

Online Appendix for
Diagnosing Hospital System Bargaining Power
in Managed Care Networks

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APPENDIX A.

TABLE A-1—INCLUDED SERVICES BY DIAGNOSTIC CATEGORY

Service Name	Diagnostic Category
Emergency Room	Unrestricted [†]
Magnetic resonance imaging	Unrestricted
Neurological services	Nervous System
Adult diagnostic/invasive catheterization	Circulatory System
Adult cardiac surgery	Circulatory System
Esophageal impedance study	Digestive System
Bariatric/weight control services	Digestive System
Medical/surgical intensive care	Unrestricted
Orthopedic services	Musculoskeletal System
Burn care	Skin, Subcutaneous Tissue & Breast
Nutrition programs	Endocrine, Nutritional, & Matabolic
Obstetrics care	Pregnancy & Childbirth
Ultrasound	Pregnancy & Childbirth
Birthing Room	Pregnancy & Childbirth
Oncology services	Any DRG associated with a cancer
Chemotherapy	Any DRG associated with a cancer

Note: [†] Included only for discharges that were not scheduled 24 hours in advance. All services also include an interaction with travel time in the demand model.

TABLE A-2—TOP 10 MANAGED CARE COMPANIES

HMO	Enrollment	Share
Blue Cross of California	3,913,413	0.2605
California Physicians' Service	2,617,096	0.1742
Health Net of California, Inc.	2,123,679	0.1414
PacificCare of California	1,283,343	0.0854
Local Initiative Health Authority For L.A. County	773,455	0.0515
Aetna Health of California, Inc.	459,827	0.0306
Inland Empire Health Plan	382,265	0.0255
Orange County Health Authority	351,056	0.0234
Molina Healthcare of California	321,744	0.0214
Heritage Provider Network, Inc.	321,234	0.0214
Total	15,020,203	1.0000

Note: Kaiser Permanente is omitted because it is an integrated managed care network and is excluded from our data.

TABLE A-3—ALL HOSPITAL CHARACTERISTICS (N = 343)

Type	Characteristic	Frequency	Type	Characteristic	Frequency
Control	Government	.199	Conditional on System Membership	Government	.093
	For-Profit	.271		For-Profit	.324
	Non-Profit	.530		Non-Profit	.583
Status	Teaching	.073	Physician Arrangement	GPWW	.021
	Rural	.184		IPA	.163

Note: There is no statistical difference between the probability of being a for-profit hospital conditional on being a private hospital in a system ($p < .10$).

TABLE A-4—CHOICE SET FREQUENCY DISTRIBUTION

# Hospitals	Freq.	Percent	Cum.
1 - 9	276,130	20.28	20.28
10 - 19	317,505	23.32	43.60
20 - 29	155,822	11.44	55.04
30 - 39	106,962	7.86	62.90
40 - 49	66,530	4.89	67.79
50 - 59	114,027	8.37	76.16
60 - 69	125,386	9.21	85.37
70 - 79	51,852	3.81	89.18
80 - 89	52,555	3.86	93.04
90 - 99	71,566	5.26	98.29
100 - 109	22,866	1.68	99.97
111 - 119	361	0.03	100.00
Total	1,361,562	100.00	

TABLE A-5—HMO HOSPITAL INCLUSION

HMO	Percentile									Mean
	99th	95th	90th	75th	50th	25th	10th	5th	1st	
Blue Shield	1.00	1.00	1.00	0.92	0.77	0.55	0.42	0.32	0.14	0.72
HPA/PacifiCare	1.00	1.00	1.00	1.00	0.92	0.65	0.54	0.36	0.20	0.82
Aetna	1.00	0.95	0.82	0.61	0.43	0.32	0.27	0.18	0.11	0.48
Health Net of CA	1.00	1.00	1.00	0.99	0.81	0.58	0.42	0.30	0.18	0.75
Blue Cross	1.00	1.00	1.00	1.00	0.94	0.71	0.55	0.45	0.20	0.84
Total	1.00	1.00	1.00	1.00	0.84	0.60	0.42	0.31	0.17	0.77

Note: This table reports the share of hospitals in a patient’s provider network (by HMO) for the HMO patients used in the bargaining analysis. Observations are at the patient level.

TABLE A-6—HOSPITAL SYSTEM SIZE FREQUENCY DISTRIBUTION

# System Members	System-Market Observations			Hospital Observations		
	N	Freq.	Cum.	N	Freq.	Cum.
1	133	43.75	43.75	133	27.2	27.2
2	10	3.29	47.04	16	3.27	30.47
3	7	2.3	49.34	19	3.89	34.36
4	11	3.62	52.96	38	7.77	42.13
5	9	2.96	55.92	24	4.91	47.03
6	11	3.62	59.54	28	5.73	52.76
8	5	1.64	61.18	5	1.02	53.78
9	11	3.62	64.8	21	4.29	58.08
11	3	0.99	65.79	3	0.61	58.69
12	13	4.28	70.07	25	5.11	63.8
20	5	1.64	71.71	11	2.25	66.05
22	10	3.29	75	20	4.09	70.14
23	10	3.29	78.29	20	4.09	74.23
24	4	1.32	79.61	6	1.23	75.46
27	1	0.33	79.93	4	0.82	76.28
30	1	0.33	80.26	4	0.82	77.1
36	15	4.93	85.2	30	6.13	83.23
39	14	4.61	89.8	29	5.93	89.16
43	2	0.66	90.46	2	0.41	89.57
55	6	1.97	92.43	8	1.64	91.21
62	5	1.64	94.08	12	2.45	93.66
63	3	0.99	95.07	5	1.02	94.68
71	2	0.66	95.72	2	0.41	95.09
74	5	1.64	97.37	12	2.45	97.55
118	2	0.66	98.03	2	0.41	97.96
166	3	0.99	99.01	5	1.02	98.98
175	3	0.99	100	5	1.02	100
	304	100	100	489	100	100

Note: The # of system members represent the total number of member hospitals. Because the data is aggregated together when a system has multiple members in the same patient market the System-Market observations columns represents the frequency and counts of the observations in the data while the Hospital observations represents the total number of hospitals that are represented in the System-Market aggregated data.

TABLE A-7—MANAGED CARE DISCHARGES ($N = 1,361,562$)

Category	Characteristic	Mean	S.D.	Min.	Max.
Insurer	Private	.833	.139	0	1
	Medicare Advantage	.167	.139	0	1
Choice Sets	Choice Set Size	59.00	28.04	2	111
	Travel Time (minutes to chosen hospital)	20.07	14.28	0	90
	Travel Time (minutes to all hospitals)	36.63	13.52	0	90
Diagnostic Category (Shares)	Nervous System Diagnosis	.057	.054	0	1
	Ear, Nose, Mouth, & Throat	.014	.014	0	1
	Respiratory System	.071	.066	0	1
	Circulatory System	.138	.119	0	1
	Digestive System	.111	.099	0	1
	Hepatobiliary System	.038	.037	0	1
	Musculoskeletal System	.099	.089	0	1
	Skin, Subcutaneous Tissue & Breast	.026	.025	0	1
	Endocrine, Nutritional, & Metabolic	.037	.036	0	1
	Kidney & Urinary Tract	.035	.034	0	1
	Male Reproductive	.008	.087	0	1
	Female Reproductive	.050	.048	0	1
	Pregnancy & Childbirth	.245	.185	0	1
	Blood & Immunological	.012	.112	0	1
	Myeloproliferative	.013	.013	0	1
	Infectious & Parasitic	.026	.025	0	1
	Injuries & Poisonings	.006	.006	0	1
Type of Cancer	.062	.058	0	1	
Diagnosis	Length of stay (days)	3.576	5.124	0	356
	Male	.281	.202	0	1
	Age < 18	.065	.061	0	1
	18 ≤ Age < 35	.238	.181	0	1
	35 ≤ Age < 65	.458	.248	0	1
	Age > 65	.239	.182	0	1
	White	.604	.239	0	1
	Black	.027	.026	0	1
	Asian	.055	.052	0	1
	Other/Unknown	.314	.215	0	1
	Rural	.029	.028	0	1
Income (\$1,000)	53.60	19.84	0	200	

Note: Summary statistics are for all discharges used in the analysis. Only the discharges for managed care patients privately insured or in Medicare Advantage are used to estimate hospital demand. The DRGs used to indicate a discharge related to cancer include 23, 54, 55, 146, 147, 148, 180, 181, 182, 374, 375, 376, 435, 436, 437, 542, 543, 544, 582, 583, 597, 598, 599, 656, 657, 658, 686, 687, 688, 715, 716, 722, 723, 724, 736, 737, 738, 739, 740, 741, 742, 743, 754, 755, 756, 820, 821, 822, 823, 824, 825, 834, 835, 836, 837, 838, 839, 840, 841, 842, 846, 847, and 848.

FIGURE A-1. LOCALIZED SYSTEMS: AHMC, INC.

