

THE IMPACT OF COMPETITION ON MANAGEMENT QUALITY: EVIDENCE FROM PUBLIC HOSPITALS

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MOTIVATION

- Major push to increase productivity of healthcare in US, UK and other OECD countries. Can competition help?
- But many US healthcare changes may reduce competition
 - 1990s wave of hospital mergers
 - Affordable Care Act encourages vertical integration: ACOs
- Does this matter?
 - “*Monopoly is a great enemy of good management*”, Adam Smith, *Wealth of Nations*, Book 1, Chapter XI
 - But effect of competition on productivity theoretically ambiguous
 - Empirical health literature also inconclusive, partly due to difficulty in obtaining causal estimates & understanding mechanism (e.g. Gaynor 2006; Cooper et al, 2011; Gaynor et al, 2013)

MOTIVATION

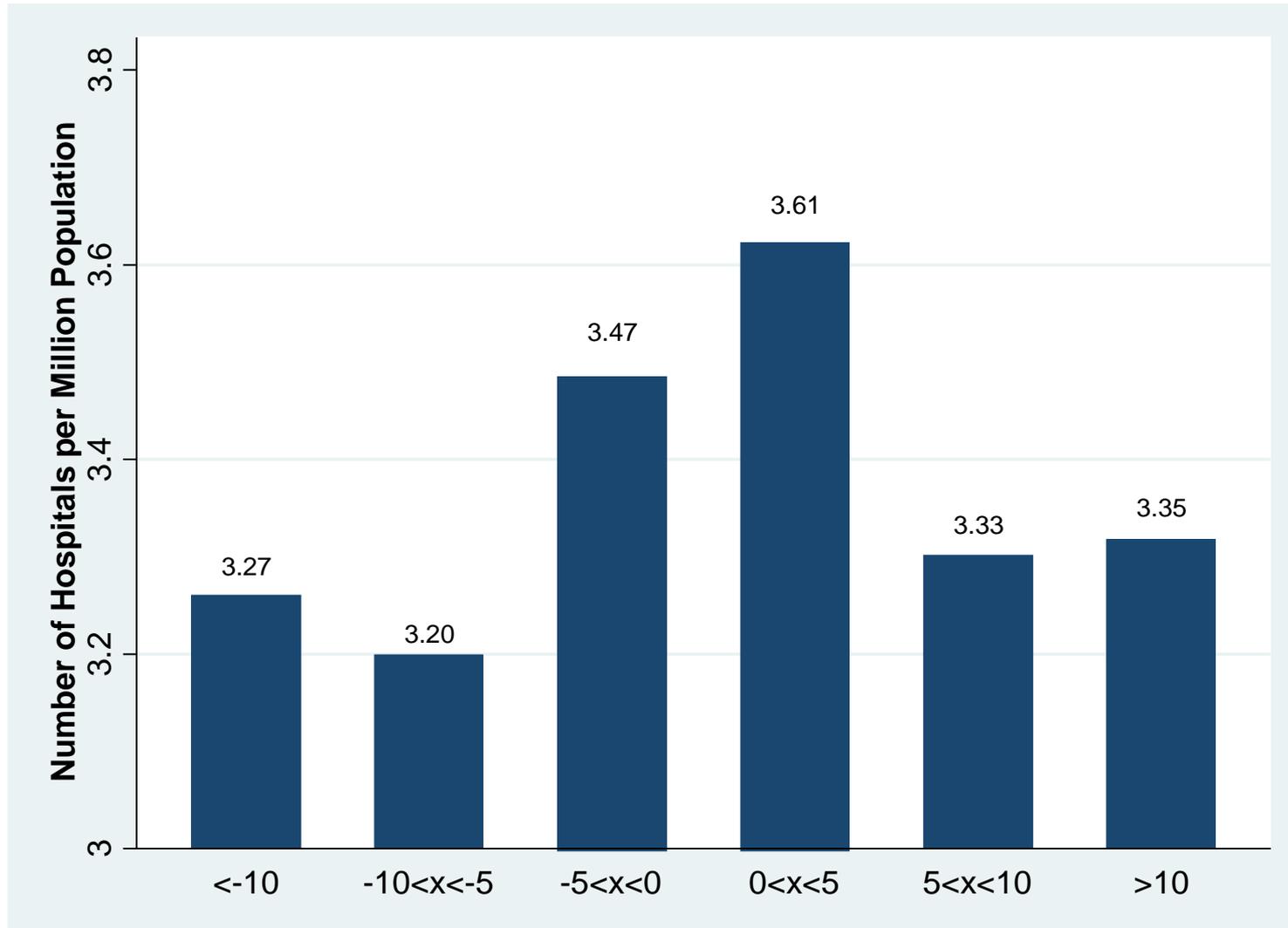
- We attempt to address these problems by looking at UK public hospitals:

Mechanism: Adapt Bloom and Van Reenen (2007, QJE) management practice survey technique for healthcare

Identification: In UK government control over hospital entry & exit yields an instrument for hospital numbers (political marginality of the district for national Parliament)

“A secret meeting has been held by ministers and Labour Party officials to work out ways of closing hospitals without jeopardising key marginal seats....” Times 15/9/2006

FIGURE 1: MORE ACUTE HOSPITALS IN (POLITICALLY) MARGINAL DISTRICTS

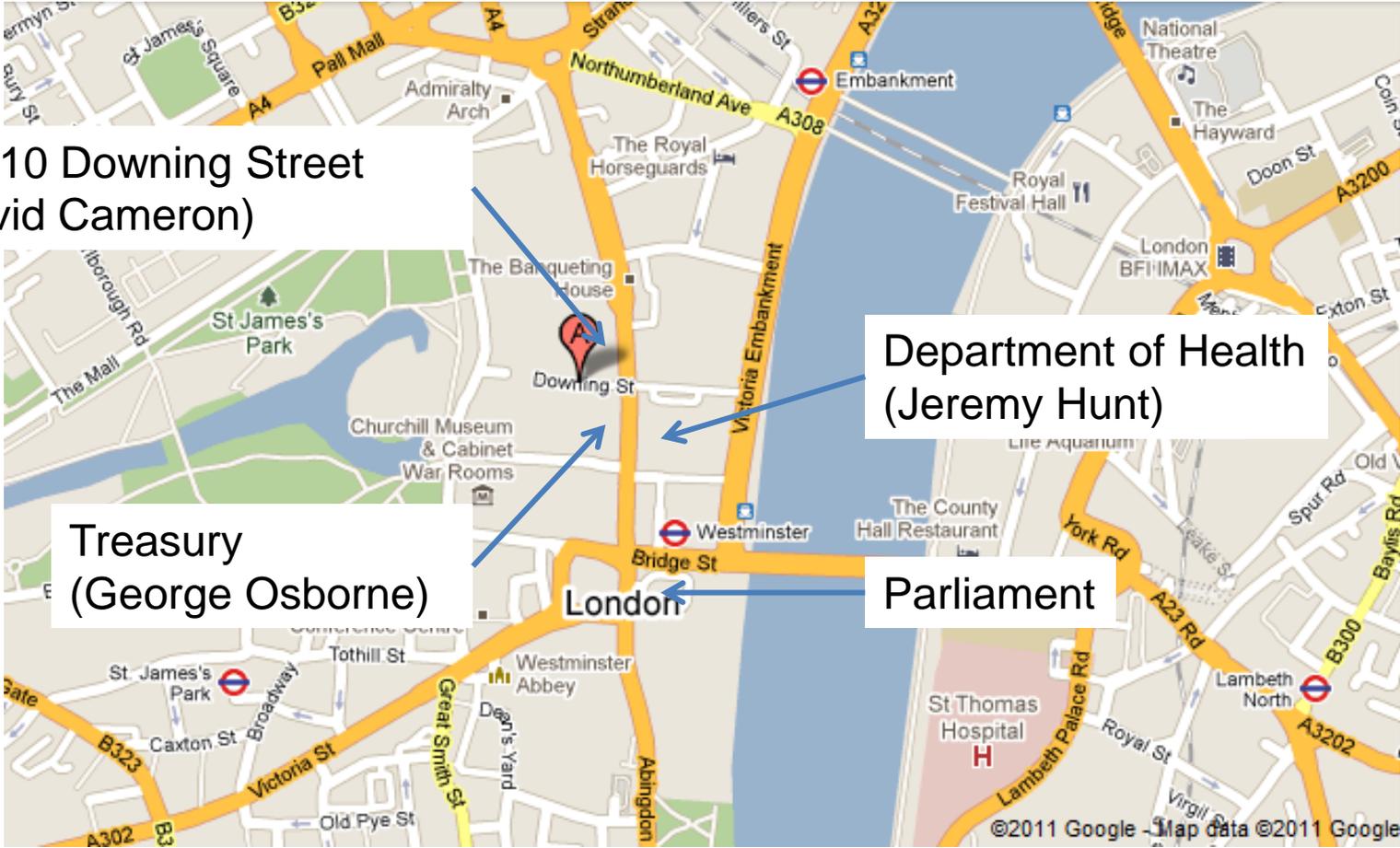


Governing Party's (Labour) winning percent margin in 1997

INSTITUTIONAL CONTEXT: COMPETITION IN ENGLISH PUBLIC HOSPITALS (NHS)

- **Payment for hospitals**: ‘Payment by results’: fixed national tariff for treatments & money follows patients
- **Choice**: Patients given choice of 4+ hospitals for elective procedures: electronic bookings system (“Choose and Book”)
- **Information**: “NHS Choices” website info on provider quality
- **Free for patient**: NHS free at point of use, taxpayer funded (private sector small: only 8% of population ever use)
- Physicians, nurses, etc. are salaried employees of hospitals
- Two entry points:
 - Primarily, through General Practitioner serves as gatekeeper local doctor
 - Secondarily, through emergency admissions (ER)

GEOGRAPHY AND THE POLITICIZATION OF THE NHS: CENTRAL LONDON



No. 10 Downing Street
(David Cameron)

Department of Health
(Jeremy Hunt)

Treasury
(George Osborne)

Parliament

OUTLINE

1. “Measuring” management practices

2. Evaluating and describing management data

3. Hospital Competition and Political Instrument

4. Results

5. International Data

THE MANAGEMENT SURVEY METHODOLOGY

1) Developing management questions

- 18 practice scorecard: “lean” operations, monitoring, targets & incentives
- Interviewed managers & physicians in cardiology & orthopaedics & for ~1 hour in 2006

2) Getting hospitals to participate in the interview

- Performance indicators from external sources (not interview)
- Endorsement letter from Department of Health
- Run by 4 MBA-types (loud, assertive & experienced)

3) Obtaining unbiased comparable responses (“Double-blind”)

- Interviewers do not know the hospital’s performance
- Interviewees are not informed (in advance) they are scored

Q1 LEAN OPERATIONS – layout of patient flow

- Can you briefly describe the patient journey for a typical episode?
- How closely located are the wards, theatres and consumables?
- Has the patient flow and the layout of the hospital changed in recent years

Score	(1): Layout of hospital and organisation of workplace is not conducive to patient flow, e.g., ward is on different level from theatre, or consumables are often not available in the right place at the right time	(3): Layout of hospital has been thought through and optimised as far as possible; but workplace organisation is not regularly challenged (and changed)	(5): Hospital layout has been configured to optimize patient flow; workplace organization is challenged regularly and changed when needed
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TYPICAL PROCESS IMPROVEMENT(BEFORE)

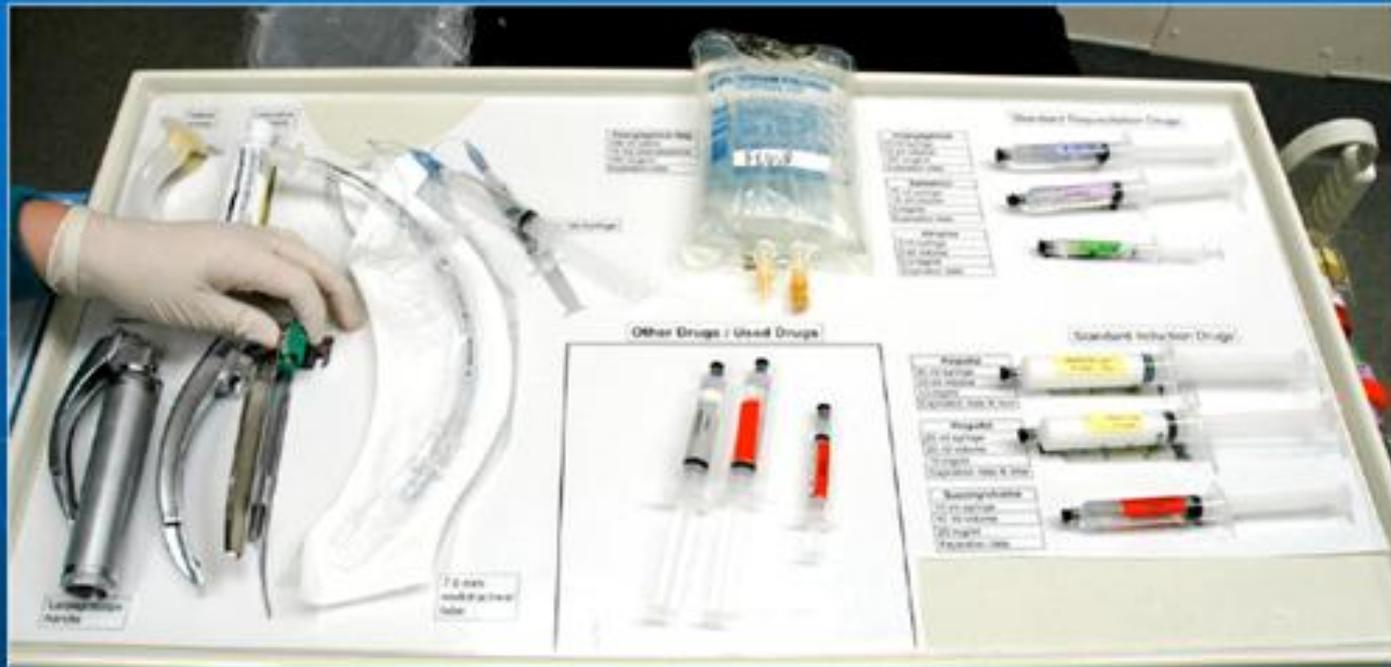
Visual Control for Safety



5S Anesthesia "Shadow Board" - Before

TYPICAL PROCESS IMPROVEMENT (AFTER)

Visual Control for Safety



5S Anesthesia Shadow Board - After

Q5 MONITORING – Performance review

How do you review your department's performance? Tell me about a recent meeting. Who is involved in these meetings? Who gets to see the results. What is the follow-up plan? Can you tell me about the recent follow-up plan?

