Mergers When Prices Are Negotiated: Evidence from the Hospital Industry

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Introduction

- For many transactions, prices are determined by bilateral negotiations
- Examples include:
  - Negotiated rates between content providers and cable companies
  - Terms of trade between book publishers and online retailers such as Amazon
  - Hospital prices in the healthcare markets we study
- Each side has an incentive to improve bargaining leverage
  - One potential way: merging with a competitor

Purpose of paper

This paper formulates and estimates a bargaining model over prices between hospital systems and managed care organizations (MCOs)

- We use high quality administrative claims data from payors to construct hospital prices
- We examine impact of counterfactual mergers and conduct remedies
- We use the model to evaluate how hospital bargaining and patient coinsurance restrain prices

Framework potentially applicable to other settings with negotiated prices and “gatekeeper” buyers who act as intermediaries

Why hospital mergers?

- Sector accounts for over 5% of GDP
- More hospital merger trials than for any other industry!
- Mergers important determinants of bargaining leverage
  - MCOs obtain lower prices than traditional insurance because of bargaining leverage
  - Significant in restraining medical prices (Cutler et al., 2000)
  - Strategic response of hospitals is merger – threat of removing hospital *system* is larger
- Recently:
  - 2012 Rockford (IL) Health System
  - 2011 ProMedica (Toledo, OH)
  - Decision based in part on simulation models
- More consolidation likely given incentives in Affordable Care Act

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In Illinois and Ohio, Turning Points in the War against Hospital Monopolies

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Swedish American Hospital in Rockford, Illinois. Swedish would have benefited from the Rockford-OSF merger, as the second-largest player in a hospital duopoly. Image via Wikipedia.

One of the big reasons why health care is so expensive is because many hospitals have near-monopoly pricing power in their local markets. Even so, it's been hard for the government's antitrust agencies to block these mergers, because the courts have sided with the hospitals against the government. Today, from Illinois, we learn of some promising news: two hospitals have abandoned plans to merge, following a challenge from the Federal Trade Commission. Could this be a turning point in the war against hospital monopolies?

In May of 2010, Rockford Health System, a network of providers in northern Illinois, signed a letter of intent to join the OSF Healthcare System, a large network of providers in the same area, including 7 hospitals. (OSF stands for the Sisters of the Third Order of St. Francis, based in Peoria.)

Why use a bargaining model?

- Alternative would be to estimate a discrete choice model of Bertrand competition with differentiated products
- Consumers pay little out-of-pocket for hospital stays
  - Demand based on patient flows will be very inelastic
  - Implication: very *negative* marginal costs
- MCO incentives generally more elastic than patient incentives
- Incentives may also change in different ways following a merger
- Structural model useful for analyzing out-of-sample policies and events and guiding reduced-form analysis
  - Estimation takes 15 minutes
  - Counterfactuals slower

Relation to literature

We combine and extend three literatures:

1. Differentiated products merger literature
   - Berry and Pakes (1993), Nevo (2000), etc.
   - Difficult to model hospitals using this framework
2. Hospital merger literature
   - Town and Vistnes (2001); Capps et al. (2003) [CDS]; Ho (2009); Lewis and Pflum (2011); Dranove et al. (2011)
   - Literature typically estimates structural patient choice and reduced form pricing equations
   - We develop structural models and counterfactuals
3. Structural bargaining model literature
   - Crawford and Yurukoglu (2013); Grennan (2013)
   - We apply framework to hospital/MCO bargaining
   - Extend framework to have unobserved term in costs
   - Examine impact of mergers, hospital systems, and coinsurance

Remainder of talk

1. Model
2. Estimation and identification
3. Institutional setting and data
4. Results
5. Counterfactuals
6. Conclusions

Model

- Two-stage model:
  1. Stage 1: MCOs and hospitals bargain to set hospital prices and set of in-network hospitals
  2. Stage 2: Some enrollees get ill and seek hospital care, basing choice on networks and prices
- Base model:
  - MCOs act as (imperfect) agents for employers
- Examine robustness model where:
  - MCOs post premiums then compete for enrollees
  - Lacking data, we calibrate parameters of this model
- True incentives likely more aligned than robustness model:
  - Majority of employers offer one plan
  - Plans negotiated via long-run contracts
  - Self-insured employers negotiate administrative fees only
- Incentive alignment might be in between two models

