

Appendix

We construct county-year level measures of the share of the market served by hospitals with each hospital characteristic H in county i at year t , Z_{it}^H , as

$$Z_{it}^H = \sum_{\substack{j \text{ serving} \\ \text{county } i}} c_{ijt} \times \sum_{\substack{k \text{ admitting} \\ \text{to } j}} b_{kjt} \times \sum_{\substack{j \text{ serving} \\ \text{zipcode } k}} a_{jkt} AHA_{jt}^H,$$

where j and k index hospitals and zip codes, respectively; a_{jkt} is the share of elderly Medicare patients who live in zip k admitted to hospital j ; b_{kjt} is the share of patients admitted to hospital j who live in zip k ; c_{ijt} is the share of patients who live in county i admitted to hospital j ; and AHA_{jt}^H is an indicator variable from the American Hospital Association survey that is equal to 1 if the hospital has characteristic H , including large/small size (omitted group is medium size), for-profit/nonprofit ownership (omitted group is public ownership), teaching, system, and vertical integration status.¹ The b_{kjt} -weighting in Z_{it}^H assumes that the characteristics of hospital j 's market depends on the weighted average of all of the zip-code patient residence areas that it serves; the c_{ijt} -weighting defines a county's characteristics as the weighted average of all of the hospitals that serve patients who live in county i .

We also construct an HHI of hospital services, $HHHI_{it}$:

$$HHHI_{it} = \sum_{\substack{j \text{ serving} \\ \text{county } i}} c_{ijt} \times \sum_{\substack{k \text{ admitting} \\ \text{to } j}} b_{kjt} \times \sum_{\substack{j \text{ serving} \\ \text{zipcode } k}} a_{jkt}^2.$$

¹ a_{jkt} , b_{kjt} , and c_{ijt} are derived from 100% MEDPAR inpatient claims files, matched with fee-for-service Medicare enrollment files.

Appendix Table 1: Descriptive Statistics for Variables Used in Analysis

	All US mean (sd)	Sample mean (sd)		All US mean (sd)	Sample mean (sd)
<u>County characteristics</u>			<u>Hospital market characteristics</u>		
Population (1,000,000)	0.114 (0.336)	0.302 (0.611)	Fully-integrated organization (FIO)	0.311 (0.247)	0.325 (0.235)
Medicare beneficiaries /pop	0.139 (0.037)	0.131 (0.035)	Closed PHO (exclusive contract)	0.088 (0.131)	0.096 (0.137)
Physicians/1,000 pop	2.365 (1.491)	2.404 (1.282)	Open PHO (nonexclusive contract)	0.097 (0.156)	0.104 (0.149)
Median income (100,000 \$)	0.472 (0.124)	0.510 (0.138)	IPA	0.072 (0.120)	0.054 (0.094)
Medicare wage index	1.011 (0.159)	0.989 (0.124)	Hospital capacity index	0.975 (0.491)	0.904 (0.403)
Northeast region	0.190	0.084	For-profit	0.130 (0.182)	0.166 (0.200)
Midwest region	0.225	0.263	Non-profit	0.754 (0.256)	0.704 (0.276)
South region	0.356	0.518	<100 bed hospital	0.094 (0.153)	0.077 (0.111)
West region	0.229	0.137	>300 bed hospital	0.497 (0.235)	0.526 (0.212)
<u>MarketScan Price, Volume, Spending</u>			Teaching	0.303 (0.241)	0.305 (0.237)
Price index		1.000 (0.269)	System	0.641 (0.253)	0.675 (0.243)
Spending index		1.000 (0.306)	Hospital HHI	0.481 (0.151)	0.453 (0.117)
Volume index		1.007 (0.199)			
Price per hospital admission (\$)		10786 (5077)			
Hospital spending per enrollee (\$/yr)		686 (401)			
			# counties	2,454	639
			Annual population	279,690,260	192,941,513
			Annual MarketScan enrollees		3,485,764

Notes: All US includes counties with county and market characteristics in every year 2001-2007; statistics are population weighted. MarketScan counties include those with > 10 claims and > 100 enrollees in every year 2001-2007; statistics are enrollment weighted.

Baker LC, Bundorf MK, Kessler DP. Vertical integration: hospital ownership of physician practices is associated with higher prices and spending. Health Aff (Millwood). 2014;33(5).

Appendix Table 2: Effect of Vertical Integration and Selected Market Characteristics on Hospital Prices, Spending, and Volume

	Dependent Variable		
	Price	Spending	Volume
Fully-integrated organization	0.137 *** (0.046)	0.103 ** (0.048)	-0.019 (0.018)
Closed PHO (exclusive contract)	0.001 (0.049)	-0.033 (0.053)	-0.033 (0.025)
Open PHO (nonexclusive contract)	0.062 (0.065)	-0.005 (0.064)	-0.050 ** (0.022)
Independent Practice Association	0.043 (0.075)	0.006 (0.079)	-0.025 (0.033)
Hospital Hirschman-Herfindahl Index	0.360 * (0.190)	0.547 *** (0.202)	0.054 (0.086)

Notes: N = 4,473 = 639 counties x 7 years. Models include county- and year-fixed effects plus county and market controls in Table 1. Heterscedasticity-consistent standard errors in parentheses. *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.