Score	(1): Performance is reviewed infrequently or in an un-meaningful way e.g. only success or failure is noted	(3): Performance is reviewed periodically with both successes and failures identified. Results are communicated to senior staff. No clear follow up plan is adopted.	(5): Performance is continually reviewed, based on the indicators tracked. All aspects are followed up to ensure continuous improvement. Results are communicated to all staff.
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REGULAR PERFORMANCE MONITORING

Tuesday "Stand Up"



Q15 INCENTIVES - Removing poor performers

- If you had a nurse who could not do her job adequately, what would you do? Could you give me a recent example?
- How long would underperformance be tolerated?
- Do some individuals always just manage to avoid being re-trained/fired?

Score

(1): Poor performers are rarely removed from their positions

(3) Suspected poor performers stay in a position for a few years before action is taken

(5): We move poor performers out of the hospital/department or to less critical roles as soon as a weakness is identified

HOSPITAL MANAGEMENT SURVEY SAMPLE

- 161 respondents in 100 public acute care (short-term general) hospitals (“trusts”)
 - 61% response rate from the population of 164 acute (short-term general) hospitals in England
 - Response rates to survey uncorrelated with observables (Table B2)

OTHER DATA

- Collect data on survey “noise” controls:
 - Interviewer fixed effects
 - Interviewee characteristics (e.g. Tenure, manager/clinician)
 - Interview characteristics (e.g. duration, day, time)
- Hospital Episode Statistics data: all England NHS admissions
 - Discharge data (6.25 million records p.a.) on diagnoses, procedures, patient characteristics, location, etc.
 - Use data from population of hospitals to construct measures of market structure & some outcome measures

OUTLINE

1. “Measuring” management practices

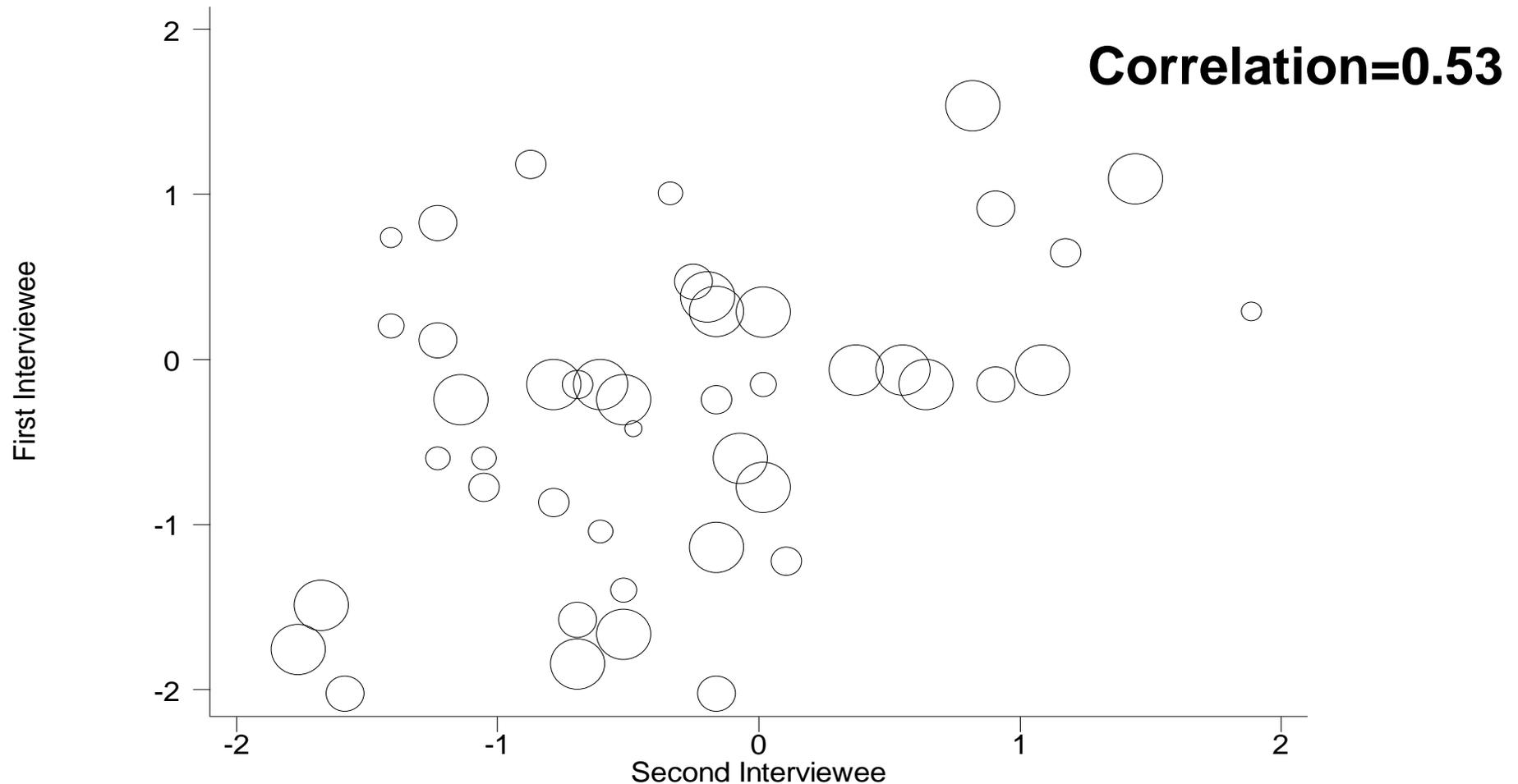
2. Evaluating and describing the management data

3. Hospital Competition and Political Instrument

4. Results

5. International Data

FIG A1 “INTERNAL VALIDATION”: CORRELATION BETWEEN 1st & 2nd INTERVIEWEE IN SAME HOSPITAL



Notes: standardized management score for hospitals with two separate interviewees and interviewees (2+ interviews). Weight is inverse of number of sites. If we restrict sample to single site hospitals the correlation is 0.7

“EXTERNAL VALIDATION” OF THE SCORING

Performance measure, P , in hospital j

$$y_j^P = \alpha_1 M_{jg} + \alpha_2' x_{jg} + u_{jg}$$

management (z-scores of 18 questions) for respondent g in hospital j

other controls:
casemix, size,
noise controls, etc.

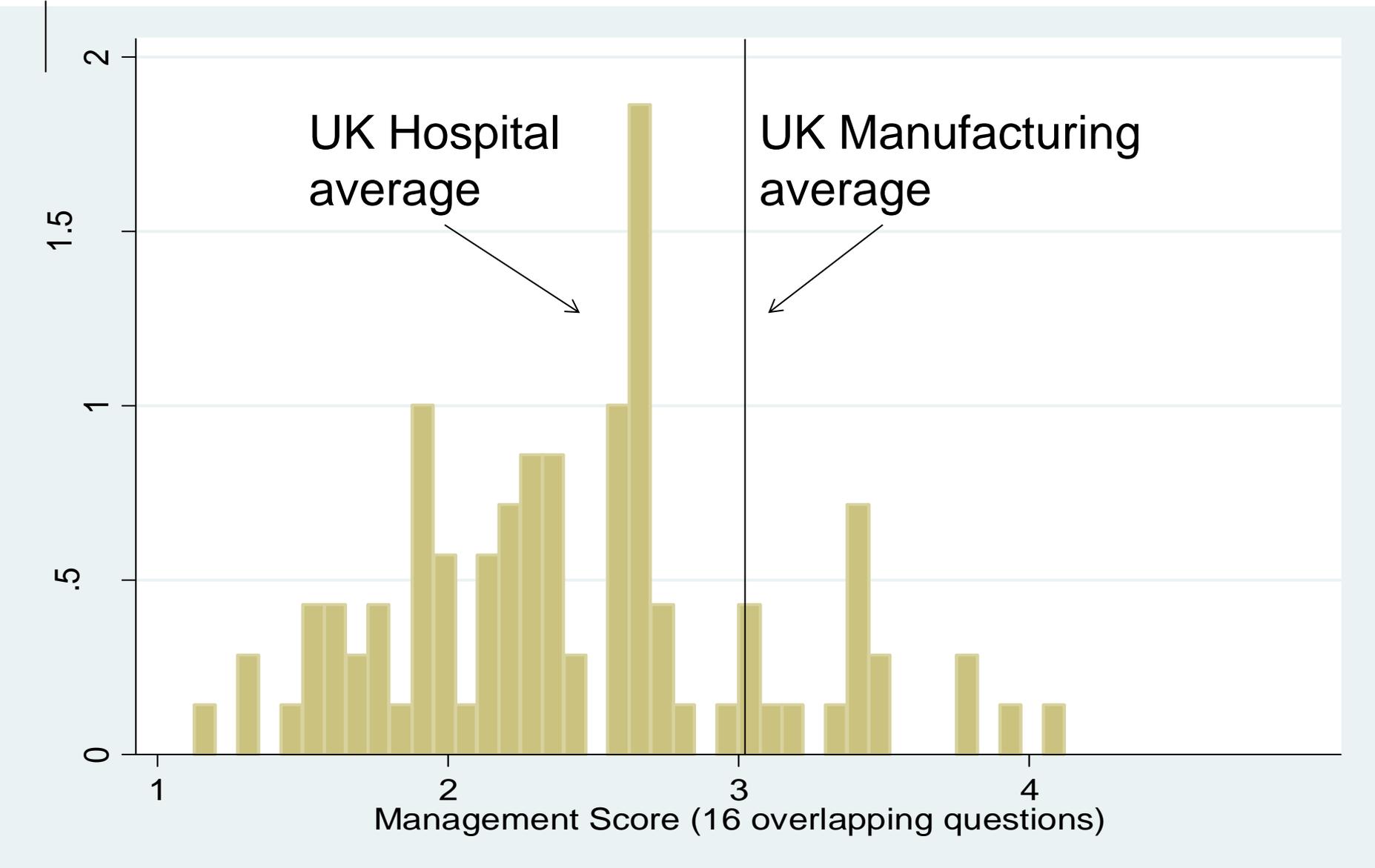
- Performance data taken from external sources
- Note – **not a causal estimation**, only an association
- Cluster SE by hospital

TAB 2: HOSPITAL PERFORMANCE & MANAGEMENT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Mortality rate (28 day) from emergency AMI	Mortality rate from emergency surgery	Total waiting list 1000's	In- hospital MRSA infection rate	Expend iture per patient	Intention of staff to leave in next 12 months	Healthcare Commis- sion rating
Mean	17.08	2.21	4.90	1.61	9.69	2.70	2.25
Managemnt Practices Score	-0.968** (0.481)	-0.099** (0.044)	-0.207* (0.121)	-0.081 (0.062)	-0.681** (0.260)	-0.031** (0.013)	0.108*** (0.041)
Obs	140	157	160	160	152	160	161

Notes: Management index is z-scored (mean=0, sd=1). SE clustered at county level (42). All columns control for casemix (e.g. age-gender of patient), size, London dummy, % managers with clinical degree, % auto ownership & “noise controls” (interviewer dummies, respondent’s tenure & whether manager (or clinician)).