Stage 2: patient choice

- Patient i can receive one of a number of illnesses, d
  - One possibility is no illness, $d = 0$
  - Other illnesses are weighted by the DRG weight, w_d
  - Probability f_{id} of each illness
- Knowing her illness, each patient makes a discrete choice among hospitals in market or outside option
- We employ a multinomial logit utility framework
- Main regressors are:
  - out-of-pocket price
  - fixed effects at hospital-year level
  - travel time
  - hospital fixed effects interacted with DRG weight

Stage 2: patient choice (details)

- We assume that out-of-pocket price is:

$$c_{id} \times w_d \times p_{m(i)j}$$

  where:
  - c_{id} is individual i's coinsurance rate
  - w_d is the DRG weight
  - $p_{m(i)j}$ is the negotiated price between i's MCO $m(i)$ and hospital j
- Utility consists of an unobservable e_{ij} plus

$$\delta_{ij} = \boldsymbol{\beta} x_{ijd} - \alpha c_{id} w_d p_{m(i)j}$$

- α and $\boldsymbol{\beta}$ are parameters to be estimated
- Consumer surplus (necessary for MCO objective function):

$$W_i(\mathcal{N}_{m(i)}, \mathbf{p}_{m(i)}) = \sum_{d=1}^{D} f_{id} \ln \left(\sum_{j \in 0, \mathcal{N}_{m(i)}} \exp(\delta_{ijd}) \right)$$

Stage 1: overview

- Network hospitals and prices decided via bargaining game
- There are $M \times S$ contracts
  - Contract is for unique MCO (m) and hospital system (s) pair
  - Contract specifies all negotiated base prices for its pair
  - Each hospital within a system has a separate base price
- Following Horn and Wolinsky (1988):
  - Each contract solves price vector as Nash bargaining solution
  - Disagreement points are second-stage values to each party from having no agreement
  - Nash bargaining solution embedded within Nash equilibrium of simultaneous complete information game
- Collard-Wexler, Gowrisankaran, and Lee (2012) show alternating offers representation for this type of game

Stage 1: MCO objective function

- MCOs/employers maximize weighted sum of enrollee surplus and payments to hospitals, with weight τ
- Let $TC_m(\mathcal{N}_m, \mathbf{p}_m)$ denote the total costs to MCO
  - Consists of payments to hospitals net of coinsurance
- Then, managed care surplus is:

$$V_m(\mathcal{N}_m, \mathbf{p}_m) = \frac{\tau}{\alpha} \sum_{i=1}^{I} 1\{m(i) = m\} W_i(\mathcal{N}_m, \mathbf{p}_m) - TC_m(\mathcal{N}_m, \mathbf{p}_m)$$

  where:
  - α is price sensitivity
  - τ reflects imperfect agency
- Surplus is enrollee welfare minus payments to hospitals

Stage 1: hospital system objective function

- Hospitals face constant marginal costs
  - Allow variation across MCO, e.g., due to paperwork
  - Proportional to DRG weight
- Hospitals maximize weighted sum of profits and quantity
  - Equivalent to cost differences for not-for-profits
- Hospital costs can be decomposed into components observable to econometrician and residual:

$$mc_{mj} = \boldsymbol{\gamma}\mathbf{v}_{mj} + \varepsilon_{mj}$$

- Hospital system s returns (profits) from all its contracts:

$$\sum_{m \in \mathcal{M}_s} \sum_{j \in \mathcal{J}_s} q_{mj}(\mathcal{N}_m, \mathbf{p}_m)[p_{mj} - mc_{mj}]$$

where $q_{mj}(\mathcal{N}_m, \mathbf{p}_m)$ is quantity weighted by DRG weight

Nash bargaining problem

- Problem is a function of equilibrium values from agreement relative to disagreement

$$NB^{m,s}(p_{mj_{j\in\mathcal{J}_s}}|\mathbf{p}_{m,\_s}) =$$

$$\Big(\sum_{j\in\mathcal{J}_s} q_{mj}(\mathcal{N}_m,\mathbf{p}_m)[p_{mj}-mc_{mj}]\Big)^{b_{s(m)}}\Big(V_m(\mathbf{N}_m,\mathbf{p}_m)-V_m(\mathcal{N}_m\backslash\mathcal{J}_s,\mathbf{p}_m)\Big)^{b_{m(s)}}$$

