

Appendix

Appendix Exhibit A1: Preferred estimating equation

Our preferred estimating equation is presented below where i indexes year and r indexes rating area.

HHI is the lagged rating area HHI for hospitals, $\%HMO$ is the rating area share of HMO plans, $carriers$ is the rating area number of insurers, $demographics$ is a vector of time-invariant rating area demographics characteristics, and $year$ and $state$ are year indicators and state fixed effects, respectively. In addition, the primary specification includes an interaction term for state and year to account for time-varying state-level characteristics:

$$premiums_{ir} = \beta_1 HHI_{ir} + \beta_2 \%HMO_{ir} + \beta_3 carriers_{ir} + \beta_4 demographics_r + \beta_5 year + \beta_6 state + \epsilon$$

Appendix Exhibit A2: Regression output from primary specifications

VARIABLES	Unadjusted	S.E.	Main Model	S.E.	W/HHI-Insurer Interaction	S.E.
2 nd HHI Tercile	72.97	(163.5)	89.28	(91.41)	338.5*	(177.5)
3 rd HHI Tercile	624.8****	(150.8)	423.7****	(103.8)	762.7****	(218.5)
No. Carriers			-275.9****	(38.59)	-237.5****	(43.03)
% HMOs			-2.560	(3.829)	-2.822	(3.788)
2 nd HHI Tercile * no. carriers					-68.85*	(36.06)
3 rd HHI Tercile * no. carriers					-99.21**	(44.89)
% black			-2.712	(6.082)	-2.646	(6.007)
% male			3.129	(59.33)	5.831	(58.59)
% poverty			54.69**	(24.89)	53.75**	(24.84)
% over 65			-34.32*	(17.55)	-36.45**	(17.62)
Population			-0.000100	(0.000141)	-0.000126	(0.000136)
Marketplace Enrollment			0.00142	(0.00228)	0.00152	(0.00221)
Median Income			0.0339***	(0.0104)	0.0334***	(0.0102)
Deaths per 1k			136.5***	(52.59)	138.3***	(52.81)
Unemployment Rate			34.50	(41.13)	34.99	(41.84)
% on food stamps			-11.82	(22.59)	-10.53	(22.68)
% over 25 w/< H.S. Diploma			-16.43	(14.46)	-17.18	(14.46)
MDs per 1k			-3.153	(67.88)	-8.548	(66.48)
Hospital Beds per 1k			32.94	(36.40)	30.74	(35.64)
Hospital Total Expenditures			122.6**	(56.99)	123.8**	(56.71)
Admissions per 1k			-5.202***	(1.925)	-5.349***	(1.920)
ICU Beds per 1k			-203.9	(590.5)	-151.0	(582.4)
% rural			5.097***	(1.765)	5.016***	(1.739)
N	1,667		1,667		1,667	
R-squared	0.017		0.821		0.822	
2014 Included	YES		YES		YES	
State FE	NO		YES		YES	
Year FE	NO		YES		YES	
Insurer-HHI Interactions	NO		NO		YES	
Lagged Premiums	NO		NO		NO	
State-Year Interactions	NO		YES		YES	

Source/Notes: Outcome is the second lowest-cost silver premium for 64-year olds

Robust standard errors (in parentheses) clustered at the rating area level

Education measure is an average for 2011-2015, all other measures are for 2014

Rating area-level measures are county-population-weighted averages

Rural % is a county-population-weighted average of an indicator for rurality

Hospital expenses are the sum of payroll and facility expenses incurred by short-term general hospitals.

The first tercile of HHI is always used as the reference group where appropriate.