FIG 5: HOSPITAL MANAGEMENT SCORES VERY DISPERSED (LIKE HOSPITAL OUTCOME DATA)



OUTLINE

1. “Measuring” management practices
2. Evaluating and describing the management data

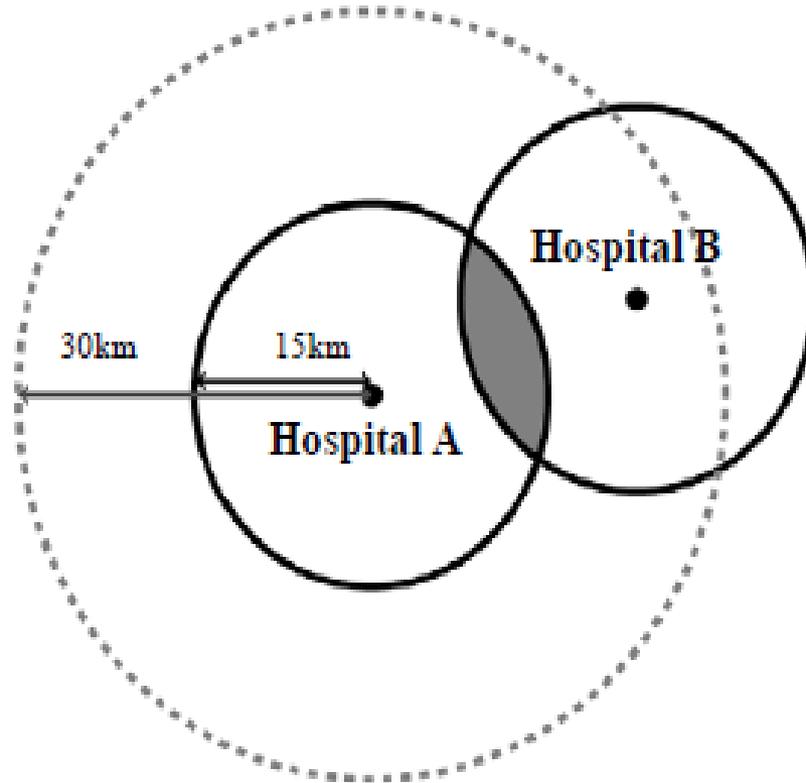
3. Hospital Competition and Political Instrument

4. Results
5. International Data

DEFINING HOSPITAL MARKETS

- Patients dislike being treated far away from home: “transport costs” imply that hospital competition strongly geographic
- Many ways to construct competition measure
 - Number of hospitals
 - Hirschman-Herfindahl Indices (HHI) uses patient flows
 - actual or predicted (Kessler and McClellan, 2000)
 - Sensitivity of demand to hospital quality
- Look at many of these, but main concern is endogeneity of hospital **numbers** which affects all measures
 - e.g. more hospitals in less healthy areas, so may underestimate positive effect of competition

FIG 2: DEFINING COMPETITION I: HOSPITAL NUMBERS



- Propper et al (2007) 15km is median patient travel distance
- So all hospitals within a 30km radius potential rivals
 - Look carefully at alternative market definitions

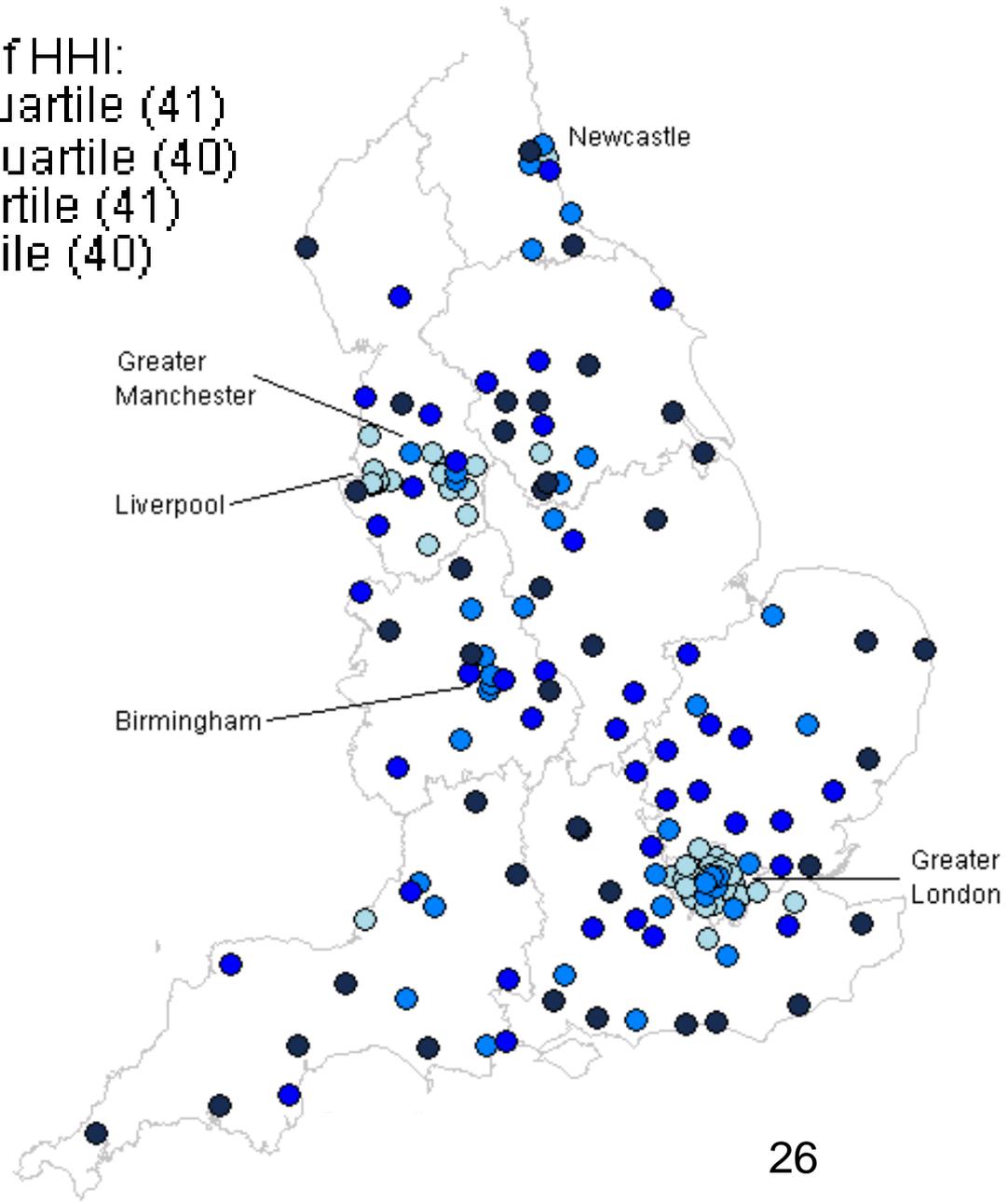
DEFINING COMPETITION: HERFINDAHL-HIRSCHMAN INDEX (HHI) OF COMPETITION

- **Actual:** Calculates an HHI for each area, and then the HHI for each hospital is averaged across areas patents come from
- **Predicted:** follow Kessler-McClellan (2000, QJE)
 - 7,000 “areas” (MSOAs)
 - Estimate MNL hospital choice 6.25m patients 2005-2006
 - Calculate predicted patient flows based on exogenous characteristics (e.g. Distance, age, gender, severity, etc)
 - Hospital HHI based on (predicted) shares in each area
- **BUT: hospital numbers still potentially endogenous**

CONCENTRATION (HHI, ACTUAL PATIENT FLOWS)

- Quartile of HHI:
- Bottom quartile (41)
 - Second quartile (40)
 - Third quartile (41)
 - Top quartile (40)

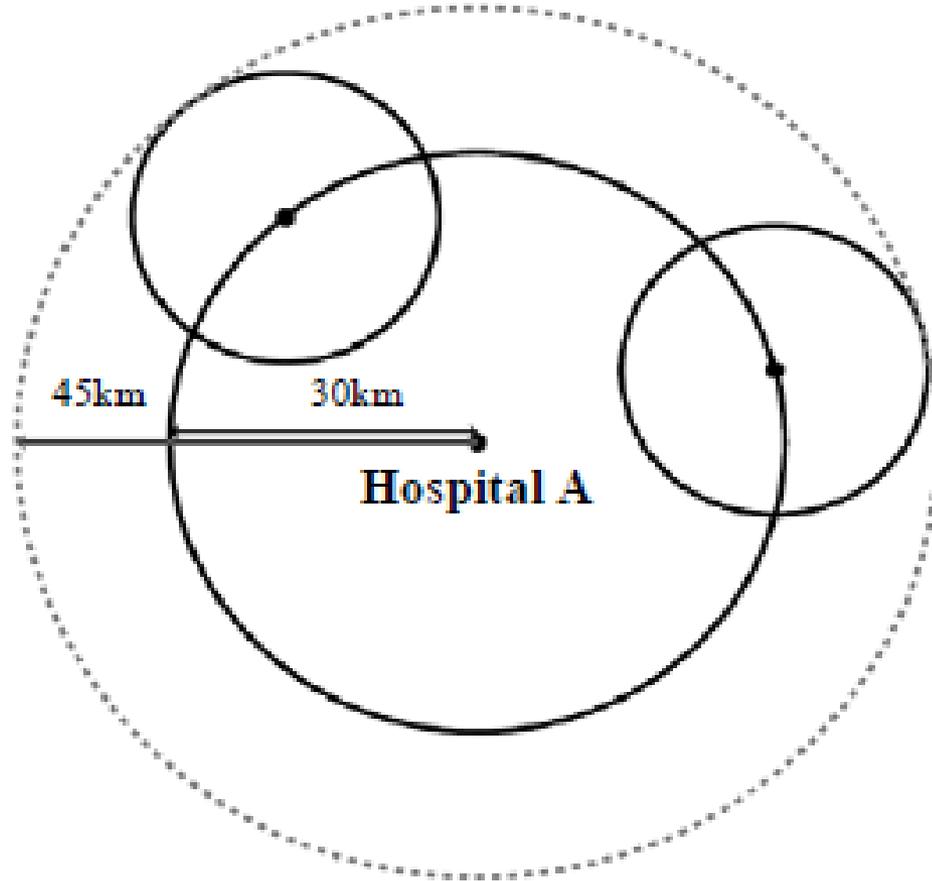
Lowest Competition



WE OBTAIN INSTRUMENT FOR COMPETITION BY EXPLOITING POLITICS OF UK HEALTH PROVISION

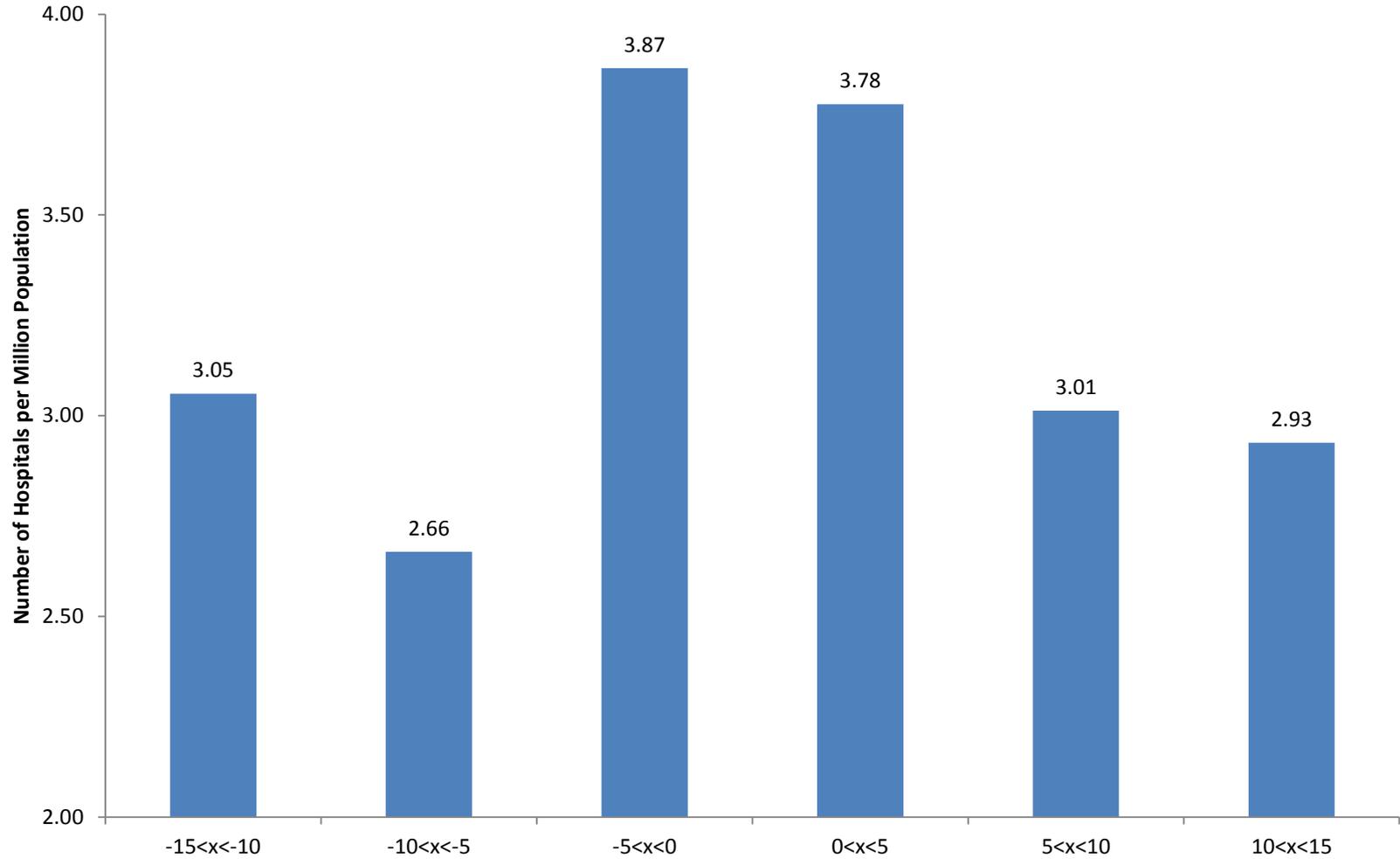
- In the UK hospital openings and closures centrally controlled
- Politically sensitive
- Construct IV based on whether a hospitals' rivals/neighbors are in marginal political constituency
 - Political districts that the ruling party (Labour) won/lost by only a small margin in the General Election