- Bargaining weights are $b_{s(m)}$ and $b_{m(s)}$
  - They represent the *portion* of the surplus that each side is able to capture
  - The surpluses themselves are expressions in parentheses
- Our equilibrium prices solve the Nash bargain:

$$p^*_{mj} = max_{p_{mj}} NB(p_{mj},\mathbf{p}^*_{m,\_j}|\mathbf{p}^*_{m,\_s})$$

Bargaining game: FOCs

- Differentiate to write the FOC:

$$b_{s(m)} \frac{q_{mj} + \sum_{k \in \mathcal{J}_s} \frac{\partial q_{mk}}{\partial p_{mj}} [p_{mk} - mc_{mk}]}{\sum_{k \in \mathcal{J}_s} q_{mk} [p_{mk} - mc_{mk}]} = -b_{m(s)} \underbrace{\frac{\overbrace{\frac{\partial V_m}{\partial p_{mj}}}^{A}}{V_m(\mathcal{N}_m, \mathbf{p}_m) - V_m(\mathcal{N}_m \setminus \mathcal{J}_s, \mathbf{p}_m)}}_{B}$$

- Rewrite the $\#(\mathcal{J}_s)$ FOCs for system s as:

$$\mathbf{q} + \Omega(\mathbf{p} - \mathbf{mc}) = -\Lambda(\mathbf{p} - \mathbf{mc})$$

where

$$\Omega(j,k) = \frac{\partial q_{mk}}{\partial p_{mj}}, \qquad \Lambda(j,k) = \frac{b_{m(s)}}{b_{s(m)}} \frac{A}{B} q_{mk}$$

- Express as: $\mathbf{p} - \mathbf{mc} = -(\Omega + \Lambda)^{-1}\mathbf{q}$
  - **mc** is our "dependent" variable for estimation
- If $\Lambda = 0$, this would be Bertrand competition FOC
  - $\Omega + \Lambda$ is effective price sensitivity

Implications of bargaining game: coinsurance rates

- When $\tau = 1$:

$$\frac{\partial V_m}{\partial p_{mj}} = -q_{mj} - \alpha \sum_{i=1}^{I} \sum_{d=1}^{D} 1\{m(i) = m\}(1 - c_{id}) c_{id} w_{id}^2 f_{id} s_{ijd} \left(\sum_{k \in \mathcal{N}_m} p_{mk} s_{ikd} - p_{mj} \right)$$

- First term is standard price effect
- Second term is *steering effect*:
  - Raising price on high-priced hospitals has positive effect – consumers may substitute to lower-priced ones
  - System may get higher margin on high-cost hospitals

Implications of bargaining game: no coinsurance

- Simpler form to FOC when $c_{mid} = 0$:

$$\sum_{k \in \mathcal{J}_s} q_{mk}[p_{mk} - mc_{mk}] = \frac{b_{s(m)}}{b_{m(s)}} [V_m(\mathcal{N}_m, \mathbf{p}_m) - V_m(\mathcal{N}_m \setminus \mathcal{J}_s, \mathbf{p}_m)]$$

  - Linear system → closed form to counterfactual prices
  - CDS's similar model is consistent with lump-sum transfer

Implications of bargaining game: price sensitivity

- Intuition easier from single-hospital system case:

$$p_{mj} - mc_{mj} = -q_{mj}\left(\frac{\partial q_{mj}}{\partial p_{mj}} + q_{mj}\frac{b_{m(j)}}{b_{j(m)}}\frac{A}{B}\right)^{-1}$$

- "B" is positive – value to MCO from hospital
- "A" term is $\partial V_m / \partial p_{mj}$ – generally (not always) negative
- Implies that *effective* price sensitivity generally higher than with Bertrand competition

Estimation of patient choice stage

Estimation uses maximum likelihood:

- Data include information on patient residences, prices paid by MCOs to hospitals and coinsurance rates
- Outcome is choice of hospital
- Parameters are multinomial logit coefficients $\boldsymbol{\beta}$ and α

Identification of patient choice stage

What identifies our parameters?