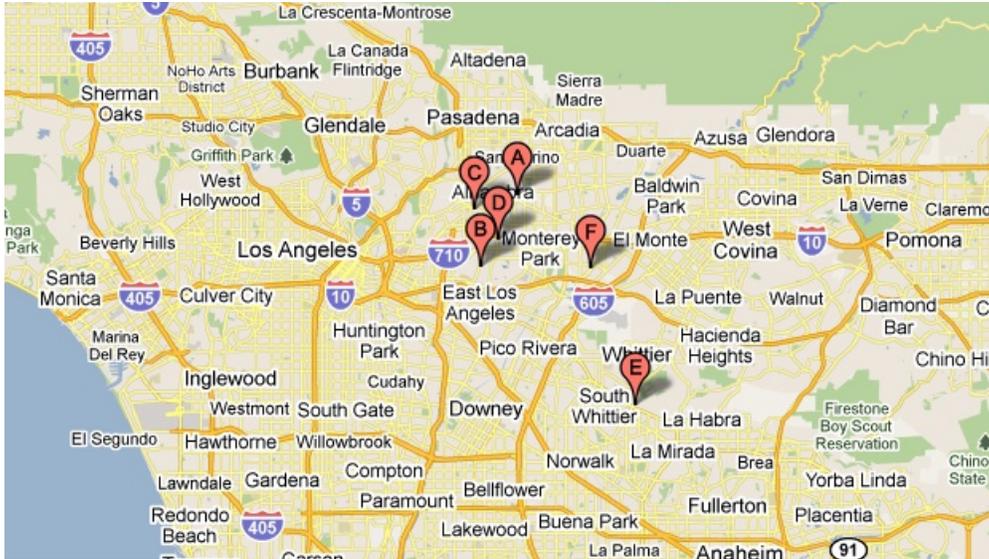
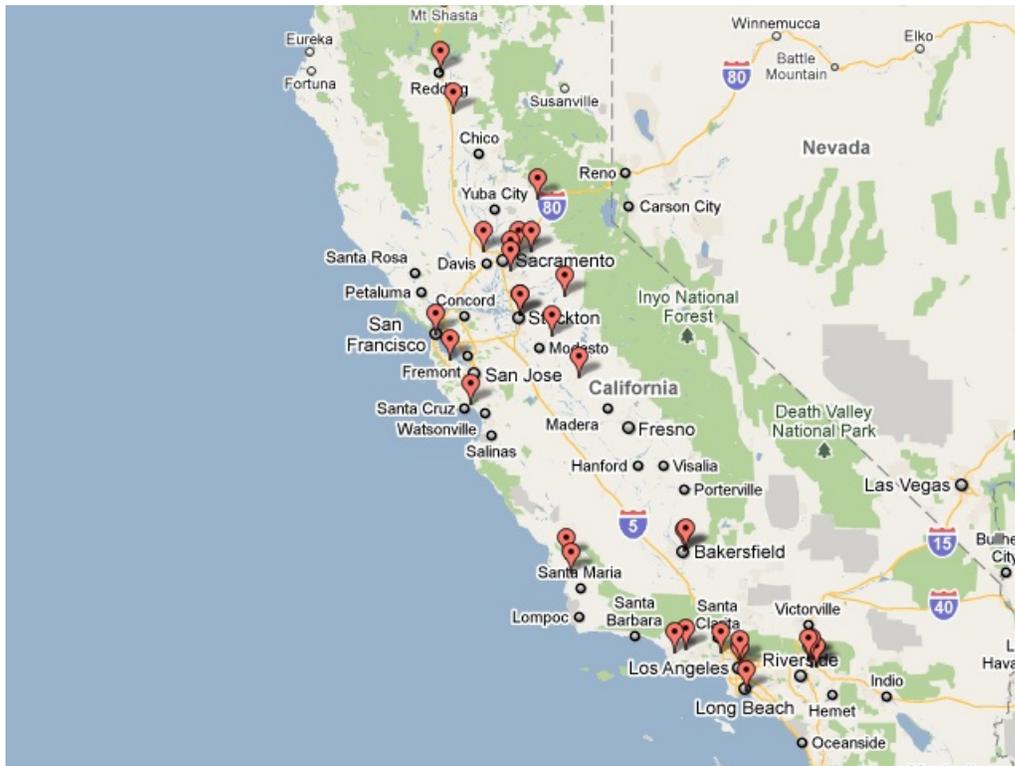


FIGURE A-2. DISPERSED SYSTEMS: CATHOLIC HEALTHCARE WEST



APPENDIX B. COMPLETE COST AND BARGAINING ESTIMATES

TABLE B-1—COST ESTIMATES BASED ON IN-PATIENT DAYS AS OUTPUT

			×For-Profit		× Government	
	b	se	b	se	b	se
% ER	-0.1221	(0.1023)	0.1146	(0.1111)	0.0617	(0.1047)
% Mcar	0.0482	(0.0563)	-0.1352	(0.0595)	-0.0807	(0.0604)
Other OP	-0.2224	(0.0971)	-0.0080	(0.1420)	0.3705	(0.1675)
Other OP ²	0.0080	(0.0093)	0.0012	(0.0103)	0.0143	(0.0117)
Mcare OP	-0.0680	(0.1041)	0.0312	(0.1546)	0.2932	(0.1965)
Mcare OP ²	-0.0021	(0.0036)	0.0009	(0.0108)	0.0130	(0.0083)
Prvt FFS OP	0.0924	(0.0657)	-0.0494	(0.0573)	0.0685	(0.1147)
Prvt FFS OP ²	0.0004	(0.0019)	0.0018	(0.0022)	-0.0056	(0.0029)
Other IP × Mcare IP	0.0135	(0.0117)	0.0013	(0.0165)	-0.0495	(0.0211)
Other IP × Prvt MC OP	0.0004	(0.0039)	0.0025	(0.0043)	-0.0090	(0.0084)
Other IP × Prvt FFS OP	-0.0112	(0.0050)	0.0033	(0.0059)	-0.0033	(0.0067)
Mcare IP × Prvt MC IP	0.0004	(0.0040)	-0.0031	(0.0041)	0.0078	(0.0087)
Mcare IP × Prvt FFS OP	-0.0003	(0.0049)	0.0011	(0.0062)	0.0061	(0.0118)
# Beds	-0.1841	(0.7001)	1.1728	(0.8794)	-1.1596	(0.9162)
# Beds ²	-0.1039	(0.0552)	0.0485	(0.0612)	0.0631	(0.0510)
Fixed Assets	-0.2685	(0.3512)	0.2686	(0.2784)	0.0965	(0.3386)
Fixed Assets ²	0.0026	(0.0100)	0.0006	(0.0049)	0.0071	(0.0132)
# Beds × Assets	0.0711	(0.0553)	-0.0114	(0.0410)	-0.0019	(0.0387)
Employee Hours × Assets	-0.0096	(0.0309)	-0.0176	(0.0251)	-0.0249	(0.0314)
Employee Hours × # Beds	0.0068	(0.0901)	-0.1133	(0.0966)	0.0403	(0.0929)
Employee Hours × Mcare Days	-0.0393	(0.0181)	0.1452	(0.0527)	0.0385	(0.0187)
Employee Hours × Prvt Days	0.0104	(0.0209)	-0.0770	(0.0305)	-0.0089	(0.0212)
Management Hours	0.3469	(0.2795)	0.3516	(0.4174)	-0.0383	(0.3946)
Management Hours ²	-0.0134	(0.0121)	-0.0170	(0.0184)	0.0009	(0.0170)
Clerical Hours	0.2742	(0.4064)	-0.8488	(0.3656)	0.0879	(0.4675)
Clerical Hours ²	-0.0083	(0.0160)	0.0330	(0.0152)	-0.0057	(0.0187)
RN Hours	-0.4090	(0.4170)	0.5578	(0.4624)	-0.0250	(0.4001)
RN Hours ²	0.0056	(0.0188)	-0.0290	(0.0176)	-0.0051	(0.0114)
RN Hours × Staff Hours	0.0281	(0.0163)	0.0092	(0.0249)	0.0029	(0.0258)
Other IP	0.1726	(0.1833)	-0.5053	(0.1851)	0.2984	(0.3238)
Other IP ²	-0.0047	(0.0078)	0.0033	(0.0082)	0.0090	(0.0099)
Mcare IP	0.2744	(0.1450)	-0.7613	(0.4280)	-0.4577	(0.3152)
Mcare IP ²	0.0152	(0.0036)	0.0062	(0.0192)	-0.0176	(0.0141)
Prvt IP	-0.1395	(0.2200)	0.2382	(0.3275)	0.0526	(0.3024)
Prvt IP ²	0.0092	(0.0037)	0.0137	(0.0087)	0.0048	(0.0085)
All IP × Other OP	0.0021	(0.0125)	0.0459	(0.0144)	-0.0424	(0.0314)
All IP × Mcar. OP	0.0119	(0.0149)	-0.1079	(0.0205)	0.0245	(0.0308)
All IP × Prvt OP	-0.0028	(0.0162)	0.0572	(0.0169)	-0.0016	(0.0380)
Other IP × Mcare IP	0.0031	(0.0063)	-0.0041	(0.0063)	0.0028	(0.0062)
Other IP × Prvt IP	-0.0058	(0.0049)	-0.0012	(0.0054)	0.0096	(0.0084)
Mcare IP × Prvt IP	0.0038	(0.0052)	0.0006	(0.0049)	-0.0056	(0.0086)

Note: All outputs and inputs are in logs. OP=Out Patient, IP=In Patient, Prvt.=Privately Insured, MCar=Medicare, MC=Managed Care, FFS=Fee for service. Standard errors are in parentheses and are clustered by hospital. Specification includes hospital fixed effects and a time trend and has an adjusted R^2 greater than 0.97.