FIGURE 3: ARE RIVAL HOSPITALS IN MARGINAL POLITICAL DISTRICTS? IF SO, LESS LIKELY TO EVER CLOSE



- Instrument is the proportion of marginal political districts in 45 km area around the hospital

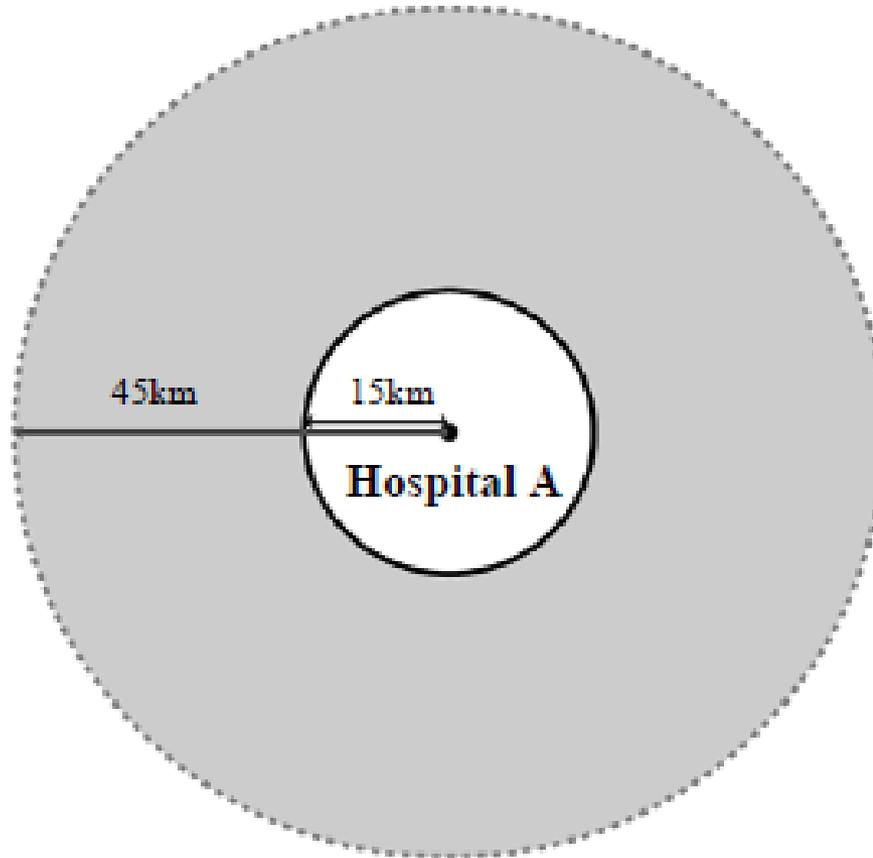
FIGURE 1: MORE HOSPITALS IN (POLITICALLY) MARGINAL DISTRICTS



DEFINING MARGINALITY FOR A HOSPITAL

- Use the share of marginal labor constituencies (5% margin) within 45km of each hospital as an IV for hospital numbers
- Controls: overall Labour vote share, population density, demographics, etc. to identify only from marginality
- Show results are robust to varying these thresholds (of marginality % and radii of markets)
- Can politicians influence health outcomes through other mechanisms then keeping hospitals open?
 - Expenditure? No, national formula (empirically confirm)
 - “Hidden policies”?
 - So include hospital’s own political marginality

FIGURE 6: COULD MARGINALITY HAVE A DIRECT EFFECT ON HOSPITAL PERFORMANCE?



- Since hospital markets don't perfectly overlap can include political marginality in 15km around hospital A in hospital A's performance regression as additional robustness check

OUTLINE

1. “Measuring” management practices
2. Evaluating and describing the management data
3. Hospital Competition and Political Instrument

4. Results

- Model
 - Association of management/health with competition
 - IV results
 - Robustness & extensions
5. International Data

WHY SHOULD COMPETITION IMPROVE HOSPITAL MANAGEMENT AND PERFORMANCE?

- **Classical incentive effects of competition**
 - NHS has competition in a fixed price regime (where $p > mc$)
 - Hospital CEOs care about profits (risk of being firing; pay & perk levels, etc.), but also care about other objectives
 - Competition increases the value of managerial effort through profit effect
 - But formally ambiguous effects
- **Other competition-based mechanisms for increasing managerial effort?**
 - *Yardstick competition*: More local hospitals enables more effective regulation?
 - *Market Selection effects*: Not strong

A SIMPLE MODEL (GAYNOR, 2006)

- Hospital CEO maximizes utility (increasing in hospital profit) by choosing effort, e , raising hospital quality $z(e)$
- Price regulated at national tariff p (free to consumers)
- Hospital demand $q(z(e), S)$, S = other factors such as distance to hospital for patients, market size, etc.

$$U = pq(e) - c(q(e), e) - F$$

$$\frac{e}{q} = \left(\frac{p - c_q}{c_e} \right) \eta_e^q(N)$$

- Elasticity of demand wrt quality increases in #hospitals (N); so elasticity of demand wrt effort η also increases in N
- **Therefore, equilibrium managerial effort increasing in competition**

SOME ISSUES

- Price regulation important for result
- Positive result. Normatively, welfare could fall if “too much” quality/effort
- Scale issues

TABLE B4: VARIOUS MEASURES OF COMPETITION ASSOCIATED WITH MANAGEMENT QUALITY

Dependent variable:	Management Practice Score					
Number of Public Hospitals	0.161*** (0.042)		0.181*** (0.049)			
Herfindahl-Index			-0.784** (0.335)		-0.701* (0.387)	
Herfindahl-Index (Based on Predicted Patient Flows)					-1.960** (0.958)	
General Controls	No	Yes	No	Yes	No	Yes
Observations	161	161	161	161	161	161

Notes: SEs clustered at county level (42); all columns include noise controls, area population density & demographic profile (9 cells), hospital type, casemix. **“General”** = Total admissions, proportion Labour votes, number of political constituencies, London dummy, teaching hospital & Proportion managers with clinical degree, % car ownership. 30km catchment area

TABLE 3: EFFECT OF POLITICAL PRESSURE ON HOSPITAL NUMBERS

Sample	All Hospitals In 1997	Interviewed Hospitals				
Dependent Variable:	# Hospitals	Change # Hospitals	Change # Hospitals	Merger Dummy	Merger Dummy	# Hospitals
	2005	1997-2005	1997-2005			2005
Political Marginality In 1997	4.127*** (1.279)			-0.894** (0.359)	-1.308*** (0.376)	4.955*** (1.382)
Change in Marginality 1992 – 1997		4.708** (2.026)	2.919** (1.256)			
Population Controls	Yes	No	Yes	No	Yes	Yes
Further Controls	No	No	No	No	No	Yes
Observations	212	212	212	212	212	161

TABLE 4: COMPETITION IMPROVES MANAGEMENT QUALITY

	OLS	IV: 1 ST Stage	IV: 2 ND Stage	OLS	IV: 1 ST Stage	IV: 2 ND Stage
Dependent variable	Management	# Rival Hospitals	Management	Management	# Rival Hospital	Management
# rival hospitals	0.161*** (0.042)		0.325* (0.178)	0.181*** (0.049)		0.366** (0.168)
% marginals		4.955*** (1.382)			7.228*** (2.115)	
F-statistic		12.85			11.68	
Full Controls	No	No	No	Yes	Yes	Yes
Obs	161	161	161	161	161	161

Notes: All columns include population density, area age profile (11 categories), Foundation Trust, Number of sites, “case-mix” (22 age/gender bins), respondent tenure & interviewer dummies. “**Full controls**” = Total admissions, proportion Labour votes, number of political constituencies, London dummy, teaching hospital & Proportion managers with clinical degrees

TABLE 4 – CONT.: COMPETITION REDUCES AMI DEATH RATES

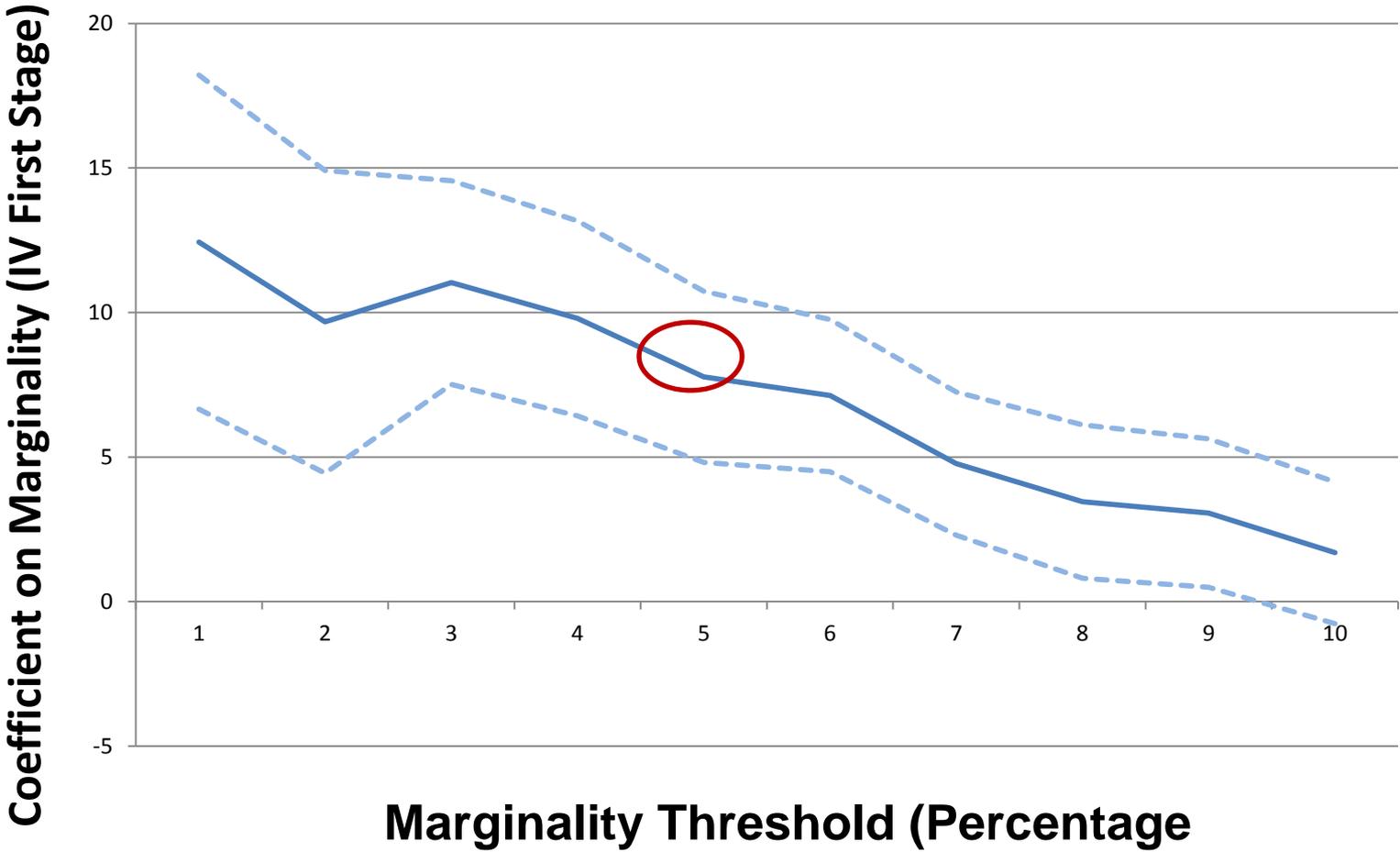
	OLS	First Stage	IV: 2 ND Stage
Dependent variable	AMI deaths	# Rival Hospitals	AMI deaths
# rival hospitals	-1.022*** (0.285)		-1.502** (0.654)
% Labour marginals		7.613*** (1.851)	
F-Statistic		16.91	
Observations	140	140	140

Notes: All columns include population density, age profile (11 categories), Foundation Trust, #sites, total admissions, “case-mix” specific to AMI admission (22 age/gender bins), respondent tenure & interviewer dummies, %Labour votes, #political constituencies, London dummy, teaching hospital status, % managers with clinical degree, dummy for joint decision making identity of winning party