- We include hospital-year interactions
  - Identification is from 'within' hospital-year variation
- Price term α identified primarily by variation in coinsurance rates across payors (within hospital-year)
  - Coinsurance varies between 0.2% and 4.4% across MCOs
  - Do people with higher coinsurance pick cheaper hospitals?
- Distance and other interactions identified from patient-level variation in location and DRG weights
  - How far do people travel?
  - Where do high-DRG-weight people seek treatment?

Estimation of first stage

Estimation uses generalized method of moments (GMM):

- Parameters are bargaining weights, cost determinants, and the MCO objective function
- We back out marginal cost residuals by imposing bargaining model at estimated demand parameters:

$$\boldsymbol{\varepsilon}(\mathbf{b}, \boldsymbol{\gamma}, \tau) = \mathbf{p} - \boldsymbol{\gamma}\mathbf{v} + (\Omega + \Lambda(\mathbf{b}, \tau))^{-1}\mathbf{q}$$

- Moments constructed based on marginal cost residual

$$E[\varepsilon_{mj}(\mathbf{b}, \boldsymbol{\gamma}, \tau)|Z_{mj}] = 0]$$

- Exogenous variables $\mathbf{Z}$:
  - Cost fixed effects
  - Fixed effects at level of bargaining parameters
  - WTP for hospital (per person and sum), system (per person), and predicted $\mathbf{q}$; all calculated with mean prices

Identification of first stage

- τ identified by extent to which MCOs value hospital choice relative to payments to hospitals
- We use WTP measures as "instruments"
  - Measures capture variation in enrollee characteristics
  - This (assumed exogenous) variation necessary to identify τ
- Cost fixed effects $\boldsymbol{\gamma}$ have similar implications to bargaining weights $\mathbf{b}$
  - When we allow bargaining weight differences by MCO, we do not allow costs to vary across MCO

Robustness model with posted premium competition

- MCOs objective in price negotiation with hospitals is to maximize profits
- Following price negotiation:
  1. MCOs simultaneously set premiums, P_m
  2. Enrollees choose an MCO or outside option
- Enrollee utility at point of MCO choice:

$$\alpha_1 W_i(\mathcal{N}_m, \mathbf{p}_m) - \alpha_2 P_m + \xi_m + E_{im}$$

where

- ξ_m is unobservable plan quality
- E_{im} is an *i.i.d.* term
- α_1 and α_2 are parameters to estimate

Calibration of posted premium competition model

Model is a function of parameters of MCO choice equation but we lack data and variation at MCO choice level

- We calibrate MCO premium sensitivity from Ericson and Starc (2012), $\alpha_2 = 0.0019$
- We choose welfare weight of $\alpha_1 = \frac{\tau\alpha_2}{\alpha}$, using estimated α and τ
  - Imposes rationality that a dollar at premium stage is worth a dollar at hospital choice stage
- We calculate plan quality ξ_m to match MCO market shares
- **mc** and **b** from base model estimates
- Need assumptions on people who are not ill
  - They purchase insurance too!
  - Assume each person has one of two outcomes: (1) no disease ($d = 0$) or (2) disease observed in data