TABLE B-1—COST ESTIMATES BASED ON IN-PATIENT DAYS AS OUTPUT, CONTINUED

	×Trauma Center		×System Member		× Rural	
	b	se	b	se	b	se
% ER	-0.1417	(0.1170)	-0.0326	(0.0997)	-0.0506	(0.1123)
% Mcar	0.0660	(0.0499)	0.0119	(0.0552)	-0.0230	(0.0506)
Other OP	-0.2385	(0.4060)	0.3336	(0.1271)	-0.0891	(0.3415)
Other OP ²	0.0512	(0.0216)	-0.0046	(0.0124)	0.0136	(0.0240)
Mcare OP	0.8262	(0.3007)	0.0935	(0.1679)	0.1704	(0.4406)
Mcare OP ²	-0.0030	(0.0092)	0.0138	(0.0098)	-0.0015	(0.0263)
Prvt FFS OP	0.1557	(0.0953)	-0.0505	(0.0657)	-0.1880	(0.1226)
Prvt FFS OP ²	0.0005	(0.0016)	-0.0012	(0.0020)	0.0030	(0.0027)
Other IP × Mcare IP	-0.0596	(0.0231)	-0.0314	(0.0171)	-0.0309	(0.0354)
Other IP × Prvt MC OP	0.0045	(0.0046)	-0.0009	(0.0033)	0.0008	(0.0062)
Other IP × Prvt FFS OP	-0.0121	(0.0086)	0.0106	(0.0058)	0.0086	(0.0126)
Mcare IP × Prvt MC IP	-0.0048	(0.0045)	-0.0008	(0.0034)	-0.0015	(0.0064)
Mcare IP × Prvt FFS OP	-0.0027	(0.0041)	-0.0022	(0.0057)	0.0091	(0.0148)
# Beds	0.3284	(1.5208)	-0.3860	(0.8450)	0.9604	(1.2910)
# Beds ²	0.0898	(0.0563)	0.1037	(0.0520)	0.0426	(0.0498)
Fixed Assets	0.4616	(0.4615)	-0.1221	(0.2309)	0.2141	(0.5010)
Fixed Assets ²	-0.0073	(0.0106)	-0.0018	(0.0080)	-0.0146	(0.0163)
# Beds × Assets	-0.0640	(0.0445)	-0.0649	(0.0294)	-0.1023	(0.0468)
Employee Hours × Assets	0.0090	(0.0370)	0.0357	(0.0277)	0.0560	(0.0476)
Employee Hours × # Beds	-0.0120	(0.1299)	0.0230	(0.0929)	0.0163	(0.1022)
Employee Hours × Mcare Days	0.0300	(0.0323)	-0.0786	(0.0347)	-0.0226	(0.0618)
Employee Hours × Prvt Days	-0.0947	(0.0658)	0.0635	(0.0260)	-0.0275	(0.0332)
Management Hours	1.0286	(0.5927)	-0.4467	(0.3435)	-0.0644	(0.5248)
Management Hours ²	-0.0462	(0.0248)	0.0196	(0.0149)	0.0054	(0.0238)
Clerical Hours	-0.6024	(0.5937)	0.5403	(0.3538)	-0.8781	(0.6178)
Clerical Hours ²	0.0237	(0.0227)	-0.0219	(0.0143)	0.0360	(0.0268)
RN Hours	-1.4926	(0.7128)	-0.1537	(0.4352)	0.7222	(0.7626)
RN Hours ²	0.0401	(0.0234)	0.0158	(0.0163)	-0.0120	(0.0240)
RN Hours × Staff Hours	0.0387	(0.0323)	-0.0258	(0.0247)	-0.0338	(0.0472)
Other IP	1.2967	(0.4693)	0.1327	(0.1511)	-0.4415	(0.3235)
Other IP ²	-0.0236	(0.0215)	0.0180	(0.0067)	0.0185	(0.0107)
Mcare IP	-0.8202	(0.4643)	0.5129	(0.5034)	0.2713	(0.5161)
Mcare IP ²	-0.0002	(0.0054)	-0.0134	(0.0094)	0.0009	(0.0219)
Prvt IP	0.7601	(0.5793)	-0.1221	(0.2926)	0.1101	(0.4372)
Prvt IP ²	0.0182	(0.0200)	-0.0159	(0.0084)	-0.0079	(0.0103)
All IP × Other OP	-0.0761	(0.0306)	-0.0387	(0.0139)	0.0067	(0.0307)
All IP × Mcar. OP	0.0328	(0.0258)	0.0713	(0.0202)	-0.0119	(0.0407)
All IP × Prvt OP	0.0182	(0.0323)	-0.0468	(0.0195)	0.0279	(0.0502)
Other IP × Mcare IP	0.0008	(0.0057)	0.0032	(0.0049)	0.0053	(0.0065)
Other IP × Prvt IP	0.0038	(0.0053)	0.0059	(0.0047)	-0.0061	(0.0088)
Mcare IP × Prvt IP	-0.0027	(0.0054)	-0.0015	(0.0045)	0.0086	(0.0092)

Note: All outputs and inputs are in logs. OP=Out Patient, IP=In Patient, Prvt.=Privately Insured, MCare=Medicare, MC=Managed Care, FFS=Fee for service. Standard errors are in parentheses and are clustered by hospital. Specification includes hospital fixed effects and a time trend and has an adjusted R^2 greater than 0.97.

TABLE B-1—COST ESTIMATES BASED ON IN-PATIENT DAYS AS OUTPUT, CONTINUED

	×Teaching Hospital	
	b	se
% ER	0.0747	(0.2087)
% Mcar	-0.0715	(0.0802)
Other OP	0.2284	(0.5479)
Other OP ²	-0.0322	(0.0285)
Mcare OP	0.2705	(0.7253)
Mcare OP ²	-0.0066	(0.0471)
Prvt FFS OP	-0.2782	(0.2004)
Prvt FFS OP ²	0.0138	(0.0107)
Other IP × Mcare IP	0.0168	(0.0482)
Other IP × Prvt MC OP	-0.0001	(0.0132)
Other IP × Prvt FFS OP	0.0390	(0.0191)
Mcare IP × Prvt MC IP	0.0066	(0.0143)
Mcare IP × Prvt FFS OP	-0.0361	(0.0232)
# Beds	0.7183	(2.2872)
# Beds ²	0.1561	(0.2560)
Fixed Assets	-0.2775	(0.9832)
# Beds × Assets	0.0610	(0.0749)
Employee Hours × Assets	-0.0047	(0.0781)
Employee Hours × # Beds	-0.2303	(0.2532)
Employee Hours × Mcare Days	0.1819	(0.1441)
Employee Hours × Prvt Days	-0.1264	(0.1298)
Management Hours	-1.6601	(0.6172)
Management Hours ²	0.0672	(0.0248)
Clerical Hours	-0.2458	(1.6737)
Clerical Hours ²	0.0114	(0.0615)
RN Hours	2.5833	(1.7395)
RN Hours ²	-0.1160	(0.0452)
RN Hours × Staff Hours	0.0457	(0.0860)
Other IP	-1.1059	(1.0820)
Other IP ²	-0.0065	(0.0425)
Mcare IP	-2.1683	(1.8006)
Mcare IP ²	0.0548	(0.0588)
Prvt IP	0.3491	(1.6427)
Prvt IP ²	0.0609	(0.0282)
All IP × Other OP	0.1032	(0.0635)
All IP × Mcar. OP	-0.1467	(0.1119)
All IP × Prvt OP	0.0410	(0.0761)
Other IP × Mcare IP	0.0017	(0.0088)
Other IP × Prvt IP	-0.0011	(0.0086)
Mcare IP × Prvt IP	-0.0082	(0.0094)

Note: All outputs and inputs are in logs. OP=Out Patient, IP=In Patient, Prvt.=Privately Insured, MCar=Medicare, MC=Managed Care, FFS=Fee for service. Standard errors are in parentheses and are clustered by hospital. Specification includes hospital fixed effects and a time trend and has an adjusted R^2 greater than 0.97.

TABLE B-2—COST ESTIMATES BASED ON DISCHARGES AS OUTPUT

			× For-Profit		× Government	
	b	se	b	se	b	se
% ER	-0.1402	(0.1155)	0.0870	(0.1359)	0.0409	(0.1303)
% Mcar	0.0225	(0.0630)	-0.0616	(0.0612)	-0.0203	(0.0610)
Other OP	-0.2102	(0.1384)	0.0348	(0.1610)	0.2418	(0.1743)
Other OP ²	0.0048	(0.0096)	-0.0008	(0.0109)	0.0006	(0.0119)
Mcare OP	-0.1439	(0.1047)	0.0121	(0.1736)	0.0969	(0.1888)
Mcare OP ²	-0.0029	(0.0060)	0.0002	(0.0091)	0.0180	(0.0111)
Prvt FFS OP	0.0864	(0.0664)	-0.1485	(0.0606)	0.0144	(0.1120)
Prvt FFS OP ²	-0.0006	(0.0023)	0.0004	(0.0021)	-0.0047	(0.0032)
Other IP × Mcare IP	0.0179	(0.0140)	-0.0047	(0.0140)	-0.0299	(0.0218)
Other IP × Prvt MC OP	-0.0019	(0.0042)	0.0002	(0.0040)	-0.0027	(0.0076)
Other IP × Prvt FFS OP	-0.0087	(0.0057)	0.0064	(0.0061)	0.0081	(0.0066)
Mcare IP × Prvt MC IP	0.0023	(0.0043)	-0.0019	(0.0042)	0.0024	(0.0082)
Mcare IP × Prvt FFS OP	-0.0005	(0.0057)	0.0088	(0.0064)	-0.0028	(0.0116)
# Beds	-0.2087	(0.9291)	0.6919	(0.9395)	-1.5533	(1.1132)
# Beds ²	-0.0927	(0.0623)	0.0182	(0.0662)	0.0483	(0.0567)
Fixed Assets	-0.0282	(0.3319)	0.0958	(0.2601)	0.1936	(0.3441)
Fixed Assets ²	0.0118	(0.0109)	-0.0043	(0.0041)	-0.0190	(0.0151)
# Beds × Assets	0.0872	(0.0546)	-0.0130	(0.0423)	-0.0101	(0.0398)
Employee Hours × Assets	-0.0546	(0.0307)	0.0084	(0.0214)	0.0343	(0.0301)
Employee Hours × # Beds	-0.0104	(0.1046)	-0.0552	(0.0991)	0.0898	(0.1084)
Employee Hours × Mcar IP	0.0010	(0.0305)	0.0992	(0.0676)	-0.0175	(0.0344)
Employee Hours × Prvt IP	0.0715	(0.0422)	-0.1152	(0.0508)	-0.0730	(0.0423)
Management Hours	0.3804	(0.3264)	0.3202	(0.4839)	0.3768	(0.5055)
Management Hours ²	-0.0154	(0.0141)	-0.0154	(0.0211)	-0.0166	(0.0215)
Clerical Hours	0.2965	(0.3232)	-0.8542	(0.3648)	-0.4568	(0.5011)
Clerical Hours ²	-0.0091	(0.0127)	0.0335	(0.0153)	0.0146	(0.0200)
RN Hours	-0.5185	(0.3883)	0.9544	(0.5300)	-0.0050	(0.3437)
RN Hours ²	0.0131	(0.0193)	-0.0453	(0.0199)	-0.0018	(0.0126)
RN Hours × Staff Hours	0.0225	(0.0178)	0.0143	(0.0259)	-0.0047	(0.0225)
Other IP	0.3206	(0.1958)	-0.1091	(0.2194)	-0.1715	(0.1646)
Other IP ²	-0.0060	(0.0132)	0.0057	(0.0118)	-0.0454	(0.0257)
Mcare IP	0.0545	(0.3011)	-0.6099	(0.5812)	0.2884	(0.5031)
Mcare IP ²	0.0039	(0.0064)	0.0194	(0.0262)	-0.0798	(0.0365)
Prvt IP	-0.7814	(0.4048)	0.7694	(0.4987)	0.7974	(0.5317)
Prvt IP ²	0.0016	(0.0053)	0.0223	(0.0137)	0.0141	(0.0137)
All IP × Other OP	0.0131	(0.0030)	0.0021	(0.0041)	-0.0010	(0.0045)
All IP × Mcar. OP	0.0096	(0.0144)	-0.0459	(0.0263)	-0.0024	(0.0403)
All IP × Prvt OP	-0.0002	(0.0159)	0.0487	(0.0239)	-0.0223	(0.0513)
Other IP × Mcare IP	-0.0182	(0.0284)	-0.0385	(0.0326)	0.1120	(0.0478)
Other IP × Prvt IP	-0.0172	(0.0293)	0.0338	(0.0251)	0.0015	(0.0270)
Mcare IP × Prvt IP	-0.0026	(0.0215)	-0.0300	(0.0294)	0.0443	(0.0334)