EXTENSIONS & ROBUSTNESS

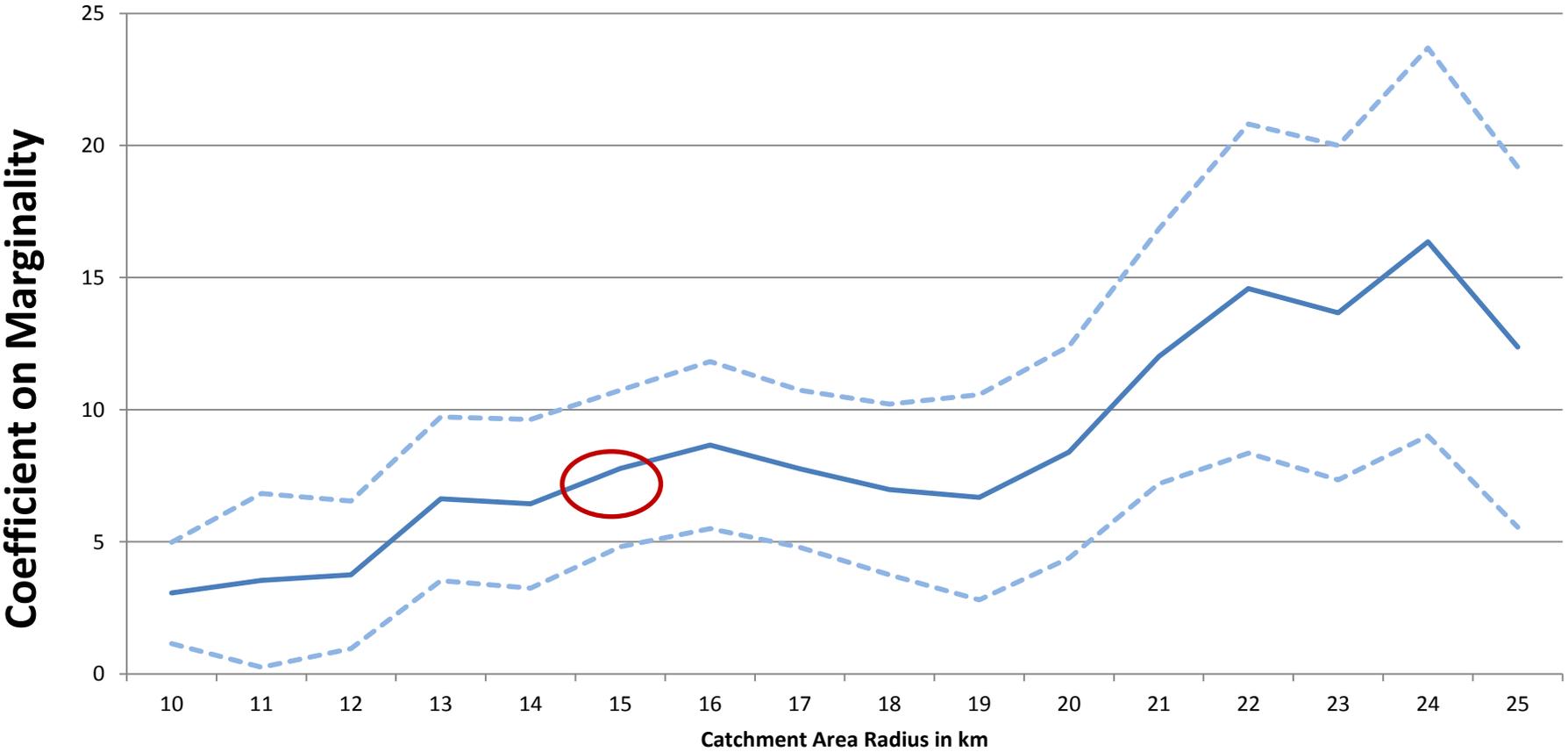
- **Definition of marginality**
- Do politicians have other ways to improve hospital management & performance other than via hospital numbers?
- Does number of hospitals just mean more local capacity?
- Does number of hospitals just proxy local labour markets?

FIGURE 8: THE EFFECT OF THE DEGREE OF POLITICAL MARGINALITY ON HOSPITAL NUMBERS



Notes: Coefficients from 10 separate first stage regressions on basic specification. All columns control for interviewer dummies, population density & age profile (11 dummies) . “Full” = # admissions, casemix (age/gender), Foundation trust status, respondent’s tenure and if manager or clinician, region dummies, # sites, % managers with clinical degree, # constituencies & Labour share of vote in catchment area

FIGURE 7: EFFECT OF CHANGING THE DEFINITION OF DISTANCE ON MARGINALITY



Notes: Results from 15 first stage regressions of #hospitals on the Labour marginality instrument (identical in specification to those of column (6) in Table 3). We vary (on the x-axis), the size of the catchment area around the hospital in an interval from 10km to 25km .Note that this increases the effective political catchment area (relevant for number of rival hospitals from 30km to 75km).

EXTENSIONS & ROBUSTNESS

- Definition of marginality
- **Do politicians have other ways to improve hospital management & performance other than via hospital numbers?**
- Does number of hospitals just mean more local capacity?
- Does number of hospitals just proxy local labour markets?

DO POLITICIANS AFFECT HOSPITALS IN MARGINAL DISTRICTS IN OTHER WAYS

- “Hidden policies” despite national formula?
- **Include marginality around own hospital (so effect is purely identified from competition around rivals)**
- Look at effect of marginality on:
 - purchaser resources
 - Provider resources (e.g. capital expenditure, technology)
- Placebos
 - Location of private hospitals
 - Number of schools & performance

TABLE 5: OTHER WAYS POLITICIANS AFFECT HOSPITALS IN MARGINAL DISTRICTS?

Type of Regression Dependent Variable	IV Mgmt	1 st Stage # rival Hospitals	IV Mgmt	OLS Expenditure Per Patient	IV Mgmt
# Competing Public Hospitals	0.366** (0.168)		0.336** (0.144)		0.359** (0.169)
% Marginals within <u>45km</u>		9.001*** (2.722)		3.596 (3.478)	
% Marginals within <u>15km</u>		-1.092 (0.916)	0.135 (0.371)		
Physicians per Patient in Local Area					-0.057 (0.052)
Observations	161	161	161	152	161

Notes: All columns include population density, age profile (11 categories), Foundation Trust, #sites, total admissions, “case-mix” specific to AMI admission (22 age/gender bins), respondent tenure & interviewer dummies, %Labour votes, #political constituencies, London dummy, teaching hospital status, % managers with clinical degree, dummy for joint decision making

DO POLITICIANS AFFECT HOSPITALS IN MARGINAL DISTRICTS IN OTHER WAYS

- Use UK Schools Placebo – same set-up as hospitals but with one exception, closure is done locally not centrally
- UK Secondary schools kids 11-18 (middle and high schools)
 - School opening/closure decisions made by Local Authority
- So if politicians affect local services through pressure we should also see **effect of marginality** on schooling outcomes.
- But we find no effect of marginality on school numbers, expenditure or performance

TABLE 6: NO EFFECT OF MARGINALITY ON SCHOOL NUMBERS OR EXPENDITURE

Dependent variable:	Number of Schools		Expenditure per Pupil	
% Marginals	-0.863 (0.922)	-0.599 (0.394)	-0.043 (0.057)	0.032 (0.047)
Labour Share of Votes	13.770*** (1.892)	0.617 (0.922)	1.155*** (0.089)	-0.117 (0.153)
School & cohort size	No	No	No	Yes
School Controls	No	No	No	Yes
Area Level Controls	No	Yes	No	Yes
Observations	300	300	2,782	2,782
Unit of Observation	Local authority		School	

Notes: All columns include controls for the Labour share of votes. “**School-level controls**” are % pupils with free school meal, %male, %non-white pupils, %with special education needs. “**Area level controls**” are % pupils in private/ selective schools, total population and population density.

TABLE 6: NO EFFECT OF MARGINALITY ON SCHOOL PERFORMANCE

Dependent variable	Test Scores % 5 GCSE (A*-C) (Key Stage 4)			Value Added: Key Stage 2 (entry at age 11) to 4 (age 16)		
% Marginals	0.001 (0.017)	-0.011 (0.011)	-0.006 (0.011)	0.529 (0.323)	0.216 (0.260)	0.314 (0.262)
Labour Share of Votes	13.770*** (1.892)	0.617 (0.922)	1.155*** (0.089)	-0.117 (0.153)	-0.251*** (0.021)	-0.026 (0.020)
# Rival Schools			0.007*** (0.001)			0.136*** (0.023)
School Controls	No	Yes	Yes	No	Yes	Yes
LA-Level Controls	No	Yes	Yes	No	Yes	Yes
Observations	2,772	2,772	2,772	2,772	2,772	2,772

Notes: All columns include controls for the Labour share of votes. “**School-level controls**” are % pupils with free school meal, %male, %non-white pupils, %with special education needs. “**LA-level controls**” are %pupils in private/ selective schools, total population and population density.

CONCLUSIONS

- Large variation in management practices in hospitals
- Better management associated with better health outcomes
- Competition improves management and health outcomes
- Problems of (Federal) government influence on entry
- Next steps:
 - Cross country comparisons
 - Public/Private differences

MY FAVOURITE QUOTE:

Don't get sick in Britain

Interviewer : “Do staff sometimes end up doing the wrong sort of work for their skills?”

NHS Manager: “You mean like doctors doing nurses jobs, and nurses doing porter jobs? Yeah, all the time. Last week, we had to get the healthier patients to push around the beds for the sicker patients”

OUTLINE

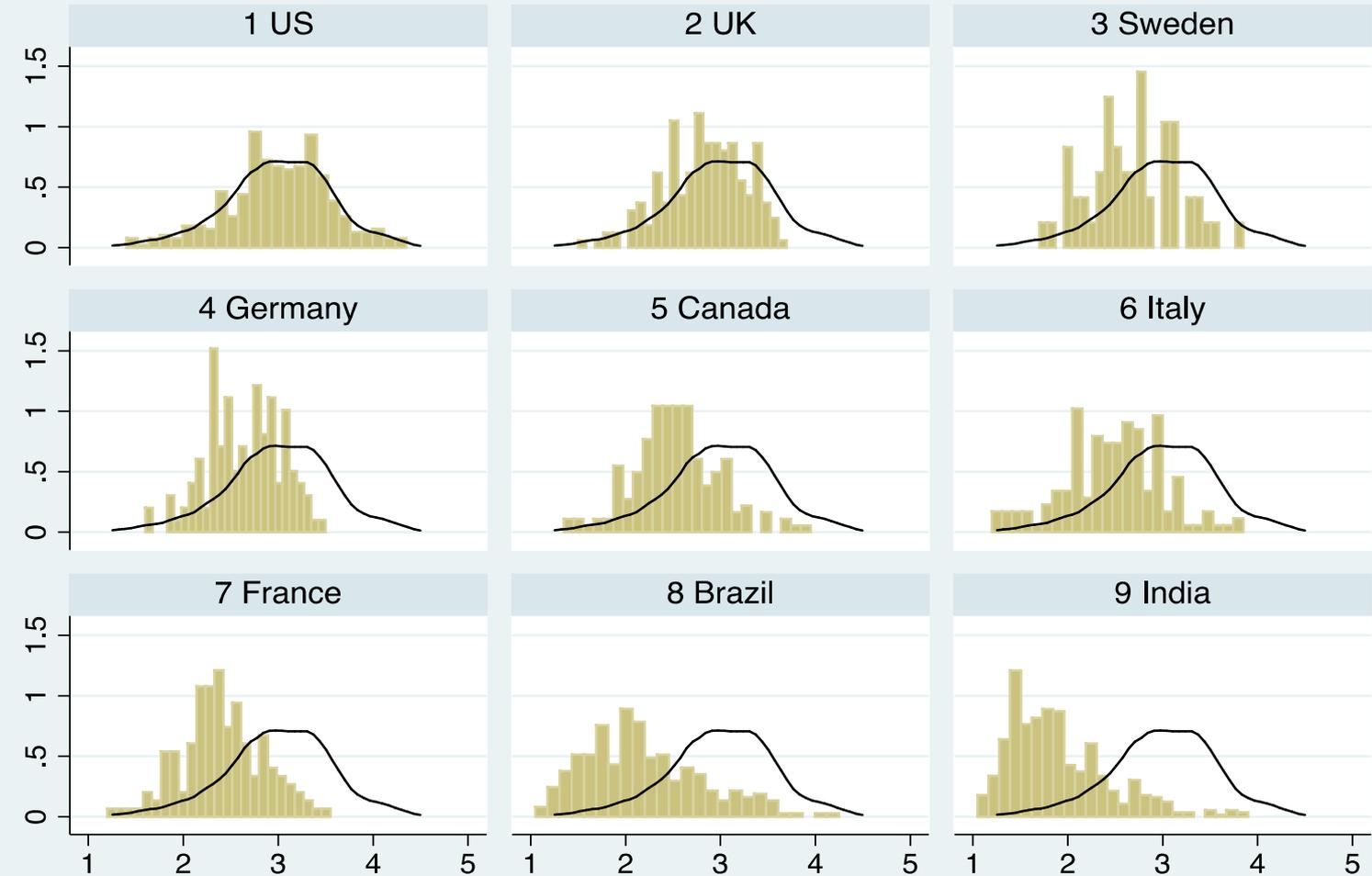
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MANAGEMENT IN 2,000 HOSPITALS ACROSS COUNTRIES



