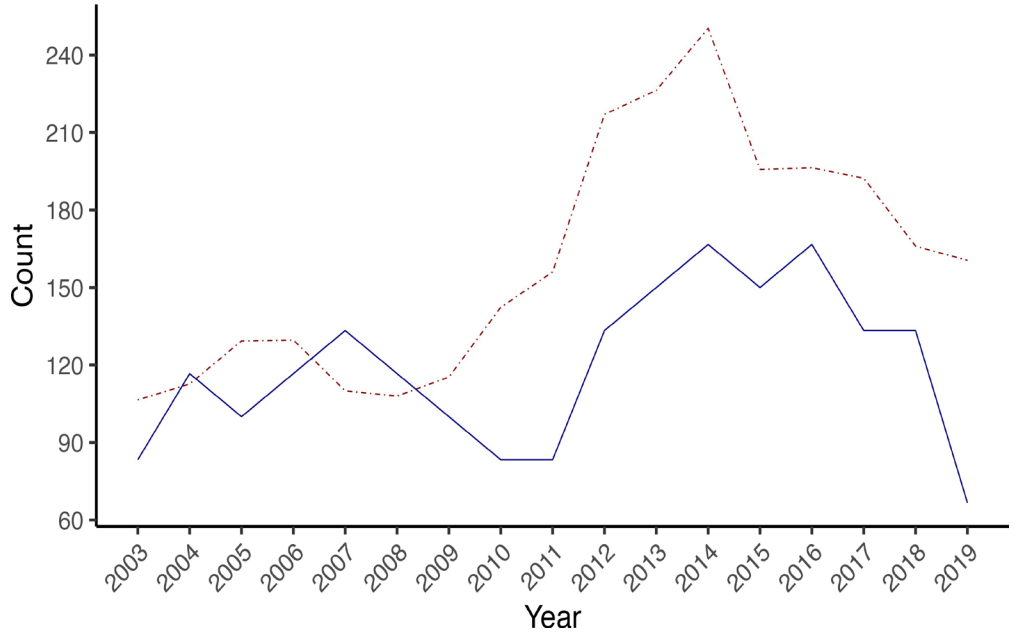
RATE OF OWNERSHIP CHANGES

Average M&A rate is 32% higher in AHA



ROLLING FREQUENCY OF OWNERSHIP CHANGES

Average M&A frequency is 33% higher in AHA



AHA — LBD

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MERGERS AND ACQUISITIONS

2017-2019 GROUND TRUTHING

Randomly select 100 AHA ownership changes

Search for same deals in the LBD

LBD has fewer false positives (4.2%) but

LBD undercounts true positives (10.2%)

Suggests AHA offers a biased M&A measure

LBD offers a (conservative) alternative

		LBD	
AHA	*Positive*	*Negative*	*Total*
True Positive	**10.2%**	23.8%	34%
False Positive	**4.2%**	37.8%	42%
Total	14.4%	61.6%	76%

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CONCLUSIONS

MATCH Census Bureau's LBD and AHA's Hospital Survey

AHA survey not a census of hospitals, missing locations often smaller and in less rural areas.

AHA panel is more balanced than the LBD sample and this affects entry and exit rates.

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DETERMINE Areas for caution

M&A measures reveal the biggest differences between the LBD and AHA.

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Thank you.

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