Note: All outputs and inputs are in logs. OP=Out Patient, IP=In Patient, Prvt.=Privately Insured, MCar=Medicare, MC=Managed Care, FFS=Fee for service. Standard errors are in parentheses and are clustered by hospital. Specification includes hospital fixed effects and a time trend and has an adjusted R^2 greater than 0.97.

TABLE B-2—COST ESTIMATES BASED ON DISCHARGES AS OUTPUT, CONTINUED

	× Trauma Center		× System Member		× Rural	
	b	se	b	se	b	se
% ER	-0.1146	(0.1277)	-0.0527	(0.1131)	0.0457	(0.1220)
% Mcar	0.1182	(0.0484)	0.0068	(0.0635)	-0.0616	(0.0549)
Other OP	0.6307	(0.4134)	0.1725	(0.1705)	0.0199	(0.3362)
Other OP ²	-0.0066	(0.0199)	-0.0030	(0.0128)	0.0276	(0.0251)
Mcare OP	0.5350	(0.2701)	0.0681	(0.1810)	0.4598	(0.4665)
Mcare OP ²	0.0022	(0.0094)	0.0034	(0.0111)	-0.0007	(0.0294)
Prvt FFS OP	0.1424	(0.0990)	-0.0124	(0.0639)	-0.1128	(0.1118)
Prvt FFS OP ²	0.0015	(0.0018)	-0.0015	(0.0022)	0.0022	(0.0030)
Other IP × Mcare IP	-0.0360	(0.0216)	-0.0137	(0.0186)	-0.0571	(0.0365)
Other IP × Prvt MC OP	0.0071	(0.0045)	0.0009	(0.0034)	0.0028	(0.0059)
Other IP × Prvt FFS OP	-0.0072	(0.0093)	-0.0001	(0.0067)	0.0001	(0.0115)
Mcare IP × Prvt MC IP	-0.0073	(0.0047)	-0.0010	(0.0033)	-0.0029	(0.0060)
Mcare IP × Prvt FFS OP	-0.0078	(0.0046)	0.0043	(0.0063)	0.0101	(0.0132)
# Beds	-0.8674	(1.3059)	0.3721	(0.9448)	0.5640	(1.3072)
# Beds ²	0.0555	(0.0581)	0.1089	(0.0520)	0.0389	(0.0541)
Fixed Assets	0.3481	(0.4397)	-0.1902	(0.2443)	0.1120	(0.5069)
Fixed Assets ²	-0.0012	(0.0114)	-0.0034	(0.0097)	0.0015	(0.0176)
# Beds × Assets	-0.0507	(0.0427)	-0.0632	(0.0283)	-0.1264	(0.0444)
Employee Hours × Assets	-0.0033	(0.0359)	0.0436	(0.0298)	0.0321	(0.0473)
Employee Hours × # Beds	0.0810	(0.1204)	-0.0378	(0.0948)	0.0707	(0.1046)
Employee Hours × Mcar IP	-0.0014	(0.0488)	-0.0968	(0.0458)	-0.0347	(0.0734)
Employee Hours × Prvt IP	-0.0981	(0.0808)	0.0678	(0.0430)	-0.0437	(0.0397)
Management Hours	0.9983	(0.5551)	-0.4474	(0.3739)	-0.2184	(0.6618)
Management Hours ²	-0.0439	(0.0233)	0.0207	(0.0162)	0.0107	(0.0300)
Clerical Hours	-0.9471	(0.5637)	0.4941	(0.3170)	-0.7888	(0.6869)
Clerical Hours ²	0.0364	(0.0220)	-0.0201	(0.0129)	0.0319	(0.0297)
RN Hours	-1.1834	(0.8365)	-0.2730	(0.5059)	0.6162	(0.6860)
RN Hours ²	0.0320	(0.0267)	0.0135	(0.0192)	-0.0189	(0.0236)
RN Hours × Staff Hours	0.0309	(0.0354)	-0.0091	(0.0261)	-0.0104	(0.0417)
Other IP	0.0669	(0.2663)	0.0607	(0.1562)	-0.2702	(0.2424)
Other IP ²	-0.0148	(0.0229)	0.0063	(0.0135)	-0.0146	(0.0303)
Mcare IP	-0.4711	(0.5530)	1.0078	(0.4847)	0.1554	(0.6917)
Mcare IP ²	0.0094	(0.0078)	-0.0070	(0.0097)	-0.0003	(0.0401)
Prvt IP	1.6751	(0.7696)	-0.0157	(0.4201)	0.3722	(0.4794)
Prvt IP ²	-0.0113	(0.0221)	-0.0175	(0.0136)	-0.0018	(0.0143)
All IP × Other OP	-0.0047	(0.0045)	-0.0028	(0.0028)	-0.0066	(0.0042)
All IP × Mcar. OP	0.0122	(0.0317)	0.0392	(0.0253)	0.0001	(0.0463)
All IP × Prvt OP	-0.0323	(0.0332)	-0.0496	(0.0274)	0.0202	(0.0539)
Other IP × Mcare IP	0.0109	(0.0390)	0.0075	(0.0293)	0.0586	(0.0452)
Other IP × Prvt IP	0.0136	(0.0340)	-0.0134	(0.0261)	-0.0049	(0.0297)
Mcare IP × Prvt IP	0.0205	(0.0259)	-0.0067	(0.0216)	-0.0057	(0.0311)

Note: All outputs and inputs are in logs. OP=Out Patient, IP=In Patient, Prvt.=Privately Insured, MCar=Medicare, MC=Managed Care, FFS=Fee for service. Standard errors are in parentheses and are clustered by hospital. Specification includes hospital fixed effects and a time trend and has an adjusted R² greater than 0.97.

TABLE B-2—COST ESTIMATES BASED ON DISCHARGES AS OUTPUT, CONTINUED

	×Teaching Hospital	
	b	se
% ER	0.1201	(0.2160)
% Mcar	-0.1316	(0.0807)
Other OP	-0.7318	(0.5502)
Other OP ²	0.0150	(0.0312)
Mcare OP	0.6855	(0.7265)
Mcare OP ²	-0.0307	(0.0375)
Prvt FFS OP	0.0645	(0.2487)
Prvt FFS OP ²	0.0065	(0.0101)
Other IP × Mcare IP	0.0285	(0.0514)
Other IP × Prvt MC OP	-0.0018	(0.0106)
Other IP × Prvt FFS OP	0.0239	(0.0211)
Mcare IP × Prvt MC IP	0.0007	(0.0126)
Mcare IP × Prvt FFS OP	-0.0371	(0.0246)
# Beds	2.3283	(1.9702)
# Beds ²	-0.0099	(0.2631)
Fixed Assets	-0.2725	(0.9038)
# Beds × Assets	0.0593	(0.0845)
Employee Hours × Assets	-0.0058	(0.0783)
Employee Hours × # Beds	-0.2105	(0.2181)
Employee Hours × Mcar IP	0.2296	(0.1814)
Employee Hours × Prvt IP	-0.1892	(0.1633)
Management Hours	-1.5151	(0.6123)
Management Hours ²	0.0613	(0.0245)
Clerical Hours	1.1695	(1.6887)
Clerical Hours ²	-0.0411	(0.0619)
RN Hours	2.8894	(2.1673)
RN Hours ²	-0.1261	(0.0575)
RN Hours × Staff Hours	0.0548	(0.0842)
Other IP	0.4597	(1.0807)
Other IP ²	0.0424	(0.0493)
Mcare IP	-3.4781	(1.8673)
Mcare IP ²	0.0198	(0.0635)
Prvt IP	2.0764	(1.8859)
Prvt IP ²	0.0373	(0.0344)
All IP × Other OP	-0.0032	(0.0077)
All IP × Mcar. OP	0.0231	(0.0920)
All IP × Prvt OP	-0.0200	(0.0792)
Other IP × Mcare IP	-0.1405	(0.1165)
Other IP × Prvt IP	0.0233	(0.0683)
Mcare IP × Prvt IP	0.0407	(0.0754)

Note: All outputs and inputs are in logs. OP=Out Patient, IP=In Patient, Prvt.=Privately Insured, MCar=Medicare, MC=Managed Care, FFS=Fee for service. Standard errors are in parentheses and are clustered by hospital. Specification includes hospital fixed effects and a time trend and has an adjusted R^2 greater than 0.97.