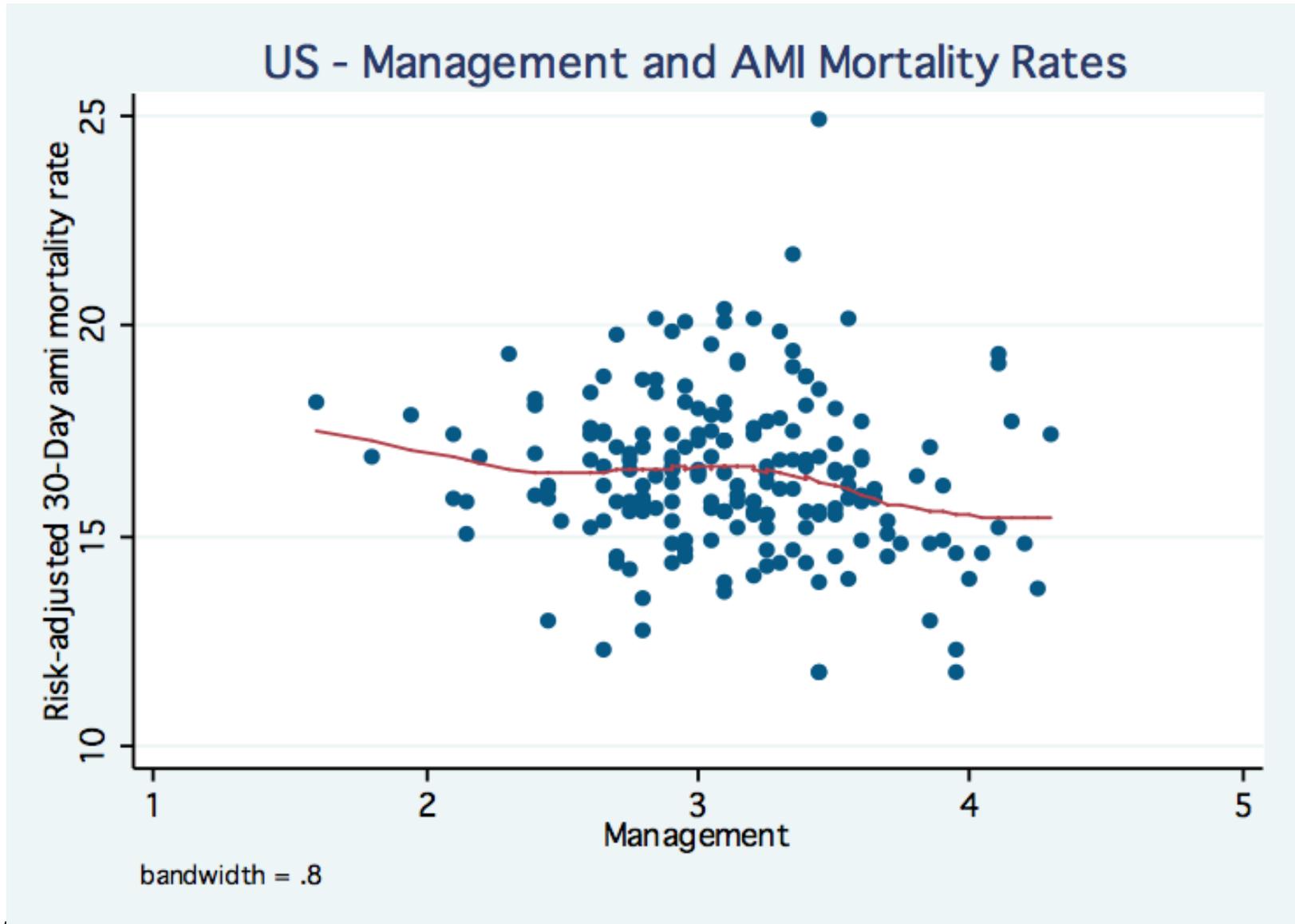
There is also substantial variation across hospitals in management within countries



Graphs by Country

Source: Bloom, Sadun & Van Reenen (2013b)

FIND POSITIVE CORRELATION BETWEEN MANAGEMENT AND CLINICAL OUTCOMES ACROSS COUNTRIES – U.S.



SOURCE: Management data collected during 195 interviews Mortality data drawn from Hospital Compare dataset, 2008

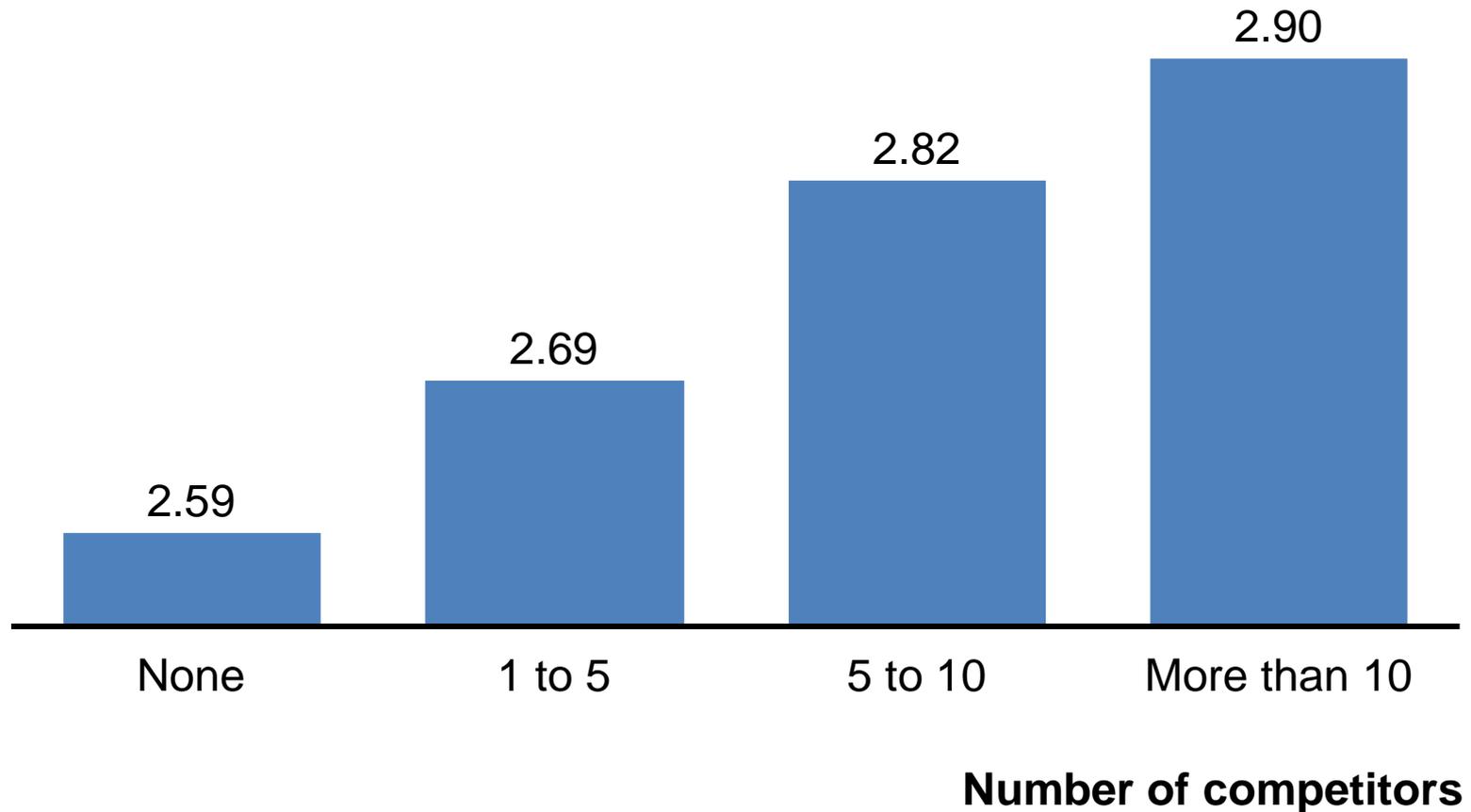
Hospitals: Patient Outcomes better when Management scores higher (US, UK, Canada & Sweden)

Dependent Variable: Case mix adjusted AMI 30 days mortality rates (z-scored by country)						
Countries	All		US	UK	Canada	Sweden
Management (z-score)	-0.162*** (0.056)	-0.246*** (0.075)	-0.211** (0.100)	-0.416* (0.224)	-0.717** (0.316)	-0.543*** (0.193)
Observations	324	324	178	74	24	48
Country dummies	y	y	y	y	y	y
Hospital controls	y	y	y	y	y	y
Region & noise controls		y	y	y	y	y

Notes. OLS; SE clustered by hospital. Hospital controls: size age, specialty, %managers with a clinical degree. “Noise controls”: 13 interviewer dummies, seniority & tenure of manager; interview duration, reliability indicator, interviewee type (nurse, doctor or manager).

Source: Bloom, Sadun & Van Reenen (2013b)

MANAGEMENT PRACTICE SCORES ALSO HIGHER WITH MORE COMPETING HOSPITALS



Notes: # rival hospitals as perceived by manager

Source: Bloom, Sadun and Van Reenen (2013b)

MY FAVOURITE QUOTES:

Don't get sick in India

Interviewer : “Do you offer acute care?”

Switchboard: “Yes ma'am we do”

Interviewer : “Do you have an orthopaedic department?”

Switchboard: “Yes ma'am we do”

Interviewer : “What about a cardiology department?”

Switchboard: “Yes ma'am”

Interviewer : “Great – can you connect me to the ortho department”

Switchboard?: “Sorry ma'am – I'm a patient here”

Back up

DISTRIBUTION OF INTERVIEWS BY HOSPITAL

interviews	hospitals	Observations
1	53	53
2	34	68
3	12	36
4	1	4
Total	100	161

Q8 TARGETS - Target stretch

How tough are your targets? Do you feel pushed by them? On average, how often would you expect to meet your targets? Do you feel that on targets all specialties, departments or staff groups receive the same degree of difficulty? Do some groups get easy targets? How are the targets set? Who is involved?

Score

(1): Goals are either too easy or impossible to achieve, at least in part because they are set with little clinician involvement, e.g., simply off historical performance

(3) In most areas, senior staff push for aggressive goals based, e.g., on external benchmarks, but with little buy-in from clinical staff. There are a few sacred cows that are not held to the same standard

(5): Goals are genuinely demanding for all parts of the organisation and developed in consultation with senior staff, e.g., to adjust external benchmarks appropriately

Other Robustness Tests

- Squared and cubic terms for Labour's vote share
- Drop London hospitals
- Expenditure per patient controls
- Building age
- Doctor vacancies (proxy for human capital)
- Ran a placebo using private hospitals (no effect of more private hospitals on NHS management quality) – they are competing in different markets
- Heterogeneity – effects are stronger for smaller hospitals
- Note Hausman tests do not reject

Other Robustness Tests- cont.

- The hospitals are trusts and could be composed of multiple “sites”. Competition among trusts not sites, so use #sites as another control (no effect of sites)
- Wages, unemployment, employment rate