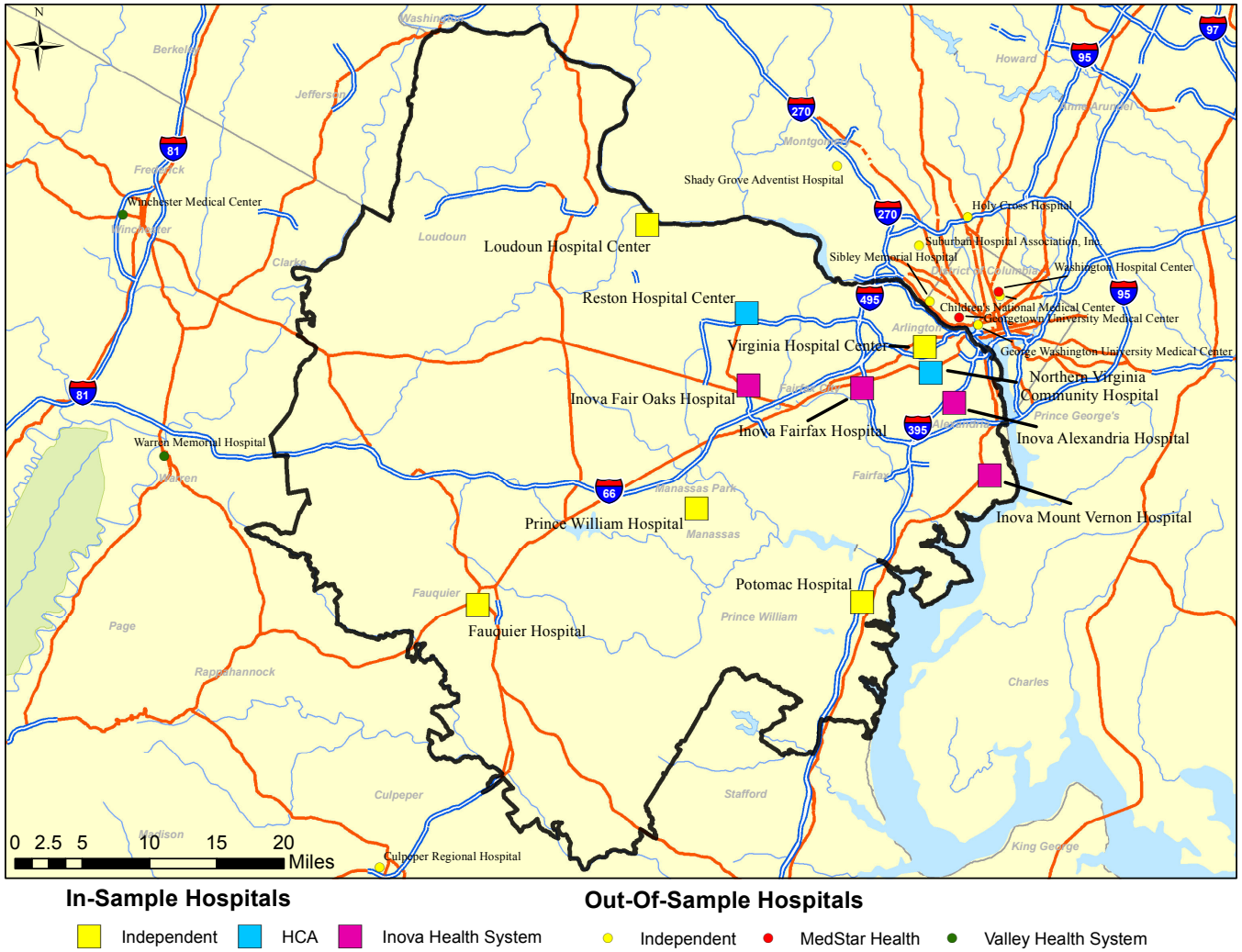
Inova's proposed acquisition of Prince William Hospital

- Inova Health System sought to acquire Prince William Hospital in 2006
- Inova Health System
  - 5 hospital system in Northern Virginia
  - 1,876 beds
  - Large tertiary hospital/high end services
  - No meaningful physician ownership
  - Operating revenue of $1.8 billion
- Prince William Hospital (PWH)
  - Community hospital in Manassas, VA
  - 170 beds
  - No tertiary services
  - Operating revenue of $170.5 million
  - Purchase "price": $175 million capital commitment
- Previous IHS acquisitions:
  - 2005: Loudoun Hospital; 1997: Alexandria Hospital

Overview of the proposed merger (continued)