TABLE B-3—SYSTEM CHARACTERISTICS AND BARGAINING POWER USING PATIENT DAYS

Dependent Var. = $\Delta\Pi_h$	Cost Estimated Using Patient Days						
	A	B	C	D	E	F	G
Base Bargaining Pwr.	1.0308** (0.4402)	0.9773** (0.4090)	0.7353 (0.4601)	0.9405** (0.4654)	0.9057** (0.4284)	0.9093** (0.4482)	0.8689** (0.4107)
Hosp. Market Share	0.2590 (0.3114)	0.1305 (0.3269)	0.1670 (0.3193)	0.4224 (0.3297)	0.2955 (0.3311)	0.4179 (0.3138)	0.3155 (0.3339)
HHI ^{Hosp} - HHI ^{HMO}	0.0680 (0.3616)	0.2341 (0.3992)	0.1004 (0.3280)	-0.1317 (0.3580)	0.0343 (0.4108)	-0.1528 (0.3388)	-0.0363 (0.3941)
Predicted Patient Days (/1000)	-0.1980** (0.0979)	-0.1923** (0.0901)	-0.2223*** (0.0836)	-0.2463*** (0.0813)	-0.2362*** (0.0797)	-0.2638*** (0.0848)	-0.2566*** (0.0848)
Physician Group	0.3313*** (0.1274)	0.3134*** (0.1133)	0.3178*** (0.1004)	0.2681** (0.1274)	0.2612** (0.1185)	0.2650** (0.1276)	0.2525** (0.1177)
Trauma Center	0.1325 (0.1049)	0.1888 (0.1165)	0.2473** (0.1047)	0.1997* (0.1167)	0.2439** (0.1219)	0.2001* (0.1113)	0.2509** (0.1221)
Specialty	-0.0819 (0.2225)	-0.1175 (0.2226)	-0.0558 (0.2012)	-0.1845 (0.2599)	-0.2002 (0.2502)	-0.1580 (0.2482)	-0.1672 (0.2481)
Teaching Hospital	0.4477 (0.2959)	0.5269* (0.2743)	0.5909** (0.2516)	0.5368* (0.3052)	0.5948** (0.2807)	0.5458* (0.2959)	0.5935** (0.2803)
Rural Hospital	-0.2669* (0.1422)	-0.1556 (0.1557)	-0.2341 (0.1426)	-0.3293** (0.1342)	-0.2186 (0.1470)	-0.3034** (0.1315)	-0.1805 (0.1460)
For-Profit (FP)	0.1601 (0.3317)	0.1560 (0.3258)	0.1606 (0.3388)	0.2030 (0.3544)	0.1931 (0.3511)	0.1991 (0.3455)	0.1837 (0.3446)
% ER Discharges	-0.7635 (0.5123)	-0.7608 (0.4814)	-0.5200 (0.5301)	-0.7665 (0.5255)	-0.7691 (0.4873)	-0.7555 (0.5033)	-0.7567 (0.4702)
FP×System Member	0.1198 (0.3342)	0.1099 (0.3306)	0.0726 (0.3423)	0.0703 (0.3649)	0.0860 (0.3557)	0.0383 (0.3522)	0.1036 (0.3594)
NFP×System Member	0.3268*** (0.1141)	0.1580 (0.1483)	-0.0396 (0.2115)	0.1287 (0.1299)	0.0001 (0.1584)	0.7828*** (0.1864)	0.5847*** (0.1953)
FP×# Hospitals (/10)		0.0007 (0.0102)	0.0033 (0.0255)		0.0004 (0.0164)		-0.0052 (0.0115)
NFP×# Hospitals (/10)		0.0879** (0.0433)	0.4436** (0.1860)		0.0796** (0.0399)		0.0779** (0.0383)
FP×# Hosp. Sqr. (/100)			-0.0004 (0.0015)				
NFP×# Hosp. Sqr. (/100)			-0.0889** (0.0408)				
FP×# States				-0.0029 (0.0104)	-0.0042 (0.0139)		
NFP×# States				0.1065*** (0.0402)	0.0933*** (0.0347)		
FP×Geographic Conc.						-0.0180 (0.1547)	-0.0784 (0.1592)
NFP×Geographic Conc.						-0.5587*** (0.1743)	-0.5044*** (0.1448)
γ_p^{-1} (×1000)	2.1627** (0.9028)	2.4388** (0.9739)	2.5739** (1.2021)	2.0332** (0.9363)	2.2708** (0.9615)	2.1957** (0.9621)	2.4619** (0.9847)
Bargaining Power							
Mean fitted value	0.6412	0.6027	0.5788	0.6301	0.5977	0.6176	0.5847
Standard deviation	0.3075	0.3103	0.2922	0.3135	0.3129	0.3069	0.3073
Adj. R ²	0.9180	0.9223	0.9269	0.9231	0.9264	0.9244	0.9277
N	304	304	304	304	304	304	304

Note: This table reports the all of the estimates except the HSA fixed effects for the results reported in Table 5. All regressions use 15% of predicted managed care patients for the change in cost calculation. Errors are clustered by hospital and adjusted to account for data generated by first-stage regressions following Murphy and Topel (1985).

Significance Levels:*** p < .01, ** p < .05, * p < .1 **B-7**

TABLE B-4—SYSTEM CHARACTERISTICS AND BARGAINING POWER USING CASE-WEIGHTED DISCHARGES

Dependent Var. = $\Delta\Pi_h$	Cost Estimated Using DRG-weighted Discharges						
	A	B	C	D	E	F	G
Base Bargaining Pwr.	0.9436*** (0.3631)	0.9563*** (0.3492)	0.7593** (0.3771)	0.9096** (0.3715)	0.9089** (0.3615)	0.8845** (0.3696)	0.8792** (0.3558)
Hosp. Market Share	0.1914 (0.2849)	0.0962 (0.2954)	0.1858 (0.3174)	0.3168 (0.2969)	0.2285 (0.2962)	0.3145 (0.2830)	0.2349 (0.2929)
HHI ^{Hosp} - HHI ^{HMO}	-0.0592 (0.2888)	0.1304 (0.3601)	0.0121 (0.3151)	-0.1641 (0.2992)	-0.0312 (0.3564)	-0.2098 (0.2481)	-0.0976 (0.3401)
Predicted Patient Days (/1000)	-0.1689** (0.0793)	-0.1786** (0.0735)	-0.2220*** (0.0716)	-0.2137*** (0.0676)	-0.2125*** (0.0679)	-0.2316*** (0.0691)	-0.2303*** (0.0714)
Physician Group	0.2663** (0.1138)	0.2764** (0.1111)	0.3094*** (0.1132)	0.2131* (0.1230)	0.2237* (0.1195)	0.2033* (0.1182)	0.2099* (0.1166)
Trauma Center	0.1401 (0.0858)	0.1628* (0.0978)	0.2139** (0.0895)	0.1733* (0.0996)	0.1966** (0.0980)	0.1794** (0.0912)	0.2049** (0.0963)
Specialty	-0.0899 (0.2086)	-0.1447 (0.2135)	-0.0812 (0.2046)	-0.1743 (0.2209)	-0.1912 (0.2197)	-0.1412 (0.2122)	-0.1613 (0.2205)
Teaching Hospital	0.2646 (0.2544)	0.3945 (0.2556)	0.4990* (0.2675)	0.3314 (0.2646)	0.4107 (0.2618)	0.3306 (0.2507)	0.4060 (0.2544)
Rural Hospital	-0.1941 (0.1216)	-0.1355 (0.1415)	-0.2343* (0.1351)	-0.2469** (0.1188)	-0.1769 (0.1349)	-0.2168* (0.1113)	-0.1473 (0.1314)
For-Profit (FP)	0.1179 (0.2240)	0.1386 (0.2199)	0.1462 (0.2293)	0.1335 (0.2224)	0.1445 (0.2208)	0.1238 (0.2191)	0.1335 (0.2171)
% ER Discharges	-0.5504 (0.4286)	-0.5969 (0.4030)	-0.3964 (0.4230)	-0.5834 (0.4249)	-0.6115 (0.4053)	-0.5893 (0.4215)	-0.6122 (0.3992)
FP×System Member	0.1363 (0.2193)	0.0966 (0.2144)	0.1094 (0.2361)	0.0795 (0.2225)	0.1067 (0.2152)	0.1149 (0.2202)	0.1182 (0.2268)
NFP×System Member	0.2789** (0.1269)	0.1643 (0.1512)	-0.0209 (0.2075)	0.1213 (0.1190)	0.0481 (0.1428)	0.6672*** (0.1968)	0.5214** (0.2310)
FP×# Hospitals (/10)		0.0064 (0.0074)	-0.0015 (0.0285)		0.0064 (0.0151)		0.0005 (0.0083)
NFP×# Hospitals (/10)		0.0752** (0.0372)	0.4344*** (0.1672)		0.0609* (0.0348)		0.0581* (0.0331)
FP×# Hosp. Sqr. (/100)			0.0001 (0.0015)				
NFP×# Hosp. Sqr. (/100)			-0.0897** (0.0358)				
FP×# States				0.0022 (0.0079)	-0.0043 (0.0143)		
NFP×# States				0.0860*** (0.0323)	0.0722** (0.0317)		
FP×Geographic Conc.						-0.0629 (0.1395)	-0.0511 (0.1488)
NFP×Geographic Conc.						-0.4717*** (0.1422)	-0.4111*** (0.1404)
γ_p^{-1} (×1000)	2.2925* (1.2473)	2.2662* (1.2429)	2.0237* (1.2274)	2.2446* (1.2706)	2.3291* (1.3250)	2.4890* (1.3257)	2.6034* (1.3819)
Bargaining Power							
Mean fitted value	0.6780	0.6674	0.6736	0.6698	0.6531	0.6515	0.6367
Standard deviation	0.2361	0.2569	0.2540	0.2458	0.2507	0.2373	0.2464
Adj. R ²	0.9519	0.9544	0.9576	0.9550	0.9565	0.9558	0.9572
N	304	304	304	304	304	304	304

