Discussion of Nathan Wilson's "Market Structure as a Determinant of Patient Care Quality"

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Introduction

- What do we know about the impact of increased "competition" on welfare in health care markets?
  1. More competition means lower prices
     - Evidence is pretty compelling
     - But prices are often administratively set
  2. More competition means higher quality
     - Central to the argument for vigorous antitrust enforcement
     - Evidence is spotty – identification is challenging
- Nathan's paper is a serious effort towards filling this gap
- The context for this analysis is dialysis clinics in Atlanta, GA

Challenges

- There are several challenges
  1. Quality measurement
     - Meaningful outcomes
     - Selection on unobservables
     - Heterogeneous treatment effects
  2. Modeling quality competition
     - Classic issues in endogeneity of market structure measure
     - Meaningful counterfactuals
- Nathan puts a lot of effort and pushes the literature forward along dimension 1). Less innovation along point 2)

Overview of the Paper

- Examines the impact of competition on the quality of renal dialysis
- Important as there has been lots of consolidation in this industry
- Uses cross sectional claims data to examine 4 outcomes in the metro Atlanta region for 2004-2008
- Estimates the quality of care using control function approach that address both endogeneity of facility choice and treatment heterogeneity
  - Use distance to facility as instrument
- The estimation approach matters
- Estimate the relationship between facility quality measures on market structure measures using OLS

Context

- Large literature focusing on measuring provider quality – most of it it does not account for unobserved selection
  - McClellan, McNeil and Newhouse (1994), Gowrisankan and Town (1999), Gowrisankaran, Geweke and Town (2003)
- Impact of competition on quality: Kessler and McClellan (2000)
- Dialysis clinics: Grieco and McDevitt (2012); Cutler, Dafny and Ody (2012)
- More recent work utilizing policy changes in the UK:
  - Cooper et al. (2010) and Gaynor et al. (2013)
- Mechanisms: Bloom and Van Reenen (2007)

Overview of the Paper – Findings

- The estimation approach for measuring quality matters
  - Unobserved selection matters in quality measure
  - Treatment heterogeneity matters as well
- More nearby competitors, higher quality
- An important contribution to the body of evidence on the impact of provider competition

Empirical Framework

- The paper seeks to estimate the following equation

  $\theta^E_{jm} = M_{jm}\beta + X_{jm}\gamma + e_{jm}$

  - θ^E_{jm} is inferred quality using approach E
  - M_m is market structure and X_{jm} is facility characteristics
  - In empirical specification M = log number of facilities within a distance and the share of facilities that are jointly owned
- Let $\theta^E_{jm} = \bar{\theta_{jm}} + \eta^E_{jm}$ where $\bar{\theta}_j$ is the 'true' facility quality and η^E_{jm} is measurement error
- Then:

  $\bar{\theta}_j = M_m\beta + X_{jm}\gamma + e_{jm} - \eta^E_{jm}$
- The role of the estimation of θ^E_j on inference for the equation of interest depends on the $Var(\eta^E_{jm})$ and $Corr(M_{jm}, \eta^E_{jm})$

Empirical Framework

- Relationship between outcomes (observable) and 'quality' (unobservable) is

$$y_{ij} = \sum_j (\bar{\theta}_j c_{ij} + \xi_i c_{ij}) + x_i \delta + \epsilon_{ij}$$

- Allow for multiple treatment locations
- Estimate θ^E_{jm} using control function approach

$$c_{ij} = x_i \alpha + z_{ij} \gamma + \eta_{ij}$$

- The CF approach the uses estimates of the unobservables in the outcome equation
  - Key: CF relaxes additive separability

$$y_{ij} = \sum_j \bar{\theta}_j c_{ij} + \sum_j (\psi_j \hat{\eta}_{ij} + \tau_j \hat{\eta}_{ij} c_{ij}) + x_i \delta + \epsilon_{ij}$$

