Hospital Choices, Hospital Prices, and Financial Incentives to Physicians

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Research Question

- Does money affect obstetricians' referral decisions?
- Moment Inequalities Estimator vs. Logit Model

Setting / Data / Terminology

- Capitation
- Focus on obstetricians
- Data: patient discharges data in California
  - Year 2003
  - Office of Statewide Planning and Development (OSHPD)

TABLE 1—ENROLLMENT DATA BY INSURER

	2002 enrollment			Birth
	Com. plans	Medicare	Medi-Cal	discharges
Aetna	485,787	37,312	0	6,291
Blue Cross	3,486,358	251,299	1,099,044	25,038
Blue Shield	2,231,350	67,049	0	16,302
Cigna	634,568	0	0	8,097
Health Net	1,665,221	101,317	349,826	16,950
Pacificare	1,543,000	386,076	0	15,479
Kaiser	5,790,348	671,858	104,844	N/A

Notes: Enrollment data on the six insurers in our analysis and on Kaiser Permanente. Source for 2002 enrollment: Baumgarten (2004). 2002 enrollment listed for commercial plans, Medicare plans and Medi-Cal/Healthy Families plans. "Birth discharges" is discharges in our data sample.

TABLE 2—SUMMARY STATISTICS BY INSURER

	Percent Prim Capitn	Tax status	Premium pmpm	Admin expense	Medical loss ratio	Inpatient utilizn		Prescrip drugs
						Discharges	Days	
Aetna	0.91	FP	152.42	19.33	86.2 percent	38.4	139.8	23.15
Blue Cross	0.38	FP	186.86	21.22	78.9 percent	38.4	142.4	20.92
Blue Shield	0.57	NFP	146.33	22.72	83.5 percent	50.3	176.4	20.51
Cigna	0.75	FP	-*	27.07	84.6 percent	39.8	137.1	15.63
Health Net	0.80	FP	184.92	18.60	86.3 percent	39.0	137.8	21.08
Pacificare	0.97	FP	149.92	24.51	88.4 percent	44.5	156.5	20.48
Kaiser		NFP	163.44	5.23	97.7 percent	49.1	158.1	0.44

Models

- Utility = Price (by insurers to doctors) + Hospital Quality + Patient Distance
- Price = list price (depends on condition) * discount rate
  - Condition: diagnosis (e.g. normal delivery/early labor) + age + comorbidity
- Hospital Quality = Objective Quality+ Subjective/Perceived Quality
  - Depends on “severity”, measured as Charlson scores (0-6)

Models (Formally)

- $W_{i,\pi,h} = \theta_{p,\pi} p(c_i, h, \pi) + g_\pi(q_h(s), s_i) + \theta_{d1} d(l_i, l_h) + \theta_{d2} d(l_i, l_h)^2 + \varepsilon_{i,\pi,h}$
- $p(c_i, h, \pi) = \delta_h^o lp^o(c_i, h)$
- $g_\pi(q_h(s), s_i) = q_h + \beta z_h x(s_i) + e_\pi(q_h(s), s_i)$
- $\theta_{p,\pi} =$
  - $\theta_{p,\pi} = \theta_p$
  - $\theta_{p,\pi} = \theta_{p,\pi}$
  - $\theta_{p,\pi} = \theta_0 + \theta_1 pcap_\pi$

Logit Estimation

- Negative Distance Coefficients (Expected)
  - Second order term doesn't matter
- Positive Price Coefficients (Unexpected)
  - Expect Positive Bias. Why?
  - Why did author zoom in on "sickest patients"?
- Higher capitation rates -> Less likely referral

TABLE 5—LOGIT ANALYSIS RESULTS

	All birth patients	Least sick patients			Sickest patients		
Price	0.010** (0.002)	−0.017* (0.009)		0.069** (0.014)	0.012** (0.002)		0.028** (0.006)
Price interactions:							
Percent capitated				−0.127** (0.016)			−0.025** (0.008)
Pacificare			−0.077** (0.012)			−0.006 (0.006)	
Aetna			−0.011 (0.016)			0.021** (0.008)	
Health Net			−0.038** (0.011)			0.007 (0.005)	
Cigna			−0.021 (0.014)			0.004 (0.007)	
Blue Shield			0.018 (0.011)			0.024** (0.004)	
Blue Cross			0.008 (0.011)			0.014** (0.003)	
Distance	−0.215** (0.001)	−0.215** (0.002)	−0.215** (0.002)	−0.215** (0.002)	−0.217** (0.002)	−0.216** (0.002)	−0.216** (0.002)
Distance squared	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
$z_h x_i$ controls (15 coeffts)	Y	Y	Y	Y	Y	Y	Y
Hospital FEs (194 coeffts)	Y	Y	Y	Y	Y	Y	Y
Observations	88,157	43,742	43,742	43,742	44,059	44,059	44,059