Note: This table reports the all of the estimates except the HSA fixed effects for the results reported in Table 5. Specifications B, D, and F correspond with I, II, and III in Table 5. All regressions use 15% of predicted managed care patients for the change in cost calculation. Errors are clustered by hospital and adjusted to account for data generated by first-stage regressions following Murphy and Topel (1985).

Significance Levels:*** p < .01, ** p < .05, * p < .1

TABLE B-5—SYSTEM CHARACTERISTICS AND BARGAINING POWER: DEMAND ESTIMATED USING INDEMNITY PATIENTS

Dependent Var. = $\Delta\Pi_h$	Cost Estimated Using DRG-weighted Discharges						
	A	B	C	D	E	F	G
Base Bargaining Pwr.	1.1596*** (0.3982)	0.9829*** (0.3489)	0.7942** (0.3864)	1.0709** (0.4181)	0.9660** (0.3821)	1.0362** (0.3994)	0.9251** (0.3618)
Hosp. Market Share	0.1459 (0.2726)	-0.0129 (0.2509)	-0.0053 (0.2376)	0.3783 (0.2936)	0.2044 (0.2817)	0.3992 (0.3006)	0.2236 (0.2898)
HHI ^{Hosp} - HHI ^{HMO}	0.0507 (0.3769)	0.2162 (0.3756)	0.1054 (0.3178)	-0.1432 (0.3772)	0.0452 (0.4180)	-0.1951 (0.3697)	-0.0071 (0.4205)
Predicted Patient Days (/1000)	-0.0270*** (0.0096)	-0.0240*** (0.0081)	-0.0253*** (0.0078)	-0.0364*** (0.0097)	-0.0319*** (0.0088)	-0.0390*** (0.0108)	-0.0341*** (0.0097)
Physician Group	0.2903** (0.1254)	0.2627** (0.1045)	0.2548*** (0.0949)	0.2168* (0.1231)	0.2205* (0.1130)	0.2216* (0.1241)	0.2200* (0.1130)
Trauma Center	0.1771* (0.0933)	0.2269** (0.1006)	0.2673*** (0.0921)	0.2487** (0.1110)	0.2768** (0.1107)	0.2499** (0.1039)	0.2762** (0.1100)
Specialty	0.2889 (0.2245)	0.2000 (0.1969)	0.2409 (0.1868)	0.1837 (0.2730)	0.1422 (0.2421)	0.2383 (0.2657)	0.1831 (0.2440)
Teaching Hospital	0.1647 (0.2764)	0.2783 (0.2507)	0.3217 (0.2456)	0.3256 (0.2841)	0.3791 (0.2622)	0.3349 (0.2746)	0.3880 (0.2626)
Rural Hospital	-0.2765* (0.1400)	-0.1543 (0.1420)	-0.2104 (0.1283)	-0.3792*** (0.1376)	-0.2612* (0.1468)	-0.3421*** (0.1306)	-0.2346 (0.1436)
For-Profit (FP)	-0.0876 (0.2113)	-0.0741 (0.1708)	-0.0790 (0.1604)	-0.0391 (0.2015)	-0.0389 (0.1791)	-0.0414 (0.1973)	-0.0387 (0.1740)
% ER Discharges	-0.8584* (0.4436)	-0.7359* (0.3867)	-0.5351 (0.4237)	-0.8718* (0.4621)	-0.7931* (0.4188)	-0.8730** (0.4406)	-0.7789* (0.3983)
FP×System Member	0.4116* (0.2264)	0.3114* (0.1831)	0.2707 (0.1768)	0.3218 (0.2199)	0.3104 (0.1977)	0.3652* (0.2124)	0.2862 (0.1930)
NFP×System Member	0.3643*** (0.1025)	0.1542 (0.1323)	-0.0268 (0.1974)	0.1411 (0.1237)	0.0229 (0.1489)	0.9199*** (0.1746)	0.6397*** (0.1953)
FP×# Hospitals (/10)		0.0042 (0.0073)	0.0060 (0.0194)		0.0093 (0.0167)		0.0030 (0.0090)
NFP×# Hospitals (/10)		0.0949** (0.0405)	0.3884** (0.1821)		0.0791** (0.0382)		0.0767** (0.0371)
FP×# Hosp. Sqrd. (/100)			-0.0003 (0.0011)				
NFP×# Hosp. Sqrd. (/100)			-0.0742* (0.0404)				
FP×# States				0.0035 (0.0078)	-0.0065 (0.0152)		
NFP×# States				0.1293*** (0.0378)	0.1003*** (0.0326)		
FP×Geographic Conc.						-0.0747 (0.1223)	-0.0180 (0.1444)
NFP×Geographic Conc.						-0.6615*** (0.1662)	-0.5259*** (0.1441)
γ_p^{-1} (×1000)	2.2896** (0.9475)	3.1282*** (1.1070)	3.2525*** (1.2319)	1.6846** (0.7301)	2.2578*** (0.8169)	1.8224** (0.7845)	2.4314*** (0.8517)
Bargaining Power							
Mean fitted value	0.6586	0.5747	0.5616	0.6779	0.6098	0.6652	0.6021
Standard deviation	0.3445	0.3158	0.2887	0.3569	0.3256	0.3482	0.3230
Adj. R ²	0.9323	0.9376	0.9412	0.9393	0.9423	0.9404	0.9433
N	305	305	305	303	303	303	303

Note: This table reports the results of the second-stage bargaining model after predicting demand using indemnity patients who have unrestricted choice-sets. All regressions use 15% of predicted managed care patients for the change in cost calculation. Errors are clustered by hospital.

Significance Levels:*** p < .01, ** p < .05, * p < .1

TABLE B-6—SYSTEM CHARACTERISTICS AND BARGAINING POWER: DEMAND ESTIMATED USING INDEMNITY PATIENTS

Dependent Var. = $\Delta\Pi_h$	Cost Estimated Using DRG-weighted Discharges						
	A	B	C	D	E	F	G
Base Bargaining Pwr.	0.9830*** (0.2607)	0.9498*** (0.2601)	0.8225*** (0.2907)	0.9793*** (0.2735)	0.9394*** (0.2776)	0.9245*** (0.2622)	0.8967*** (0.2644)
Hosp. Market Share	0.0282 (0.2205)	-0.0703 (0.2063)	-0.0324 (0.2088)	0.2305 (0.2299)	0.1163 (0.2198)	0.2382 (0.2269)	0.1273 (0.2209)
HHI ^{Hosp} - HHI ^{HMO}	-0.0950 (0.2657)	0.0896 (0.3063)	0.0029 (0.2832)	-0.1961 (0.2759)	-0.0563 (0.3252)	-0.2714 (0.2407)	-0.1163 (0.3252)
Predicted Patient Days (/1000)	-0.0208*** (0.0064)	-0.0215*** (0.0057)	-0.0240*** (0.0058)	-0.0289*** (0.0064)	-0.0270*** (0.0063)	-0.0307*** (0.0069)	-0.0288*** (0.0069)
Physician Group	0.2017** (0.0946)	0.2122** (0.0870)	0.2231** (0.0873)	0.1511 (0.1123)	0.1667 (0.1065)	0.1431 (0.1055)	0.1582 (0.1039)
Trauma Center	0.1998*** (0.0706)	0.2159*** (0.0798)	0.2521*** (0.0746)	0.2285** (0.0880)	0.2418*** (0.0844)	0.2341*** (0.0770)	0.2421*** (0.0818)
Specialty	0.2723 (0.1676)	0.1926 (0.1628)	0.2472 (0.1587)	0.2136 (0.1767)	0.1746 (0.1737)	0.2621 (0.1651)	0.2091 (0.1781)
Teaching Hospital	0.0222 (0.1975)	0.1823 (0.2048)	0.2410 (0.2244)	0.1124 (0.2176)	0.1990 (0.2261)	0.1104 (0.1982)	0.2014 (0.2189)
Rural Hospital	-0.1873* (0.0962)	-0.1290 (0.1177)	-0.1971* (0.1085)	-0.2681*** (0.0991)	-0.2020* (0.1145)	-0.2315*** (0.0866)	-0.1811* (0.1091)
For-Profit (FP)	-0.0117 (0.1540)	-0.0002 (0.1389)	-0.0053 (0.1358)	0.0156 (0.1455)	0.0202 (0.1373)	0.0125 (0.1399)	0.0172 (0.1326)
% ER Discharges	-0.6537** (0.3197)	-0.6415** (0.3040)	-0.4965 (0.3322)	-0.7068** (0.3339)	-0.6846** (0.3243)	-0.6957** (0.3179)	-0.6732** (0.3100)
FP×System Member	0.2821* (0.1578)	0.2297 (0.1406)	0.2029 (0.1397)	0.2173 (0.1522)	0.2321 (0.1447)	0.2651* (0.1418)	0.2114 (0.1444)
NFP×System Member	0.3286*** (0.0998)	0.1995 (0.1325)	0.0481 (0.1846)	0.1642 (0.1016)	0.0966 (0.1293)	0.7553*** (0.1614)	0.5931** (0.2300)
FP×# Hospitals (/10)		0.0060 (0.0065)	0.0101 (0.0196)		0.0105 (0.0142)		0.0041 (0.0073)
NFP×# Hospitals (/10)		0.0714** (0.0325)	0.3335** (0.1548)		0.0526 (0.0344)		0.0490 (0.0334)
FP×# Hosp. Sqrd. (/100)			-0.0004 (0.0011)				
NFP×# Hosp. Sqrd. (/100)			-0.0660* (0.0341)				
FP×# States				0.0045 (0.0063)	-0.0061 (0.0132)		
NFP×# States				0.0956*** (0.0284)	0.0767** (0.0308)		
FP×Geographic Conc.						-0.0728 (0.0930)	-0.0127 (0.1164)
NFP×Geographic Conc.						-0.5123*** (0.1157)	-0.4285*** (0.1366)
γ_p^{-1} (×1000)	3.2218*** (1.0779)	3.4349*** (1.2553)	3.1522*** (1.1468)	2.4495*** (0.8268)	2.8369*** (1.0594)	2.8245*** (0.8731)	3.1351*** (1.0711)
Mean fitted value	0.6354	0.6107	0.6213	0.6689	0.6309	0.6425	0.6177
Standard deviation	0.2774	0.2777	0.2668	0.2914	0.2742	0.2816	0.2738
Adj. R ²	0.9570	0.9598	0.9620	0.9614	0.9626	0.9623	0.9634
N	305	303	305	303	303	303	