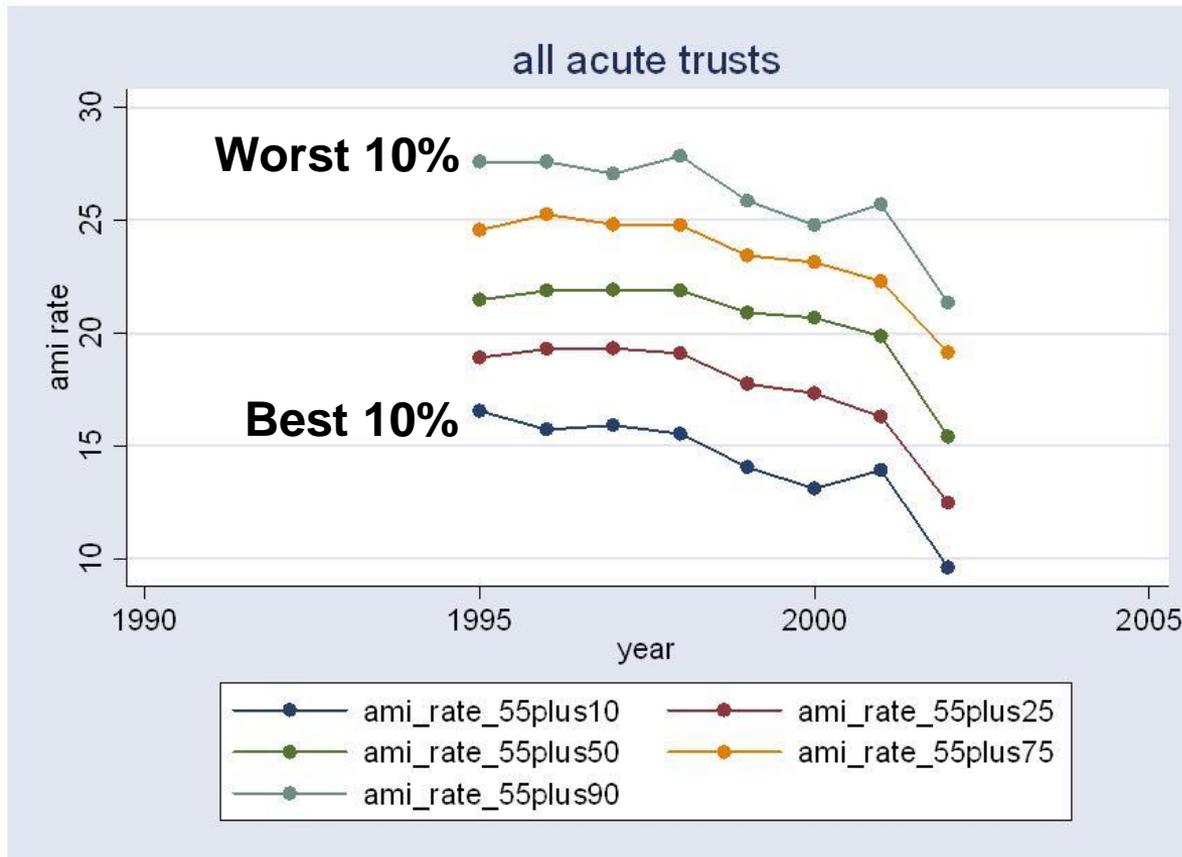
TABLE B3: FULL SETS OF RESULTS

Type of Regression	OLS	Reduced form	1 st Stage	IV
Dependent Variable	Management	Management	# Hospitals	Management
Number of Competing Hospitals	0.172*** (0.060)			0.443*** (0.167)
%Labor Marginals		7.661*** (2.796)	17.284*** (3.752)	
Number of Constituencies	0.066 (0.049)	0.140** (0.056)	0.285*** (0.070)	0.013 (0.056)
Labor Share of Votes	0.011 (0.017)	0.004 (0.018)	-0.053* (0.030)	0.027 (0.019)
Foundation Trust Dummy	0.639*** (0.166)	0.782*** (0.156)	0.282 (0.387)	0.657*** (0.223)
% Managers with Clinical Degree	0.762* (0.400)	0.755** (0.373)	-0.421 (0.462)	0.942** (0.458)
Clinicians & Managers Take Decision Jointly	0.293* (0.157)	0.267 (0.166)	-0.135 (0.236)	0.327** (0.165)
Teaching Hospital	0.599** (0.266)	0.485* (0.258)	0.253 (0.473)	0.373 (0.295)
London	-1.047 (0.875)	-0.989 (0.822)	2.875* (1.665)	-2.263* (1.297)
Total Population in Catchment Area	-1.132** (0.520)	-1.212** (0.527)	0.364 (0.745)	-1.373** (0.647)
Age-/ Gender-Controls (F-stat for 11 Variables)	1.84* (0.128)	2.59*** (0.137)	5.79*** (0.187)	1.44 (0.129)
Total Admissions	0.155 (0.128)	0.242* (0.137)	0.122 (0.187)	0.188 (0.129)
Age-/ Gender Controls (F-stat for 21 Variables)	2.23***	1.51*	1.69**	1.93**
Observations	161	161	63	161

TABLE B5: FULL SETS OF RESULTS

Type of Regression	OLS	Reduc Form	1 st Stage	IV, 2 nd St.
Dependent Variable	Mgmt	Mgmt	# Hospitals	Mgmt
Number of Competing Hospitals	0.181*** (0.049)			0.366** (0.168)
Proportion of Marginal Constituencies		2.644** (1.013)	7.228*** (2.115)	
Number of Constituencies	0.077 (0.060)	0.117* (0.062)	0.178*** (0.060)	0.051 (0.058)
Size (Total patient admissions) In 10,000s	0.111 (0.090)	0.129 (0.106)	-0.125 (0.194)	0.175 (0.107)
Foundation Trust	0.562*** (0.192)	0.576*** (0.192)	-0.138 (0.491)	0.627** (0.248)
Proportion of Managers with Clinical Degree	0.519 (0.374)	0.479 (0.361)	-0.397 (0.396)	0.624 (0.416)
Teaching Hospital	0.228 (0.358)	0.245 (0.345)	0.600 (0.384)	0.026 (0.340)
London	-0.590 (0.833)	-0.162 (0.663)	3.929** (1.571)	-1.599 (1.165)
Total Population in 15km (1,000,000s)	-1.354** (0.604)	-1.111* (0.596)	1.487* (0.761)	-1.655** (0.762)
Fraction of Households that own a car	-0.009 (0.017)	-0.006 (0.017)	0.040 (0.028)	-0.020 (0.020)

Large spread in death rates from AMI between hospitals



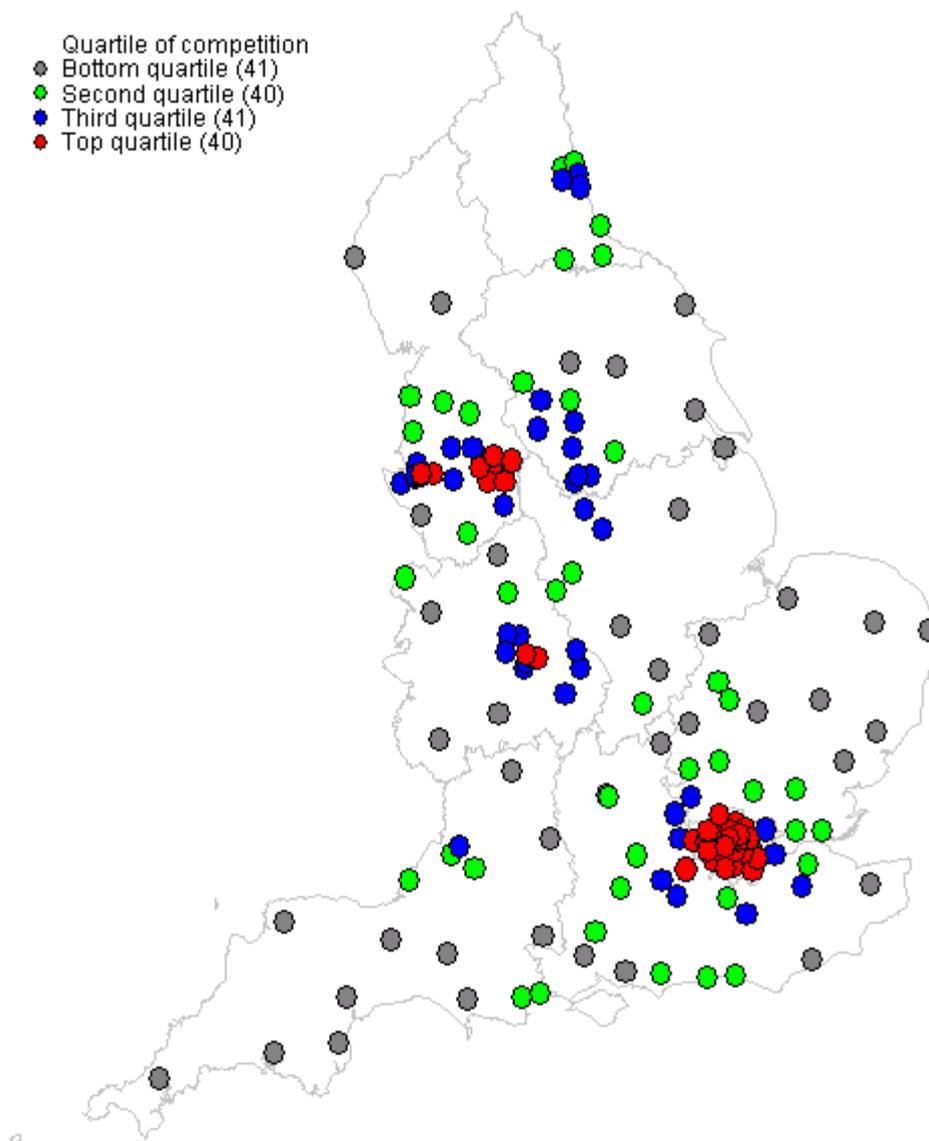
Source: Propper and Van Reenen (2010) I

Notes: Improvements over time (cf. TECH Investigators); 1995: 10 percentage point difference between top and bottom decile (90th =27%,10th =17%); Drop in 2002 related to HD National Service Framework

Competition at the hospital level

2003/04

- Quartile of competition
- Bottom quartile (41)
 - Second quartile (40)
 - Third quartile (41)
 - Top quartile (40)



Competition measure: Predicted HHI - Kessler-McClellan.
Each dot in the figure represents a hospital.

ALTERNATIVE HHI-BASED COMPETITION MEASURE

- Follow Kessler-McLennan (2000, QJE)
- Standard HHI uses actual patent flows.
 - 7,000 MSOAs (“areas”) of ~7,200 people (cf US zipcodes), $k = 1, \dots, K$
 - Calculate a HHI based on shares in all of the $j = 1, \dots, J$ hospitals in England
 - Use all elective admissions ($i=1, \dots, n$); $n= 13m$ per year from HES 2003/4 - 2006/7
- But flows potentially endogenous (e.g. more patients to better hospitals)
 - Exploit information from HES to estimate MNL logit of patient choice of hospital

Characteristics in MNL

- Choice probabilities depend on:
 - **Characteristics of patient**
 - Gender, age, severity of condition (ICD)
 - **Characteristics of hospital**
 - Teaching/non-teaching; dummy for big/small;
 - **Characteristics of patient-hospital match**
 - Physical distance between patient and hospital
 - Interactions of distance and hospital type
 - Interactions of patient characteristics and hospital type

Model of patient choice

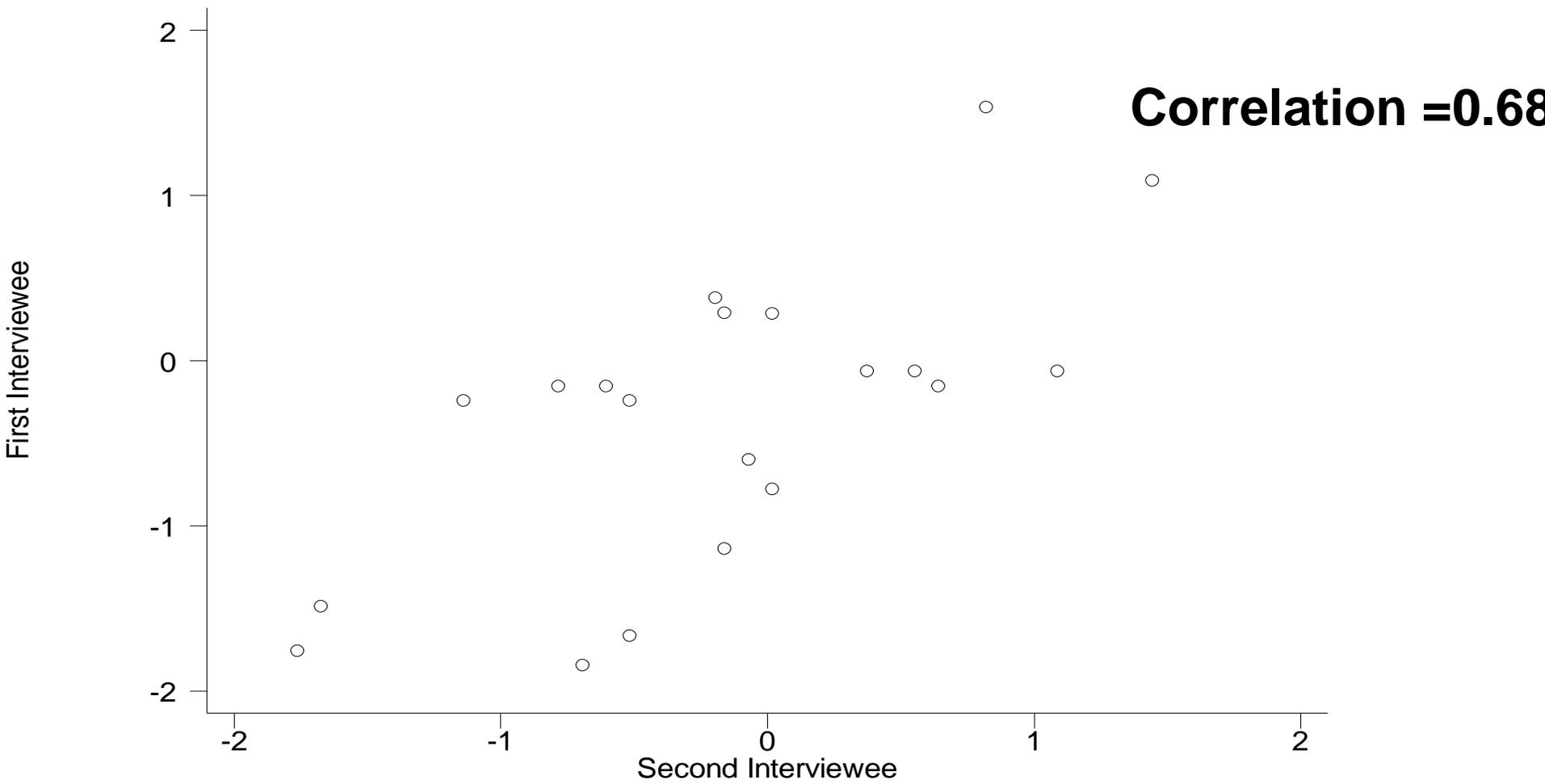
$$U_{ij} = \sum_{h=1}^2 \left\{ \beta_1^h (d_{ij} - d_{ij^+}^h) \times z_j^h + \beta_2^h (d_{ij} - d_{ij^+}^h) \times (1 - z_j^h) \right\} \\ + \sum_{h=1}^2 \left\{ \beta_3^h (d_{ij} - d_{ij^-}^h) \times z_j^h + \beta_4^h (d_{ij} - d_{ij^-}^h) \times (1 - z_j^h) \right\} \\ + \sum_{h=1}^2 \left\{ \begin{array}{l} \beta_5^h \text{female}_i \times z_j^h \\ + \beta_6^h \text{young}_i \times z_j^h + \beta_7^h \text{old}_i \times z_j^h \\ + \beta_8^h \text{lowseverity}_i \times z_j^h + \beta_9^h \text{highseverity}_i \times z_j^h \end{array} \right\} + e_{ij}$$