- Accounting for the fact that patients seek care a multiple facilities

Data

- Use individual and facility data from the United States Renal Dialysis System
- The data integrates individual and facility level information and contains demographic data, length of dialysis treatment
- Outcomes:
  - Mortality
  - ICU/CCU days
  - Inpatient days
- Market Structure:
  - $log(N_r)$ were N_r is the number of competitors within 10 miles
  - Share of clinics jointly owned
  - Chain FE (De Vita)
- Recommendation: Implement a KM HHI-type measure

Identification

- Cross sectional
- Quality measurement:
  - Instrument is distance to clinic
  - Assumption is that distance is uncorrelated with unobservable health status
  - Clinics can locate freely and entry is free – raises some concerns
  - Indirect tests might be useful
- Competition analysis:
  - Quality measurement error is uncorrelated with market structure
  - Strategic reasons that might not be true
  - Costs and Demand shocks are uncorrelated with market structure measures
- Assumes fixed facility quality – patient discrimination?

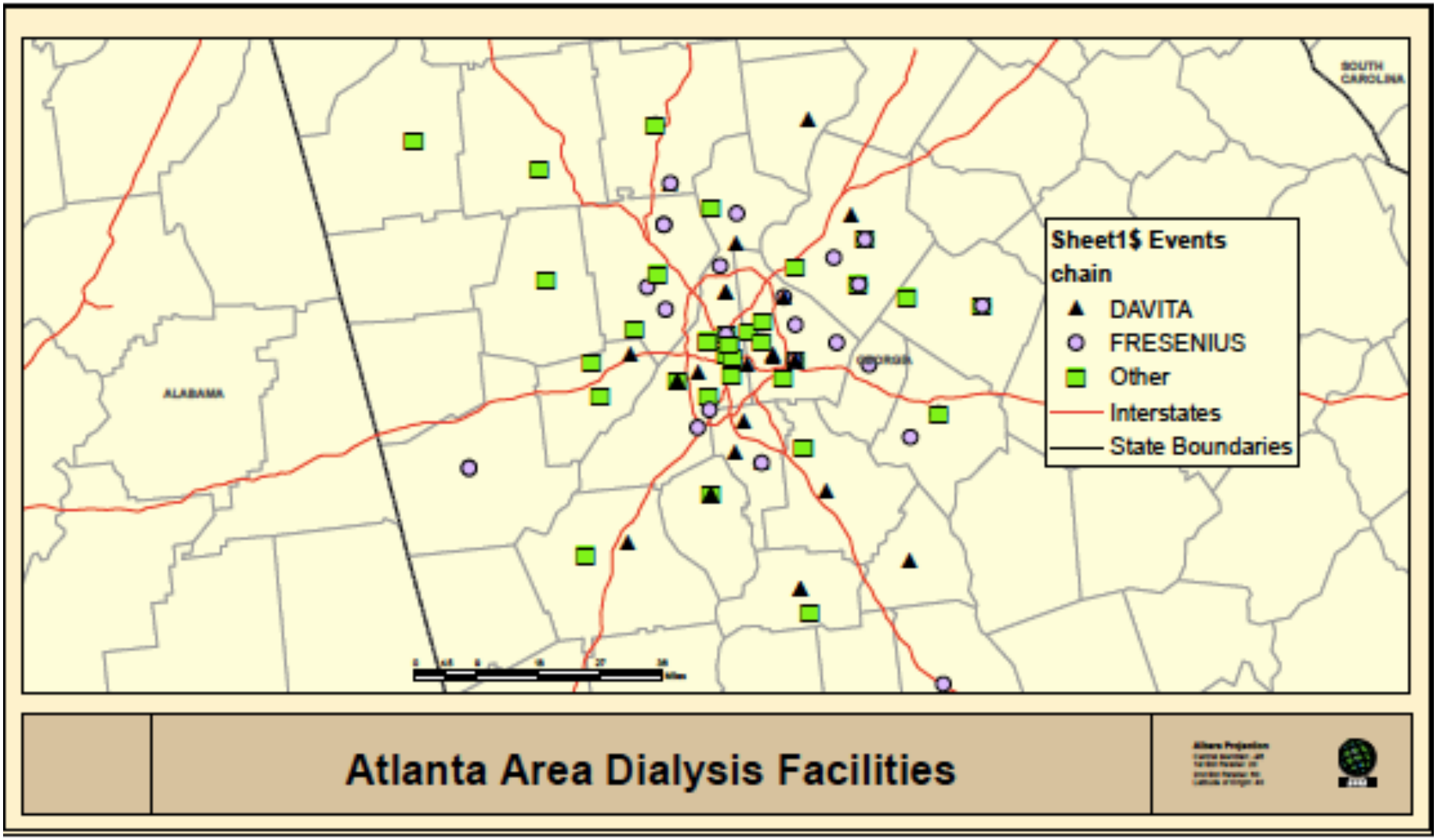
A Suggestion

- Profit function of the firm:
- $\pi_j(\theta) = \sum_{l \in \Xi_j} \sum_i (\bar{p}(x_i) - mc_l(\theta, x_i)) s_l(\theta, x_i, z)$
- FOC (in vector notation):
  $(\bar{p}(x) - mc(\theta, x))\Delta(\theta) - mc_\theta(\theta) s(\theta, x, z) = 0$