Note: This table reports the results of the second-stage bargaining model after predicting demand using indemnity patients who have unrestricted choice-sets. All regressions use 15% of predicted managed care patients for the change in cost calculation. Errors are clustered by hospital.

Significance Levels:*** p < .01, ** p < .05, * p < .1 B-10

APPENDIX C. ALTERNATIVE BARGAINING MODEL

In Eq. (9) market power differences are controlled for via the differences in surplus hospitals produce. The change in the enrollees' willingness-to-pay will be higher when an entire system can be withdrawn from an MCO's network when those system hospitals are also in the enrollees' choice-set. Furthermore, using assumption A4, hospitals lose all of the demand from those enrollees when they fail to negotiate a contract with an MCO so are not in the enrollees' choice-set. However, if some enrollees have sufficiently strong preferences that they will switch MCOs in order to continue to have access to their preferred hospital (or system)—even after the MCO reduces its premium to reflect the enrollees' reduced willingness-to-pay—then the surplus calculation is incorrect, biasing the bargaining power estimates.

To see how assumption A4 could bias the bargaining power results, consider the following change to the model. Let $\phi_h(\mathcal{M})$ represent the proportion of enrollees who will switch from the MCO having network \mathcal{M} when hospital h is removed from the network. Observe that the proportion of enrollees who will switch MCOs in order to have access to hospital h depends on whether there are suitable substitutes in network \mathcal{M} so is dependent on both the network and the hospital's characteristics. The objective function for hospital h and MCO m is now expressed as

$$(C-1) \max_{p_{hm}} [\Pi_m(\mathcal{M}) - \Pi_m(\mathcal{M} \setminus h; \phi_h(\mathcal{M}))]^{1-\alpha_h} [\Pi_h(\mathcal{H}) - \Pi_h(\mathcal{H} \setminus m; \phi_h(\mathcal{M}))]^{\alpha_h},$$

where $\Pi_m(\mathcal{M} \setminus h; \phi_h(\mathcal{M}))$ is the MCO's profit when hospital h is not in its network causing it to have $\phi_h(\mathcal{M})D_h(\mathcal{M})$ fewer enrollees; and $\Pi_h(\mathcal{H} \setminus m; \phi_h(\mathcal{M}))$ is hospital h 's profit when it is no longer in MCO m 's network but it still treats $\phi_h(\mathcal{M})D_h(\mathcal{M})$ of the patients that were enrolled with MCO m . The FOC of the Nash bargaining product can be

expressed as

$$\begin{aligned}
 \Delta \Pi_h(p_{hm}) = & \alpha_h [\Delta_h W_m(\mathcal{M}) - \Delta_m C_h(D_h(\mathcal{M})) + \Delta_h R_m(\mathcal{M} \setminus h)] \\
 \text{(C-2)} \quad & + \alpha_h [\phi_h(\mathcal{M}) D_h(\mathcal{M}) (W_m(\mathcal{M} \setminus h) - p_m) - (\phi_h(\mathcal{M}) D_h(\mathcal{M}) p_h \\
 & - C_h(\phi_h(\mathcal{M}) D_h(\mathcal{M})))],
 \end{aligned}$$

where $W_m(\mathcal{M} \setminus h)$ is the willingness to pay to have access to network $\mathcal{M} \setminus h$; p_m represents the vector of reimbursements from MCO m to the hospitals that its enrollees who would have chosen hospital h now select when h is not in the network, p_h represents the vector of reimbursements that hospital h receives from the MCOs that the $\phi_h(\mathcal{M}) D_h(\mathcal{M})$ enrollees from MCO m switch to in order to still have access to the hospital. The first term in brackets in eq. (C-2) represents the baseline contract surplus calculated in the paper, while the second term in brackets represents the potential bias to that baseline analysis created by enrollees switching MCOs. Intuitively the value of a contract to the MCO increases by $\phi_h(\mathcal{M}) D_h(\mathcal{M}) (W_m(\mathcal{M} \setminus h) - p_m)$ because that represents profit that is now at risk when a contract is not agreed to; and, similarly, the value of a contract to the hospital decreases by $\phi_h(\mathcal{M}) D_h(\mathcal{M}) p_h - C_h(\phi_h(\mathcal{M}) D_h(\mathcal{M}))$ because those profits are not at risk as those patients will remain with the hospital if it does not agree to a contract with MCO m . When the difference between these two terms is positive the bargaining power estimates will be biased upwards and when negative the bias will be downwards.

Ho (2006) uses data on managed care plans and networks to estimate the demand for managed care coverage as a function of observables including the estimated utility of the associated hospital network. Ho's demand estimates suggest the number may be quite small. For instance, she reports that a one standard deviation drop in the expected utility of an MCO's network will cause the MCO to lose about 31% of its enrollees.³⁵ In our data, a one standard deviation change in expected utility of a choice-set is 2.966 *utils* and the average change in *utils* from removing a hospital and an entire system is 0.033 (0.212) and

³⁵Ho (2006) reports that a one standard deviation increase in the expected utility is equivalent to a \$39 decrease in the premium. She also reports a price elasticity of demand of -1.24 suggesting that a \$5 increase of a \$141 premium results in 4 percent reduction in the probability of being chosen thus a one standard deviation drop in expected utility from the network should result in about a 31 percent reduction in the probability of being chosen.

TABLE C-1—DETERMINANTS OF BARGAINING POWER

Dependent Var. = $\Delta\Pi_h$	Cost Specification					
	Patient Days			DRG-Weighted Discharges		
Output:						
Revenue Associated w/ Discharge	\$5,000	\$10,000	\$20,000	\$5,000	\$10,000	\$20,000
Base Bargaining Pwr.	0.9397** (0.4072)	0.9731** (0.4298)	0.9598** (0.4449)	0.9232** (0.3610)	0.9432** (0.3671)	0.9427*** (0.3658)
Hosp. Market Share	0.2461 (0.2993)	0.2080 (0.2955)	0.1046 (0.2728)	0.2208 (0.2898)	0.1910 (0.2827)	0.0846 (0.2564)
HHI ^{Hosp} - HHI ^{HMO}	0.1667 (0.3531)	0.1548 (0.3600)	0.0889 (0.3275)	0.0428 (0.3082)	0.0242 (0.3099)	-0.0352 (0.2818)
Predicted Patient Days (/1000)	-0.0277** (0.0138)	-0.0284** (0.0141)	-0.0275** (0.0138)	-0.0261** (0.0118)	-0.0267** (0.0119)	-0.0262** (0.0115)
Physician Group	0.2762** (0.1263)	0.2890** (0.1262)	0.2838** (0.1214)	0.2349** (0.1127)	0.2474** (0.1108)	0.2511** (0.1006)
Specialty	-0.0786 (0.2083)	-0.0769 (0.2100)	-0.0438 (0.2099)	-0.0980 (0.1931)	-0.1029 (0.1958)	-0.0862 (0.1915)
Trauma Center	0.1594 (0.1005)	0.1398 (0.0999)	0.1147 (0.0932)	0.1622* (0.0864)	0.1430* (0.0842)	0.1179 (0.0774)
Teaching Hospital	0.3966 (0.2935)	0.4095 (0.2909)	0.3897 (0.2810)	0.2547 (0.2480)	0.2639 (0.2472)	0.2670 (0.2336)
Rural Hospital	-0.2109 (0.1364)	-0.2249 (0.1410)	-0.2206 (0.1386)	-0.1666 (0.1189)	-0.1787 (0.1217)	-0.1841 (0.1188)
For-Profit (FP)	-0.0488 (0.0818)	-0.0535 (0.0827)	-0.0633 (0.0802)	-0.0260 (0.0740)	-0.0264 (0.0737)	-0.0369 (0.0713)
% ER Discharges	-0.7109 (0.4750)	-0.7069 (0.4942)	-0.6319 (0.4936)	-0.5644 (0.4277)	-0.5491 (0.4302)	-0.4996 (0.4192)
System Member	0.2917*** (0.1031)	0.2991*** (0.1077)	0.2880*** (0.1091)	0.2703** (0.1234)	0.2746** (0.1274)	0.2739** (0.1281)
$\gamma_p^{-1} (\times 1000)$	3.5148*** (1.1353)	3.1047*** (1.1896)	2.8875** (1.4161)	3.1606** (1.3368)	2.7776** (1.3907)	2.5062 (1.5290)
Mean Fitted Bargaining Power	0.5891	0.5980	0.6120	0.6688	0.6767	0.6889
Adj. R ²	0.9180	0.9179	0.9176	0.9511	0.9511	0.9510
N	304	304	304	304	304	304

