Free to Choose?

Reform, Choice, and Consideration Sets in the English National Health Service

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Motivation

Increasing health choice through reforms has been widely adopted by multiple governments.

More choices for patients is expected to make insurers and providers of care more responsive to demand.

- Greater efficiency in delivery
- Greater efficiency in funding
- Better overall quality of health care

How patients choose hospitals when patient choice is improved is unknown.

Research Question

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How do health care consumers' responses change when offered more choice?

- Exogenous variation in patient choice
- Analyze changes in hospital choice
- Estimate demand with a structural model

Main Results Preview

Post-Reform Evidence

- Minimal changes in average distance traveled
- Improved sorting of patients to higher quality hospitals
  - Decrease in patient mortality by 3.5 patients per year

Hospital Response

- Increase in mortality $\Rightarrow$ 5X larger drop in market share
- Largest increase in elasticity $\sim$ biggest reduction in mortality rates

Literature Review

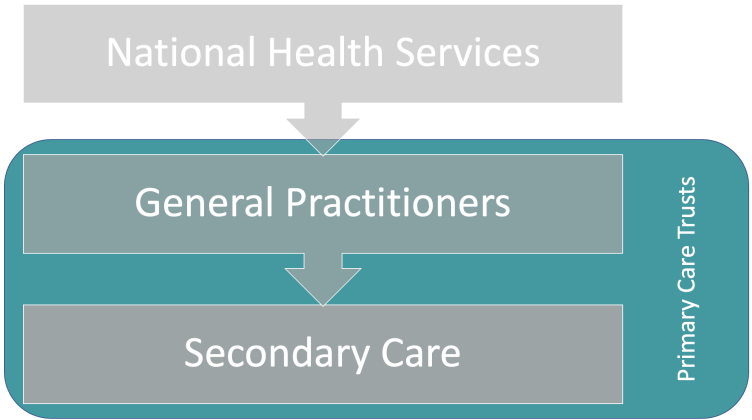
Most literature finds that competition leads to enhanced quality.

- Majority of papers use nonstructural approaches.
- Gaynor, Moreno-Serra, and Propper (2013) and Cooper et al. (2011) used reduced-form models in the same environment.

Other literature examining constrained choice sets do not observe the removal of the constraint.

Literature on consideration set formation do not observe changes in the set formation.

United Kingdom Hospital Structure



Choice Reform

Beginning in 2006, the reform package changed how hospitals and patients interact.

- Choice of five providers for hospital care
- "Choose and Book" information system
- Website with additional information
- Fixed, regulated pricing for patients through NHS

The reform did not change financial incentives for patients or financial payments to referring physicians.

Data

United Kingdom Department of Health's Hospital Episode Statistics (HES)

Inpatient Admissions	Inpatient Discharges	Characteristics
▶ Medical procedure classification ▶ Diagnoses code	▶ Elective CABG surgery ▶ 29 hospitals	▶ Age, sex, comorbidities ▶ Distance, waiting times, mortality rates

Hospital Characteristics

TABLE 1—DESCRIPTIVE STATISTICS: HOSPITAL CHARACTERISTICS

	Total admissions		Waiting times (days)		Mortality rate	
	Mean	SD	Mean	SD	Mean	SD
2003	497.7	178.4	109.1	32.1	1.32	0.62
2004	486.8	194.9	100.5	20.7	1.42	0.69
2005	423.8	153.9	67.8	15.2	1.25	0.52
2006	385.5	160.3	65.6	17.3	1.52	0.81
2007	419.9	146.7	64.9	21.4	0.99	1.02

Notes: The table reports descriptive statistics for all hospitals performing CABGs from 2003 to 2007. To compute the columns in the table, the hospital-year level values of the variables are calculated. The means and standard deviations are based purely on between-hospital variation within each year.