  - Δ is $J \times J$ matrix of cross partials, $\frac{\partial s_l}{\partial \theta_k}$ if l, k owned by same firm, zero otherwise
- Parameterize mc as: $mc_{li} = \xi_l + f(\theta, x_i)$
- $\xi = (f'(\theta, x) s(\theta, x, z))\Delta^{-1}(\theta)\bar{p}^{-1} - f(x, \theta)$
- Estimate f using GMM and then simulate the impact of counterfactual mergers

Results

- Control Function estimates of quality
- The correlates of quality

Results – Map


SOUTH CAROLINA
ALABAMA
Sheet1$ Events
chain
DAVITA
FRESENIUS
Other
Interstates
State Boundaries
Atlanta Area Dialysis Facilities

Results – Table 1

Table 1: Brands and Ownership Structure of Facilities

Chain	Obs	Percent
Davita	7,091	29.35
DCI	1,065	4.41
Fresenius	6,004	24.85
Gambro	1,548	6.41
NRA	164	0.68
NRI	410	1.7
RCG	249	1.03
Independent	7,629	31.58
Total	24,160	100

Results – Table 2

Table 2: Variation in Facility Characteristics Across Ownership Types

	Total			For-profit			Non-profit			
	Obs	**Mean**	**SD**	**Obs**	**Mean**	**SD**	**Obs**	**Mean**	**SD**	**T-Stat**
Nearby Facilities	451	14.91	12.78	410	13.46	12.16	35	28.97	9.85	-8.76
Same Owner	451	3.38	4.89	410	3.58	5.07	35	1.71	1.51	5.21
Different Owner	451	11.53	10.46	410	9.88	9.11	35	27.26	9.27	-10.66
Facility Age	451	11.26	8.30	410	10.22	7.60	35	22.29	8.48	-8.14
Population > 60	451	66275	42211	410	63760	42368	35	91622	33685	-4.59
Patients	451	260.80	312.33	410	232.04	133.99	35	573.29	978.69	-2.06