Note: All specifications include HSA fixed effects and use 15% of predicted managed care patients adjusted by the proportion of patients predicted to switch MCOs for the change in cost calculation. Errors are clustered by hospital.
Significance Levels:*** p < .01, ** p < .05, * p < .1

0.079 (0.316) *utils*, respectively. Assuming a similar demand for insurance in California, these data suggest that the removal of one hospital or one system will, on average, lower an MCO's demand by 0.3% and .8%, respectively. Although the switching probabilities indicated by the demand estimates in Ho (2006) are low on average we predict that the removal of certain hospitals in our data can result in MCOs losing as much as 60% of their enrollees within the local patient market, suggesting that not accounting for this in the surplus calculation could result in biased results. To determine how much this impacts the results we

estimate (C-2) using the elasticity implied by Ho (2006). As in the main analysis our data is aggregated at the hospital level. Eq. (C-2) presents in additional challenge in that we do not observe $W_m(\mathcal{M} \setminus h)$, which essentially represents the MCO's revenues from premiums, deductibles, and co-pays that are associated with a given discharge. Given that the average total premium paid for an individual health plan is on the order of \$5,000 and deductibles range from a few hundred to several thousand dollars we estimate the model using values of \$5,000, \$10,000, \$20,000 for $W_m(\mathcal{M} \setminus h)$. The results of this exercise are reported in Table C-1.

The results show that the coefficient estimates are very similar across revenue amounts and almost all are nearly identical to those in the baseline analysis. The system coefficients are slightly lower and, as a result, statistically insignificant in the DRG-weight specification; but, when interacted with not-for-profit status and the number of system hospitals the coefficient is similar to the result in the paper and statistically significant. This may indicate that system hospitals are somewhat more likely to keep patients, perhaps from providing more value than other non-system hospitals in that market or as a consequence of the system having multiple hospitals in the same patient market.

APPENDIX D. ANALYSIS USING ONLY PRIVATELY INSURED PATIENTS

TABLE D-1—DETERMINANTS OF BARGAINING POWER

Dependent Var. = $\Delta\Pi_h$	Cost Specification					
	Patient Days			DRG-Weighted Discharges		
	7.5%	15%	30%	7.5%	15%	30%
Output:						
Patient Proportion:						
Base Bargaining Pwr.	1.0222** (0.4983)	1.0273** (0.5030)	1.0045** (0.4974)	0.8134** (0.4033)	0.7822** (0.3936)	0.7119* (0.3746)
Predicted Patient Days (/1000)	-0.0842* (0.0502)	-0.0438* (0.0255)	-0.0227* (0.0129)	-0.0643* (0.0386)	-0.0321* (0.0192)	-0.0158 (0.0096)
Hosp. Market Share	0.4910 (0.3285)	0.5163 (0.3327)	0.5375 (0.3366)	0.4414 (0.3169)	0.4545 (0.3113)	0.4767 (0.2951)
HHI ^{Hosp} - HHI ^{HMO}	-0.0028 (0.3922)	-0.0007 (0.4088)	0.0037 (0.4307)	-0.1709 (0.3238)	-0.1807 (0.3326)	-0.2032 (0.3538)
Physician Group	0.3633*** (0.1203)	0.3737*** (0.1169)	0.3734*** (0.1109)	0.3415** (0.1468)	0.3506** (0.1501)	0.3670** (0.1519)
Specialty	-0.2387 (0.2081)	-0.2828 (0.2146)	-0.3564 (0.2473)	-0.3110 (0.2358)	-0.3436 (0.2365)	-0.3879* (0.2116)
Trauma Center	0.0980 (0.1185)	0.0979 (0.1216)	0.1086 (0.1267)	0.0853 (0.1206)	0.0828 (0.1253)	0.0803 (0.1330)
Teaching Hospital	0.5945** (0.2643)	0.6294*** (0.2366)	0.6528*** (0.1817)	0.4861* (0.2769)	0.5136* (0.2792)	0.5680** (0.2754)
Rural Hospital	-0.3005* (0.1553)	-0.3125* (0.1595)	-0.3193* (0.1667)	-0.2071 (0.1601)	-0.2031 (0.1651)	-0.1898 (0.1752)
For-Profit (FP)	0.0002 (0.0938)	-0.0019 (0.0935)	-0.0146 (0.0927)	0.0396 (0.1073)	0.0475 (0.1105)	0.0642 (0.1161)
System Member	0.2919** (0.1193)	0.3086** (0.1220)	0.3420*** (0.1263)	0.2399* (0.1264)	0.2447* (0.1288)	0.2563* (0.1331)
% ER Discharges	-0.6622 (0.5744)	-0.6578 (0.5816)	-0.6227 (0.5782)	-0.2401 (0.4789)	-0.1880 (0.4741)	-0.0725 (0.4617)
$\gamma_p^{-1} (\times 1000)$	1.9580** (0.9269)	1.7298** (0.8541)	1.4337* (0.7578)	1.3860 (1.2001)	1.2327 (1.1223)	0.9430 (0.9394)
Mean Fitted Bargaining Pwr.	0.6824	0.6968	0.7087	0.7691	0.7797	0.8018
Adj. R ²	0.9194	0.9198	0.9211	0.9558	0.9559	0.9564
N	289	289	289	289	289	289

Note: All specifications include HSA fixed effects. Errors are clustered by hospital and adjusted to account for data generated by first-stage regressions following Murphy and Topel (1985).
Significance Levels:*** p < .01, ** p < .05, * p < .1

TABLE D-2—DETERMINANTS OF BARGAINING POWER

Dependent Var. = $\Delta\Pi_h$	Cost Specification					
	Patient Days			DRG-Weighted Discharges		
	\$5,000	\$10,000	\$20,000	\$5,000	\$10,000	\$20,000
Output:						
Revenue Associated w/ Discharge						
Base Bargaining Pwr.	0.9093* (0.4719)	0.9343* (0.4833)	0.9790* (0.5039)	0.7720* (0.4117)	0.7772* (0.4113)	0.7850* (0.4098)
Predicted Patient Days (/1000)	-0.0059 (0.0036)	-0.0061 (0.0037)	-0.0063 (0.0038)	-0.0052* (0.0030)	-0.0053* (0.0030)	-0.0053* (0.0031)
Hosp. Market Share	0.5231 (0.3377)	0.5242 (0.3420)	0.5168 (0.3490)	0.5345 (0.3626)	0.5411 (0.3611)	0.5433 (0.3557)
HHI ^{Hosp} - HHI ^{HMO}	0.1578 (0.4074)	0.1587 (0.4185)	0.1567 (0.4377)	-0.0273 (0.3576)	-0.0351 (0.3630)	-0.0516 (0.3715)
Physician Group	0.3047** (0.1187)	0.3156*** (0.1191)	0.3355*** (0.1196)	0.2918** (0.1454)	0.3021** (0.1481)	0.3201** (0.1529)
Specialty	-0.2423 (0.1996)	-0.2532 (0.2019)	-0.2739 (0.2058)	-0.2928 (0.2006)	-0.3077 (0.2082)	-0.3377 (0.2243)
Trauma Center	0.1530 (0.1201)	0.1435 (0.1209)	0.1242 (0.1220)	0.1418 (0.1224)	0.1309 (0.1245)	0.1102 (0.1283)
Teaching Hospital	0.5463** (0.2560)	0.5645** (0.2541)	0.5974** (0.2496)	0.4648* (0.2671)	0.4780* (0.2713)	0.5010* (0.2789)
Rural Hospital	-0.2307 (0.1467)	-0.2454 (0.1506)	-0.2726* (0.1588)	-0.1499 (0.1492)	-0.1598 (0.1541)	-0.1781 (0.1634)
For-Profit (FP)	0.0010 (0.0898)	-0.0021 (0.0912)	-0.0089 (0.0939)	0.0374 (0.1059)	0.0408 (0.1075)	0.0462 (0.1103)
System Member	0.2627** (0.1120)	0.2711** (0.1147)	0.2868** (0.1203)	0.2285* (0.1236)	0.2313* (0.1262)	0.2367* (0.1310)
% ER Discharges	-0.6342 (0.5508)	-0.6437 (0.5623)	-0.6561 (0.5823)	-0.2771 (0.4871)	-0.2614 (0.4880)	-0.2286 (0.4893)
γ_p^{-1} ($\times 1000$)	3.3559*** (1.0465)	3.1009*** (1.0346)	2.6458** (1.0321)	2.4561* (1.2450)	2.2282* (1.2284)	1.8271 (1.2070)
Mean Fitted Bargaining Pwr.	0.6815	0.6962	0.7215	0.7954	0.8084	0.8289
Adj. R ²	0.9184	0.9185	0.9184	0.9541	0.9543	0.9545
N	289	289	289	289	289	289

Note: All specifications include HSA fixed effects and use 15% of predicted managed care patients adjusted by the proportion of patients predicted to switch MCOs for the change in cost calculation. Errors are clustered by hospital.

Significance Levels:*** p < .01, ** p < .05, * p < .1