- FTC & Virginia AG challenged the acquisition in May, 2008
  - Product Market: General, acute care inpatient hospital services sold to private payors
  - Geographic Market: Virginia Health Planning District 8 and Fauquier County
- HHI (private revenues): 5,635 to 6,174
- Outcome:
  - The parties abandoned the transaction after the case was filed
  - Prince William later acquired by Novant Health

Map


Shady Grove Adventist Hospital
Holy Cross Hospital
Suburban Hospital Association, Inc.
Sibley Memorial Hospital
Washington Hospital Center
Children's National Medical Center
Georgetown University Medical Center
George Washington University Medical Center
Northern Virginia Community Hospital
Inova Alexandria Hospital
Inova Mount Vernon Hospital
Loudoun Hospital Center
Reston Hospital Center
Virginia Hospital Center
Inova Fair Oaks Hospital
Inova Fairfax Hospital
Prince William Hospital
Potomac Hospital
Fauquier Hospital
Winchester Medical Center
Warren Memorial Hospital
Culpeper Regional Hospital
Berkeley
Jefferson
Frederick
Winchester
Clarke
Loudoun
Montgomery
Howard
Anne Arundel
District of Columbia
Arlington
Prince George's
Fairfax
Manassas Park
Manassas
Prince William
Fauquier
Warren
Page
Rappahannock
Culpeper
Madison
Stafford
Charles
King George
0 2.5 5 10 15 20 Miles
In-Sample Hospitals
Independent
HCA
Inova Health System
Out-Of-Sample Hospitals
Independent
MedStar Health
Valley Health System

Data

- Claims data from 4 MCOs who operate in market
  - Use to construct base prices and patient-specific coinsurance rates
- State inpatient discharge data
  - Use to define sample
  - Keep data from same four MCOs
  - Includes patient ZIP code and at episode level
- Hospital characteristics from AHA
- Travel time information from MapQuest

Sample, prices and coinsurance rates

- Use more complete discharge data for sample
- Construct base price for each hospital-payor-year triplet:
  - Aggregate claims to episode level
  - Regress amount paid divided by DRG weight on gender, age, and hospital dummies, separately by MCO/year
  - Impute price p_{mjt} as fitted value across MCO/year
- Construct coinsurance rate for each patient:
  - Define coinsurance rate as coinsurance amount divided by total price
  - For some MCOs, remove *copays*, such as \$25, \$50, \$100
  - Tobit regression of coinsurance rate on DRG weight and demographics, by MCO
  - Impute coinsurance rate as fitted value
- Merge price and coinsurance to discharge data

Sample hospitals

Hospital	Beds	Mean price $	FP	Mean NICU	Cath lab
Prince William Hospital	170	10,273	0	1	0
Alexandria Hospital	318	9,757	0	1	1
Fair Oaks Hospital	182	9,799	0	.5	1
Fairfax Hospital	833	11,881	0	1	1
Loudoun Hospital	155	11,565	0	0	1
Mount Vernon Hospital	237	12,112	0	0	1
Fauquier Hospital	86	13,270	0	0	0
N. VA Community Hosp.	164	9,545	1	0	1
Potomac Hospital	153	11,420	0	1	1
Reston Hospital Center	187	9,973	1	1	1
Virginia Hospital Center	334	9,545	0	.5	1

Patient summary statistics

Hospital	Mean age	Share white	Mean DRG weight	Mean travel time	Mean coins. rate	Discharges Total	Discharges Share
Prince William Hospital	36.1	0.73	0.82	13.06	0.032	9,681	0.066
Alexandria Hospital	39.3	0.62	0.92	12.78	0.025	15,622	0.107
Fair Oaks Hospital	37.7	0.54	0.94	17.75	0.023	17,073	0.117
Fairfax Hospital	35.8	0.58	1.20	18.97	0.023	46,428	0.319
Loudoun Hospital	37.2	0.74	0.81	15.54	0.023	10,441	0.072
Mount Vernon Hospital	50.3	0.66	1.38	16.18	0.022	3,749	0.026
Fauquier Hospital	40.5	0.90	0.92	15.29	0.033	3,111	0.021
N. VA Comm. Hosp.	47.2	0.48	1.43	16.02	0.016	531	0.004
Potomac Hospital	37.5	0.60	0.93	9.62	0.024	8,737	0.060
Reston Hospital Center	36.8	0.69	0.90	15.35	0.021	16,007	0.110
Virginia Hospital Center	40.8	0.59	0.98	15.88	0.017	12,246	0.084
Outside option	39.3	0.82	1.39	0.00	0.029	2,113	0.014
All Inova	37.5	0.59	1.09	17.37	0.024	85,540	0.641
All others	38.1	0.68	0.92	13.74	0.023	60,199	0.359