Results – Table 3

Table 3: Variation in Patient Characteristics Across Ownership Types

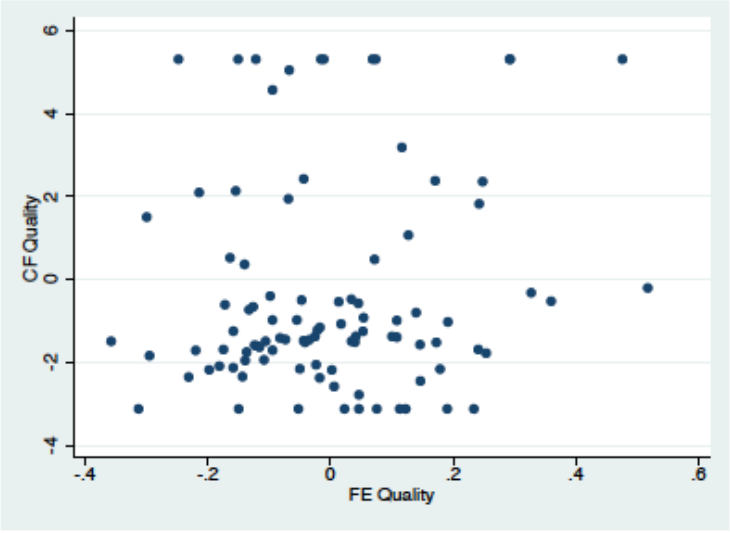
	Total			For-profit			Non-profit			
	Obs	**Mean**	**SD**	**Obs**	**Mean**	**SD**	**Obs**	**Mean**	**SD**	**T-Stat**
Male	24160	0.54	0.50	19672	0.52	0.50	4013	0.57	0.50	-4.90
Black	24160	0.68	0.47	19672	0.63	0.48	4013	0.89	0.32	-42.53
White	24160	0.28	0.45	19672	0.33	0.47	4013	0.07	0.25	49.78
Age	24160	5.78	1.42	19672	5.86	1.42	4013	5.34	1.37	21.85
Length of Treatment	24160	0.35	0.41	19672	0.34	0.39	4013	0.45	0.47	-14.61
Died	24160	0.14	0.35	19672	0.14	0.35	4013	0.13	0.34	1.74
Days in ICU/CCU	24160	2.79	7.88	19672	2.97	8.18	4013	2.02	6.40	8.15
Days in hospital	24160	9.75	20.48	19672	10.37	21.34	4013	7.28	16.16	10.39
1(Diabetic)	12941	0.44	0.50	10671	0.46	0.50	1997	0.39	0.49	6.19
1(Smoker)	12941	0.06	0.23	10671	0.04	0.20	1997	0.15	0.36	-13.03
1(Alcoholism)	12941	0.02	0.15	10671	0.01	0.10	1997	0.10	0.30	-13.48

Results – Table 4

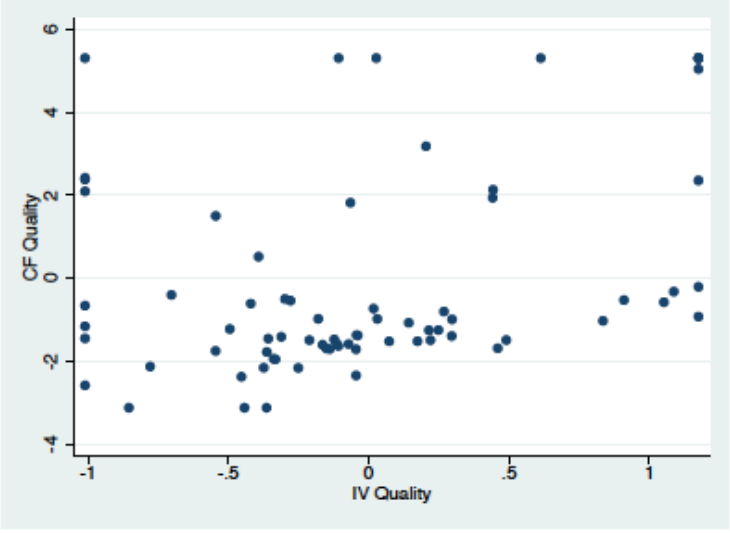
Table 4: Model of Treatment Outcomes: Mortality