**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

Appendix Exhibit A3: Regression output from supplemental models

VARIABLES	Lagged Premium	S.E.	Exclude 2014	S.E.	Continuous HHI	S.E.
2 nd HHI Tercile	57.45	(52.39)	123.4	(98.12)		
3 rd HHI Tercile	118.3*	(60.26)	469.7****	(109.4)		
% HMO	-2.298	(2.375)	-2.964	(4.069)	-2.503	(3.881)
No. carriers	-128.1****	(23.12)	-296.7****	(40.40)	-273.7****	(38.36)
Continuous HHI					0.219****	(0.0487)
Lagged Premium	0.932****	(0.0476)				
% black	6.984**	(3.513)	-0.354	(6.414)	-2.343	(6.007)
% male	16.86	(31.36)	21.37	(67.51)	10.40	(62.87)
% poverty	4.110	(12.06)	57.18**	(26.25)	55.69**	(24.85)
% over 65	-16.34**	(7.967)	-36.68*	(19.17)	-33.76	(17.68)
Population	-7.61e-05	(5.60e-05)	-8.25e-05	(0.000149)	-9.02e-05	(0.000142)
Marketplace Enrollment	-6.85e-05	(0.000958)	0.000231	(0.00238)	0.00155	(0.00231)
Median Income	0.00390	(0.00530)	0.0367****	(0.0106)	0.0347****	(0.0104)
Deaths per 1k	49.45*	(26.52)	154.2**	(56.82)	143.0***	(53.47)
Unemployment Rate	-19.44	(28.38)	39.72	(42.31)	19.76	(40.40)
% on food stamps	-24.30*	(12.84)	-21.40	(24.10)	-8.427	(22.69)
% over 25 w/< H.S. Diploma	9.367	(9.530)	-9.808	(16.09)	-14.53	(14.75)
MDs per 1k	10.81	(31.20)	23.32	(73.77)	3.376	(67.28)
Hospital Beds per 1k	-18.31	(24.42)	25.80	(40.38)	17.96	(35.93)
Hospital Total Expenditures	10.73	(29.08)	116.3	(62.91)	126.1**	(57.49)
Admissions per 1k	-0.823	(0.903)	-5.476***	(2.080)	-5.231***	(1.957)
ICU Beds per 1k	-96.86	(352.8)	-212.8	(662.3)	-250.9	(590.7)
% rural	1.492	(0.933)	5.286***	(1.948)	4.896***	(1.800)
N	1,224		1,310		1,667	
R-squared	0.898		0.822		0.821	
2014 Included	YES		NO		NO	
State FE	YES		YES		YES	
Year FE	YES		YES		YES	
Insurer-HHI Interactions	NO		NO		NO	
Lagged Premiums	YES		NO		NO	
State-Year Interactions	YES		YES		YES	

Source/Notes: Outcome is the second lowest-cost silver premium for 64-year olds

Robust standard errors (in parentheses) clustered at the rating area level

Education measure is an average for 2011-2015, all other measures are for 2014

Rating area-level measures are county-population-weighted averages

Rural % is a county-population-weighted average of an indicator for rurality

Hospital expenses are the sum of payroll and facility expenses incurred by short-term general hospitals.

The first tercile of HHI is always used as the reference group where appropriate.

**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

Appendix Exhibit A4: Relationship Between Hospital HHI and Premiums Stratified by Number of Insurers

Number of Insurers	Differences in Premiums between Least and Most Concentrated Hospital Markets (\$)	N
Most Insurers	505 (133) ****	469
Moderate number of Insurers	346 (138) **	370
Fewest Insurers	341 (156) **	828

Source: Authors' calculations based on HIX Compare and Hospital Service Area file data. The number of insurers is ranked into terciles of number of insurers within a rating area in the given year. Includes controls for year and state fixed effects, share of HMOs, the number of carriers in the rating area-year, demographics, and a state-year interaction term. Robust standard errors clustered at the rating area are in parentheses. **** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

Appendix Exhibit A5: Summary of key variables

	Mean	Median	N	SD	Min	Max
Hospital HHI	3701.70	3561.38	1667.00	909.93	1705.42	6907.79
% HMO	38.33	39.13	1667.00	31.08	0.00	100.00
No. carriers	3.51	3.00	1667.00	2.09	1.00	12.00
% black	12.61	7.73	1667.00	12.76	0.42	62.16
% male	49.46	49.30	1667.00	1.27	46.20	60.25
% poverty	16.80	16.37	1667.00	4.78	5.71	34.50
% over 65	16.23	15.70	1667.00	4.30	7.18	52.89
Population	654,441.90	319,185.00	1667.00	1,015,381.36	159,44.00	9,787,579.00
Marketplace Enrollment	20672.45	8521.00	1667.00	43331.87	0.00	392442.00
Median Income	49142.86	47237.76	1667.00	10629.14	29799.63	102293.95
Deaths per 1k	9.35	9.27	1667.00	2.00	3.74	17.92
% unemployed	6.33	6.20	1667.00	1.79	2.50	21.91
% on food stamps	15.68	15.25	1667.00	5.55	4.11	33.34
% w/diploma	13.65	12.54	1667.00	5.13	4.70	37.90
MDs per 1k	2.08	1.73	1667.00	1.31	0.27	10.27
Hospital beds per 1k	3.11	2.89	1667.00	1.50	0.00	10.39
Hospital total expenditures	3.34	3.07	1667.00	1.68	0.00	12.71
Admissions per 1k	109.90	105.09	1667.00	46.65	0.00	328.13
ICU beds per 1k	0.15	0.14	1667.00	0.09	0.00	0.56
% rural	29.12	8.03	1667.00	37.24	0.00	100.00

Source/Notes: Authors' analysis of data from Hospital Service Area Files, AHRF, and HIX Compare.