Moment Inequalities

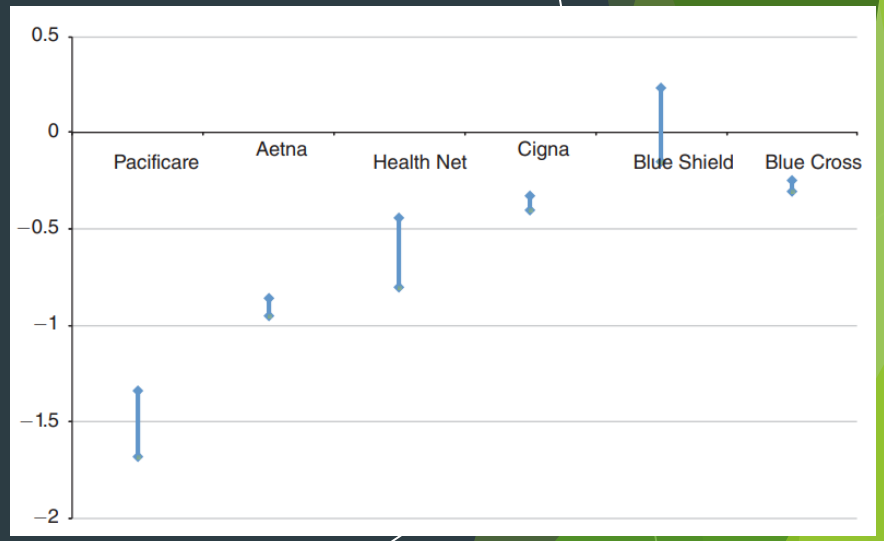
- Set Identification vs. Point Identification
- Construct Inequalities (Revealed Preference):
  - Assume Mary and Maria are similar (same severity)
  - If Mary chose hospital h over h', $\Delta \mathrm{W}(\mathrm{Mary}, \mathrm{h}, \mathrm{h}') = W_{Mary,\pi,h} - W_{Mary,\pi,h'} > 0$
  - If Maria chose hospital h' over h, $\Delta \mathrm{W}(\mathrm{Maria}, \mathrm{h}, \mathrm{h}') > 0$
  - $\Delta \mathrm{W}(\mathrm{Mary}, \mathrm{h}, \mathrm{h}') + \Delta \mathrm{W}(\mathrm{Maria}, \mathrm{h}, \mathrm{h}') = \theta_{p,\pi}[\Delta p(c_{Mary}, h, h') + \Delta p(c_{Maria}, h, h')] + \Delta f_{\pi}(l_{Mary}, h, h') + \Delta f_{\pi}(l_{Mary}, h', h)$
- Benefits:
  - The quality part (including unobserved error) is eliminated
  - Allow for more finely specified models (finer patient characteristics controls without sacrificing power)

Moment Inequality Results

- Negative Price Coefficients!
- Higher capitation rates -> send people further away
- Compare with logit: much bigger impact

TABLE 8—INEQUALITIES ANALYSIS, DIFFERENT PRICE MEASURES

			(1) $p(\cdot) = (1 - \hat{d}^1_{\pi,h})lp(c_i,h)$		(2) $p(\cdot) = (1 - \hat{d}^2_{\pi,h})lp(c_i,h)$	
		Percent capitated	$\hat{\theta}$	$[CI_{LB}, CI_{UB}]$	$\hat{\theta}$	$[CI_{LB}, CI_{UB}]$
Pacificare		0.97	−1.07**	[−1.52, −0.62]	−1.47**	[−1.64, −1.32]
Aetna		0.91	−0.68**	[−0.72, −0.62]	−0.77**	[−0.81, −0.71]
Health Net	Baseline	0.80	−0.11**	[−0.23, −0.07]	−0.20**	[−0.30, −0.17]
	Drop $t \leq -2$		−0.41	[−0.43, 0.94]	−1.87**	[−1.89, −1.33]
Cigna		0.75	−0.35**	[−0.39, −0.33]	−0.32**	[−0.36, −0.30]
Blue Shield		0.57	0.18	[−0.16, 0.79]	0.004	[−0.28, 0.70]
Blue Cross	Baseline	0.38	−0.03	[−0.18, 0.39]	−0.09**	[−0.22, −0.01]
	Drop $t \leq -2$		−0.12**	[−0.14, −0.05]	−0.18**	[−0.21, −0.14]



Does capitation affect quality?

- Short answer: No!
- I omit math here.
- Price-Quality tradeoff $\frac{\theta_{p,\pi}}{\alpha_\pi}$ is independent of capitation rates

TABLE 11—TRADE-OFFS AGGREGATED OVER MARKETS AND SEVERITIES

Insurer	P-care	Aetna	HNet	Cigna	BC
Percent cap	0.97	0.91	0.80	0.75	0.38
$\theta_{p,\pi}$	−1.50	−0.92	−0.78	−0.35	−0.29
α_π	5.13	3.12	2.63	1.20	1.00
$\theta_{p,\pi}/\alpha_\pi$	−0.293	−0.295	−0.297	−0.291	−0.290
$1/\alpha_\pi$	0.20	0.32	0.38	0.83	1.00
Upper and lower bounds on CI $\theta_{p,\pi}/\alpha_\pi^*$					
Lower	−0.38	−0.36	−0.35	−0.40	−0.31
Upper	−0.23	−0.23	−0.15	−0.22	−0.25

*Calculated as lower bound (upper bound) θ_p divided by upper bound (lower bound) α_π.

Conclusion

- Obstetricians refer patients to more distant hospitals to save money
- Capitation don't force obstetricians to sacrifice quality
- Moment Inequalities Estimator is better than Logit/Discrete Choice Models sometimes
- Discussions:
  - 1. This paper only looked at patient's distance. The omission of physician's distance, in my opinion, is a major flaw. If a physician sends patients further away, then he/she has to travel further to do their daily rounding. Do you think such omission compromises the author's analysis?
  - 2. The authors didn't explain why sending patients to distant hospitals help physicians save money. Can you think of a reason why?