	OLS b/se	FE b/se	IV b/se	CF b/se
Age	-0.071***	-0.068***	-0.071***	-0.071***
	0.01	0.01	0.01	0.01
Age2	0.009***	0.009***	0.009***	0.009***
	0.001	0.001	0.001	0.001
Years Treated	-0.094***	-0.093***	-0.095***	-0.094***
	0.024	0.025	0.025	0.025
Age*Years Treated	0.027***	0.027***	0.027***	0.028***
	0.005	0.005	0.005	0.005
Male	0.007	0.006	0.007	0.006
	0.004	0.004	0.004	0.004
Black	-0.002	-0.003	-0.006	-0.006
	0.011	0.011	0.011	0.012
White	0.038**	0.042***	0.037**	0.040**
	0.012	0.012	0.012	0.012
Diabetes DG	0.231***	0.236***	0.42	0.017
	0.031	0.053	0.484	1.396
Hypertension DG	0.195***	0.199***	0.384	-0.021
	0.03	0.053	0.484	1.396
Gloeruloneph DG	0.175***	0.183***	0.365	-0.036
	0.029	0.052	0.483	1.395
Cystic Kidney DG	0.153***	0.160**	0.342	-0.06
	0.033	0.054	0.484	1.396
Other Urologic DG	0.169***	0.178**	0.361	-0.041
	0.035	0.057	0.483	1.395
Other Cause DG	0.262***	0.269***	0.453	0.05
	0.03	0.053	0.484	1.396
Unknown Cause DG	0.217***	0.223***	0.41	0.006
	0.032	0.054	0.485	1.395
Missing DG	0.265*	0.274*	0.46	0.085
	0.114	0.118	0.495	1.399
Facility Effects	No	Yes	Yes	Yes
Patient Residence FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	24160	24160	24160	24160
r2	0.184	0.188	0.187	0.194

Results – Figure 2



(a) FE vs. CF



Results – Table 9

Table 9: Decomposition of Facility Quality on Market and Facility Characteristics: CF Estimates

	Mortality b/se	Days in ICU/CCU b/se	Days Hospitalized b/se
Log(Total)	0.234**	1.096**	0.965**
	0.074	0.366	0.367
Share Affiliated	1.035**	4.118**	3.119*
	0.396	1.833	1.802
Facility Age	-0.001	0.012	0.012
	0.007	0.028	0.034
Non-Profit	0.163	0.939	1.071
	0.323	1.398	1.776
Alternative Large Firm	0.116	0.056	0.091
	0.135	0.58	0.723
Other	0.184	1.148+	0.8
	0.149	0.7	0.751
Constant	-1.299**	-5.076**	-3.726**
	0.304	1.435	1.392
N	97	97	97
r2	0.12	0.153	0.103

* p<0.10, ** p<0.05, *** p<0.01, + p< 0.10 in one-sided test. Standard errors bootstrapped with 500 replications.

Results – Table 10

Table 10: Decomposition of Facility Quality on Market and Facility Characteristics: FE and IV Estimates

	Mortality		Days in ICU/CCU		Days Hospitalized	
	FE	IV	FE	IV	FE	IV
	b/se	b/se	b/se	b/se	b/se	b/se
Log(Total)	0.001	-0.011	-0.028	0.011	0.027	0.037
	0.007	0.035	0.024	0.11	0.03	0.178
Share Affiliated	0.015	0.299*	-0.05	0.475	0.209	1.361*
	0.032	0.155	0.126	0.463	0.204	0.804
Facility Age	0	0.004	-0.001	-0.009	-0.006**	-0.014
	0	0.003	0.002	0.008	0.003	0.016
Non-Profit	-0.015	-0.112	-0.046	-0.089	-0.103	-0.712
	0.015	0.182	0.079	0.568	0.106	1.16
Alternative Large Firm	-0.004	-0.039	-0.011	-0.071	-0.031	0.079
	0.011	0.058	0.042	0.144	0.064	0.309
Other	0.017	0.064	0.049	0.145	0.116*	0.942**
	0.015	0.072	0.052	0.213	0.067	0.369
Constant	-0.015	-0.134	0.076	-0.15	-0.093	-0.666
	0.033	0.139	0.103	0.43	0.141	0.755
N	97	73	97	73	97	73
r2	0.046	0.112	0.058	0.047	0.126	0.124

* p<0.10, ** p<0.05, *** p<0.01, + p< 0.10 in one-sided test. Standard errors bootstrapped with 500 replications.

Concluding Thoughts

- Mechanisms and magnitudes
- Endogeneity of location – demand and supply side issues
- Nice implementation of CF approach to estimate provider quality
- Nice paper