Source: Hospital Episode Statistics (HES), UK Department of Health

Patient Characteristics

TABLE 2—DESCRIPTIVE STATISTICS: PATIENT CHARACTERISTICS

	Mean	Median	SD	10th percentile	90th percentile
Age	65.76	66	55.04	53	76
Fraction male	0.81				
Index of multiple deprivation	0.14	0.11	0.12	0.04	0.31
Comorbidity count	5.42	5	2.81	2	9
Charlson index	0.55	0	0.71	0	2
Distance pre-reform	34.93	22.34	44.97	4.77	71.40
Distance post-reform	32.24	22.91	32.94	4.93	70.58

Source: Hospital Episode Statistics (HES), UK Department of Health

Data Concerns

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- Measuring quality of care with mortality rates
  - Case-mix differences do not affect mortality rates significantly
- Change in choice set and market structure post-reform
  - No change in market structure around the policy reform
  - Choice set is nearly identical pre- and post-reform

Structural Estimation

Constrained Pre-Reform Choice

$$V_{ij} = \bar{V}_{ij} + \upsilon_{ij} = g(D_{ij}) + \zeta_j + \upsilon_{ij}$$

Consideration set: $V_{ik} \geq \max_{j \in J}(V_{ij}) - \lambda_i$

Degree of constraint: $\lambda_i = \bar{\lambda} + \lambda X_i$

Structural Estimation

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Structural Estimation

Constrained Pre-Reform Choice

$$V_{ij} = g(D_{ij}) + \zeta_j + \upsilon_{ij}$$

$$g(D_{ij}) = \gamma_{d1} D_{ij} + \gamma_{d2} \text{Closest}_{ij} + \gamma_{d3} \text{WithinPCT}_{ij}$$

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Structural Estimation

Unconstrained Post-Reform Choice

$$U_{ij} = \bar{U}_{ij} + \varepsilon ij = \beta_{wi} W_{jt} + \beta_{zi} Z_{jt} + f(D_{ij}) + \zeta_j + \varepsilon ij$$

Structural Estimation

Unconstrained Post-Reform Choice

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$$U_{ij} = \beta_{wi} W_{jt} + \beta_{zi} Z_{jt} + f(D_{ij}) + \zeta_j + \varepsilon ij$$

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Structural Estimation

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Probabilities

Pre-Reform

$$\Pr_{ik}^{CON}(\Omega_{patient}, \Omega_{physician}) = \sum_{CS_k} Pr_i(CS_k|\Omega_{physician}) Pr_i(k|CS_k, \Omega_{patient})$$
$$\Omega_{patient} = \beta_{wi}, \beta_{zi}, \alpha_d, \zeta$$
$$\Omega_{physician} = \gamma_d, \lambda_i, \zeta_j$$

Post-Reform

$$\mathrm{PR}_{ik}^{UNCON}(\Omega_{patient}) = \frac{exp[\bar{U}_{ik}(\Omega_{patient})]}{\sum_{j \in J} exp[\bar{U}_{ij}(\Omega_{patient})]}$$

Identification Strategy

Patient and Physician Preferences

- Reform $\Rightarrow$ change in formation of consideration sets
- Exclusion restriction on waiting times and mortality
- Patient preferences are stable over time

Patient Preference Parameters

- Endogeneity of waiting time and quality of service

Reduced-Form Evidence

TABLE 3—REDUCED-FORM EVIDENCE: REGRESSIONS USING AGGREGATE MARKET SHARES

Dependent variable:	Elective CABGs market share		Emergency CABG market share	
Time period:	Pre-reform (1)	Post-reform (2)	Pre-reform (3)	Post-reform (4)
Mortality rate coefficient	−0.001 (0.047)	−0.177 (0.034)	0.031 (0.066)	−0.046 (0.053)
Hospital fixed effects	Yes	Yes	Yes	Yes
Observations	142	143	142	143
Hospitals	29	29	29	29
Quarters	5	5	5	5

Note: Standard errors are reported in parentheses.

A lower mortality rate is associated with a higher market share post-reform.