Multinomial logit demand estimates

Variable	Coefficient	Standard error
Base price × weight × coinsurance	−0.0008**	(0.0001)
Travel time	−0.1150**	(0.0026)
Travel time squared	−0.0002**	(0.0000)
Closest	0.2845**	(0.0114)
Travel time × beds / 100	−0.0118**	(0.0008)
Travel time × age / 100	−0.0441**	(0.0023)
Travel time × FP	0.0157**	(0.0011)
Travel time × teach	0.0280**	(0.0010)
Travel time × residents/beds	0.0006**	(0.0000)
Travel time × income / 1000	0.0002**	(0.0000)
Travel time × male	−0.0151**	(0.0007)
Travel time × age 60+	−0.0017	(0.0013)
Travel time × weight / 1000	11.4723**	(0.4125)
Cardiac MDC × cath lab	0.2036**	(0.0409)
Obstetric MDC × NICU	0.6187**	(0.0170)
Nerv, circ, musc MDC × MRI	−0.1409**	(0.0460)
N	1,710,801	
Pseudo R^2	0.445	

Note: specification also includes hospital-year interactions and hospital dummies interacted with disease weight.

Demand elasticity estimates – select hospitals

Hospital	(1) PW	(2) Fairfax	(3) Reston	(4) Loudoun	(5) Fauquier
1. Prince William	−0.125	0.052	0.012	0.004	0.012
2. Inova Fairfax	0.011	−0.141	0.018	0.006	0.004
3. HCA Reston	0.008	0.055	−0.149	0.022	0.002
4. Inova Loudoun	0.004	0.032	0.037	−0.098	0.001
5. Fauquier	0.026	0.041	0.006	0.002	−0.153
6. Outside option	0.025	0.090	0.022	0.023	0.050

Note: Elasticity is $\frac{\partial s_j}{\partial p_k}\frac{p_k}{s_j}$ (rows=j, col = k)

- Implied value of reducing travel time to all hospitals by 1 minute: $167

Bargaining parameter estimates

	Specification 1		Specification 2	
Parameter	Estimate	S.E.	Estimate	S.E.
MCO Welfare Weight (τ)	2.79	(2.87)	6.69	(5.53)
MCO 1 Bargaining Weight	0.5	–	0.52	(0.09)
MCOs 2 & 3 Bargaining Weight	0.5	–	1.00**	(7.77×10^{-10})
MCO 4 Bargaining Weight	0.5	–	0.76**	(0.09)
Cost parameters				
Inova Fairfax	10, 786**	(3,765)	6, 133**	(1,211)
Inova Fair Oaks	11, 192**	(3,239)	6, 970**	(2,352)
Inova Alexandria	10, 412*	(4,415)	6, 487**	(1,905)
Inova Mount Vernon	10, 294*	(5,170)	4,658	(3,412)
Inova Loudoun	12, 014**	(3,188)	8, 167**	(1,145)
Prince William Hospital	8, 635**	(3,009)	5, 971**	(1,236)
Fauquier Hospital	14, 553**	(3,390)	9, 041**	(1,905)
No. VA Community Hosp.	10, 086**	(2,413)	5, 754**	(2,162)
Potomac Hospital	11, 459**	(2,703)	7, 653**	(902)
Reston Hospital Center	8, 249**	(3,064)	5, 756**	(1,607)
Virginia Hospital Center	7, 993**	(2,139)	5, 303**	(1,226)
MCO 2 Cost	−9, 043**	(2,831)	–	–
MCO 3 Cost	−8, 910**	(3,128)	–	–
MCO 4 Cost	−4,476	(2,707)	–	–
Year 2004	1,130	(1,303)	1,414	(1,410)
Year 2005	1,808	(1,481)	1,737	(1,264)
Year 2006	1,908	(1,259)	2, 459*	(1,077)

Note: we report bootstrapped standard errors at the payor, year, system level.

Lerner indices, actual and effective price elasticities

- Lerner index is the price/cost margin, formally $L = \frac{p-mc}{p}$
- We calculate effective price elasticities using inverse elasticity rule for pricing: $elast = L^{-1}$

System name	Lerner index	Actual own price elasticity	Effective own price elasticity	Own price elasticity without insurance
Prince William Hospital	0.52	0.13	1.94	5.16
Inova Health System	0.39	0.07	2.55	3.10
Fauquier Hospital	0.22	0.17	4.56	6.11
HCA (Reston Hospital)	0.35	0.15	2.87	7.34
Potomac Hospital	0.37	0.15	2.74	6.77
Virginia Hospital Center	0.58	0.13	1.74	6.43

Impact of counterfactual industry structures

Counterfactual	System	%Δ Price	%Δ Quantity	%Δ Profits
1. Inova/PWH merger	Inova & PWH	3.1	−0.5	9.3
	Rival hospitals	3.6	1.2	12.0
	Change at Inova+PW relative to PW base	30.5	−4.9	91.5
2. Inova/PWH merger with separate bargaining	Inova & PWH	3.3	−0.5	8.8
	Rival hospitals	3.5	1.2	11.2
3. Loudoun demerger	Inova & Loudoun	−1.8	0.1	−4.7
	Rival hospitals	−1.6	−0.2	−4.7
	Change at Inova relative to Loudoun base	−14.7	0.8	−38.5
4. Breaking up Inova	All hospitals	−6.8	0.05	−18.9

- "Separate bargaining" is conduct remedy imposed in Evanston Northwestern-Highland Park merger

Impact of counterfactual coinsurance levels

Counterfactual	System	%Δ Price	%Δ Quantity	%Δ Profits
1. No coinsurance	All hospitals	3.7	0.01	9.8
2. Coinsurance 10 times current	All hospitals	−16.1	0.9	−0.4
3. Inova/PWH merger, no coinsurance	Inova & PWH Rival hospitals	2.9 1.3	0 0	7.4 3.9

- Coinsurance 10 times larger approximates optimal insurance (Manning and Marquis, 1996)

Baseline predictions across models

Variable	Mean value in posted premium competition model	Mean value in base model
Hospital prices	$11,088	$13,618
Hospital margin per patient	$4,796	$4,893
MCO premiums	$1,706	–
MCO margin per enrollee	$792	–
Consumer surplus	$4,398	–
Health insurance take-up (%)	84.5	–

- Results broadly similar across models
- Not shown, Lerner indices also similar across models

Merger impact across base and robustness models

	Posted premium competition model	Base model – Specification 1
Inova/PWH prices	7.2%	3.1%
Other hospitals prices	2.2%	3.6%
Inova/PWH margin per patient	16.9%	9.8%
Other hospitals margin per patient	6.6%	10.7%
MCO premiums	3.4%	–
MCO margin per enrollee	1.0%	–
Consumer surplus	-4.4%	–
Health insurance take-up	-1.6%	–

- Posted premium competition model increases value from disagreement on both sides of market
- Hospitals benefit more from merger with posted premium competition
  - Hospitals in this model can recapture some patients following disagreement
  - Spill-and-recapture appears to be dominant difference between models

Conclusions

- Paper constructs and estimates a model of a bargaining game between hospital systems and MCOs
  - Bargaining equilibria differ from Bertrand equilibrium
  - Techniques for analyzing mergers with Bertrand competition can be adapted to negotiated prices
- Bargaining leverage results in MCOs being more price sensitive than patients
  - Implication: MCOs can help lower prices
- Patient coinsurance also lowers prices
  - Implication: recent higher coinsurance rates will do more
- Significant price increase from blocked Inova and PW merger
  - Conduct remedies don't help – they change leverage on both sides of market
- Paper provides structural framework to evaluate bargaining models, which are being used for merger policy