Reduced-Form Evidence

TABLE 4—REDUCED-FORM EVIDENCE: CHANGES IN THE EXPECTED MORTALITY RATE

Sample	Mean mortality rate pre-reform	Mean mortality rate post-reform	Difference in means
All patients	1.330	0.935	−0.395
	(0.007)	(0.009)	(0.011)
Patients visiting the nearest hospital	1.276	1.027	−0.249
	(0.008)	(0.011)	(0.013)
Patients not visiting the nearest hospital	1.445	0.735	−0.711
	(0.015)	(0.015)	(0.021)

Note: Standard errors are reported in parentheses.

Patients sought better hospitals when given a choice.

Structural Model Results

TABLE 5—STRUCTURAL PARAMETER ESTIMATES

	Coefficient	Standard error
Patient preferences		
Distance	−6.983	0.211
Closest hospital dummy	1.341	0.052
Mortality rate	−7.883	2.229
Mortality rate × high severity	−5.419	2.467
Mortality rate × high income	3.832	2.320
Waiting times	−1.528	1.887
Waiting times × high severity	−1.584	1.140
Waiting times × high income	6.262	1.196
Physician preferences		
Distance	−4.985	0.207
Closest hospital dummy	1.734	0.110
Within-pct dummy	1.309	0.308
Choice constraint parameters		
Constant	0.000	0.119
High severity	1.011	0.178
High income	0.000	0.113

Structural Model Results

TABLE 6—SENSITIVITY OF DEMAND WITH RESPECT TO QUALITY

Panel A. Patient-level sensitivity (*by characteristics*)	Consideration set size (pre-reform)	Sensitivity to quality pre-reform	Sensitivity to quality post-reform
Low severity, low income	1	0	−1.209
	(0.037)	(0.041)	(0.317)
Low severity, high income	1	0	−0.637
	(0.056)	(0.035)	(0.272)
High severity, low income	1.611	−0.486	−1.972
	(0.110)	(0.090)	(0.354)
High severity, high income	1.611	−0.354	−1.438
	(0.108)	(0.083)	(0.323)

Panel B. Hospital-level sensitivity	Mean	SD	25th percentile	Median	75th percentile
Pre-reform	−0.82	0.65	−1.33	−0.56	−0.30
	(0.17)				
Post-reform	−4.46	2.57	−6.53	−3.69	−2.38
	(0.70)				
Change	−3.50	1.97	−4.37	−3.09	−2.04
	(0.60)				

Notes: The top panel reports the pre-reform consideration set size and the responsiveness of demand at the patient-level with respect to the mortality rate. The values reported in the second and third column represent the average percentage change in the choice probability when a hospital increases the mortality rate by one standard deviation. The bottom panel reports the distribution of percentage changes (across all hospitals) in market share when a hospital increases the mortality rate by one standard deviation. Bootstrapped standard errors are reported in parentheses.

Policy Evaluation

TABLE 7—POLICY EVALUATION

Panel A. Impact on patient survival	Change in survivals when post-reform choices are constrained				−4.17
	Post-Reform (5 quarters)	Admissions			14,968
		Deaths			140
		Mortality rate			0.94
		Recomputed mortality rate under constraints			0.96
Panel B. Percentage change in market shares due to the reform	Mean	SD	25th percentile	Median	75th percentile
	−3.77	22.83	−15.92	2.14	13.49
Panel C. Supply-side response	Dependent variable			Change in mortality rate	
	Change in the elasticity of demand with respect to the mortality rate			−0.328 (0.128)	
	Observations			27	

Notes: Panel A reports the change in the number of survivals when constraints are removed. Panel B shows the changes in market shares across hospitals for the counterfactual scenario of an earlier removal of constraints. This entails a zero-sum game of market share reshuffling between hospitals. The distribution of changes across hospitals is reported. Panel C reports results from an OLS regression of a change in mortality on the change in the elasticity of demand (derived from the demand model).

Conclusion

Patient Response to Reform

- More responsive to clinical quality of care of hospital
- Heterogeneity of responses to waiting times

Overall Findings

- Reduction in mortality
- Increase in patient welfare
- Increase in elasticity of demand

Discussion

1. Mortality as a measure of quality
2. Assuming referrals reflect choice from the full set of hospitals that perform CABG surgery
3. Important hospital qualities are shared on websites
4. Length of the study post-reform