Predicted HHIs based on predicted patient flows based on MNL model of hospital choice

$$HHI_{\hat{j}} = \sum_{k=1}^K \left(\frac{\hat{n}_{kj}}{\hat{n}_j} \right) HHI_k, \quad HHI_k = \sum_{j=1}^J \left(\frac{\hat{n}_{jk}}{\hat{n}_k} \right)^2$$

$$\hat{n}_j = \sum_{i=1}^n \hat{\pi}_{ij}, \quad \hat{n}_k = \sum_{i=1}^{n_k} \sum_{j=1}^J \hat{\pi}_{ij} = \sum_{i=1}^{n_k} 1 = n_k, \quad \hat{n}_{kj} = \hat{n}_{jk} = \sum_{i=1}^{n_k} \hat{\pi}_{ij}$$

CORRELATION BETWEEN FIRST AND SECOND INTERVIEWEE IN SAME HOSPITAL (SINGLE SITES)



Notes: standardized management score (16 questions) for hospitals where there Where 2+ interviews. 20 hospital trusts.

MARGINALITY STATISTICS

- 529 seats in England
 - 64 marginals in 1997 (40 in '01 and 76 in '05)
 - 19 Labour marginals in 1997 (15 in '01 and 36 in '05)
 - 13 of these stayed marginal in '01
- 62% of our hospitals' 30km markets have no Labour marginal
 - Of the 38% who do, the mean proportion is 12.7%
- 24% of our hospitals have no marginal seat
 - Of the 76% who do, mean proportion is 24.9%

SOME RELATED LITERATURE

- **Competition & Performance**
 - Nickell (1996); Holmes & Schmitz (2010, 2001, *water shipping*); Syverson (2004, *concrete*); Schmitz (2005, *Iron Ore*); Matsa (2009, Wal-Mart entry); Dunne et al (2008, *Cement*); Bridgeman et al (2008, *Sugar*); Galdon-Sanchez & Schmitz (2002, *Iron Ore*)
 - Generally find productivity increased. Usually some within-firm component & stress management changes
- **Hospital Competition & Performance**
 - Gaynor (2006), Kessler and McLellan (2000); Volpp et al (2003); Propper et al (2004, 2008), Cooper et al (2011); Gaynor et al (2010)
- **Entry:** Bresnahan and Reiss (1991); Cutler et al (2009)
- **Political connections and jobs:** Bertrand et al (2007)

SINGLE INDUSTRY STUDIES OF COMPETITION AND PRODUCTIVITY

- Syverson (2004) *concrete* (market size in different geographical markets)
- Holmes & Schmitz (2001) *Long-distance water shipping* (effect of railroads)
- Schmitz (2005) *Iron Ore manufacturing in 1980s* (fall in transport costs for Brazilian imports)
- Matsa (2009) *Supermarkets* (Wal-Mart entry)
- Dunne et al (2008) *Cement* in 1980s (overseas imports from e.g. Mexico, Venezuela & Australia)
- Bridgeman et al (2008) *Sugar manufacturing cartel* (disbanded in 1974)
 - All find productivity increased. Some within-plant component. Stress management changes

Existing research: essential reading (1)

- US evidence generally mixed: mainly cross-sectional evidence, or long run changes over time
- Kessler and McLellan (QJE, 2000), 1985-1994 Medicare patient data. Competition:
 - pre-1990s linked to higher costs/ambiguous quality
 - post 1990s linked to lower costs/higher quality (under ‘managed care’ regime)
 - They pay careful attention to potential endogeneity of market areas and hospital competition indices (Herfindahls)
- Also Volp et al 2003: dif-in-dif to price competition policy in NJ, finding adverse effects on AMI mortality

Existing research: essential reading (2)

- UK evidence on clinical quality effects:
- Propper et al (JPubE 2004, EJ 2008), hospital-level data:
 - Competition in the 1990s linked to higher mortality
 - 2008 paper compares the 1992-1996 period with 1991 and 1997-1999
 - Finds that competition worked against the general decline in AMI mortality created by technological change
 - They use drive-time based market areas

	Management	New Variable
Baseline	0.543** (0.220)	
Drop London	0.756** (0.369)	
Include Doctor vacancies	0.526** (0.216)	-0.089 (0.062)
Include employment	0.554** (0.222)	-0.001 (0.001)
Include #private Hospitals	0.702** (0.319)	-0.114* (0.059)
Interact with Large hospitals	0.562 (0.470)	-0.010 (0.220)
Include total #sites in Area	0.712** (0.356)	-0.079 (0.053)
Include square & cubic Labour share	0.551*** (0.208)	-0.002 (0.005)
4 types of management	0.220 (0.260)	
Operations	0.113 (0.271)	
Monitoring	0.547** (0.223)	
Targets	0.684*** (0.273)	
Incentives		

Table B2: CHECKING FOR RESPONSE BIAS

Variable	Marginal effect (standard error)
Mortality rate from AMI (after 28 days)	0.129 (0.161)
Mortality rates from all emergency surgery (after 30 days)	0.313 (0.365)
Total Waiting List	0.025 (0.045)
MRSA Infection rate	-0.025 (0.041)
Health Care Commission overall rating of hospital	-0.011 (0.043)
Mortality in hospital's area	0.275 (0.277)
Size (Number of total admissions)	0.213 (0.427)
Foundation Trust	0.091 (0.082)
Expenditure per patient	0.015 (0.008)*

Notes: Each row a separate Probit ML regression. Dependent variable =1 if hospital responded to survey (100 hospitals out of 164 possible acute hospitals). Only 1 variable from 16 was significant at 10% level.

TABLE 5 - ROBUSTNESS OF IV RESULTS TO ALTERNATIVE MARKET DEFINITIONS

Experiment	Baseline (30km; 5% thresh- hold)	% marginals within 26km	% marginals within 32km	3% marginal threshold	7% marginal threshold
# rival hospitals	0.366** (0.168)	0.484** (0.225)	0.395* (0.219)	0.227* (0.126)	0.485* (0.279)
Full controls	Yes	Yes	Yes	Yes	Yes
Observations	161	161	161	161	161

Notes: All columns include population density, age profile (11 categories), Foundation Trust, #sites, total admissions, “case-mix” specific to AMI admission (22 age/gender bins), respondent tenure & interviewer dummies, %Labour votes, #political constituencies, London dummy, teaching hospital status, % managers with clinical degree, dummy for joint decision making

WE OBTAIN INSTRUMENT FOR COMPETITION BY EXPLOITING POLITICS OF UK HEALTH PROVISION

- In the UK hospital openings and closures centrally controlled
- Politically sensitive: e.g. Dr. Richard Taylor, Kidderminster 2001



“He defeated a sitting government minister (David Lock, Labour) in 2001 to take Wyre Forest after campaigning on a single issue - saving the local Kidderminster Hospital which the government planned to downgrade” *BBC News, April 30th 2010*

TABLE B5 CORRELATION OF MARGINALS WITH OTHER VARIABLES

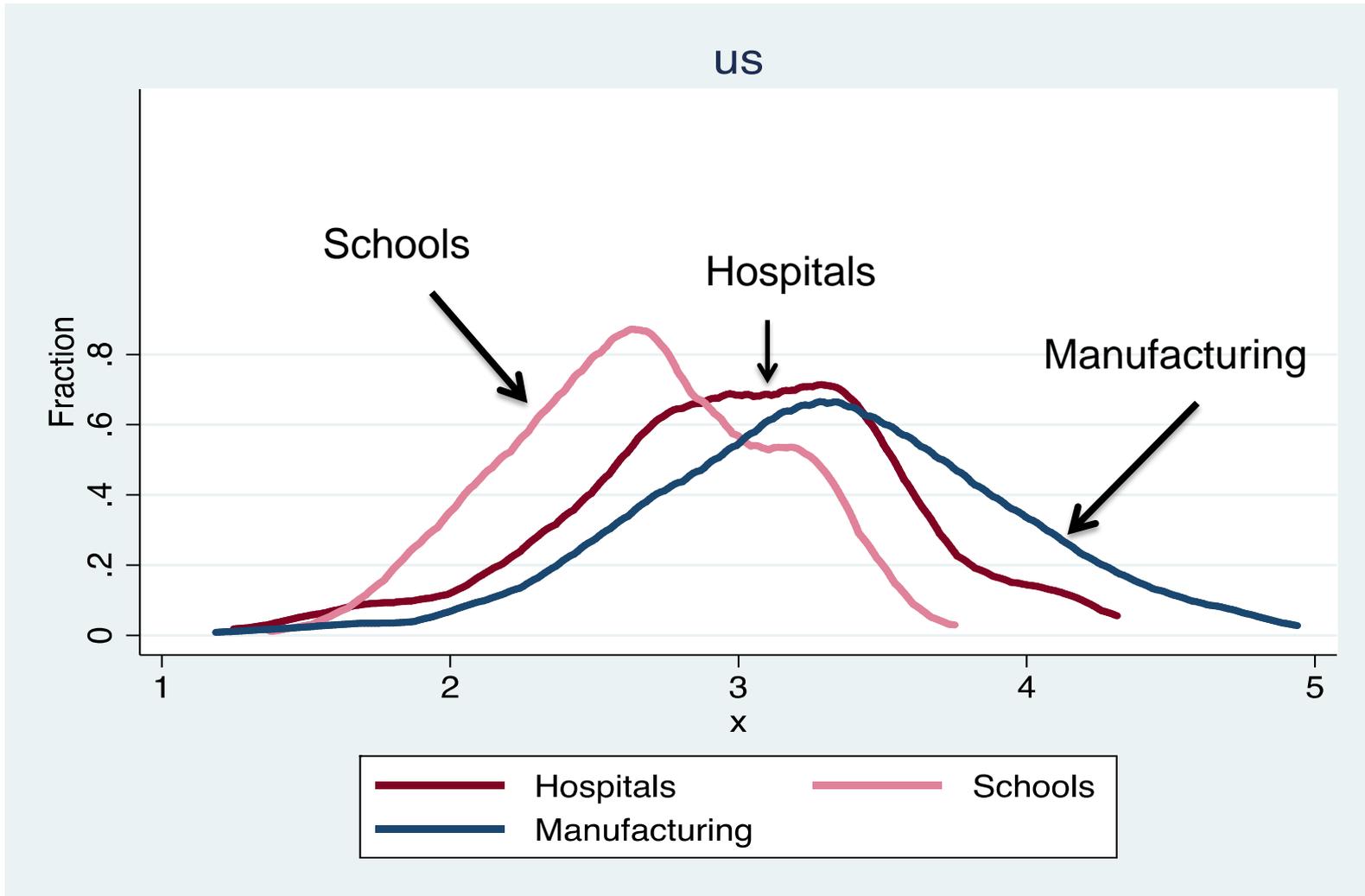
Dependent variable	Unconditional	Conditional
1. Number of Households (100,000)	-1.363* (0.758)	n/a
2. Fraction of Retired Population	0.211 (0.571)	-0.690 (0.479)
3. Fraction of Population with Long-term Illness	-1.431*** (0.547)	-0.356 (0.380)
4. Fraction of Unemployed	-0.680*** (0.216)	0.077 (0.096)
5. Fraction that Own a House	5.976*** (1.829)	-0.480 (0.815)
6. Fraction of Higher Social Class (Managerial and Professional)	1.172 (1.194)	-0.174 (0.764)
7. Fraction that do not Work	-0.806*** (0.298)	0.006 (0.181)
8. Fraction Long-term Unemployed	-0.252*** (0.084)	0.002 (0.041)

Method	Unconditional	Conditional
Dependent Variable		
9. Fraction Students	-0.637 (0.569)	0.269 (0.511)
10. Fraction Without Qualification	-1.446 (1.162)	0.697 (0.858)
11. Fraction Migrants	-0.337 (0.443)	0.247 (0.380)
12. Fraction Working Age Pop.	3.272*** (0.982)	0.243 (0.543)
13. Fraction that Work in Manufacturing	0.407 (0.883)	0.550 (0.744)
14. Fraction Using Public Transport\ to Work	-4.802** (2.088)	-0.486 (0.689)
15. Fraction Single Households	-2.233*** (0.728)	0.046 (0.443)
16. Fraction Lone Parents	-1.319*** (0.413)	-0.073 (0.249)

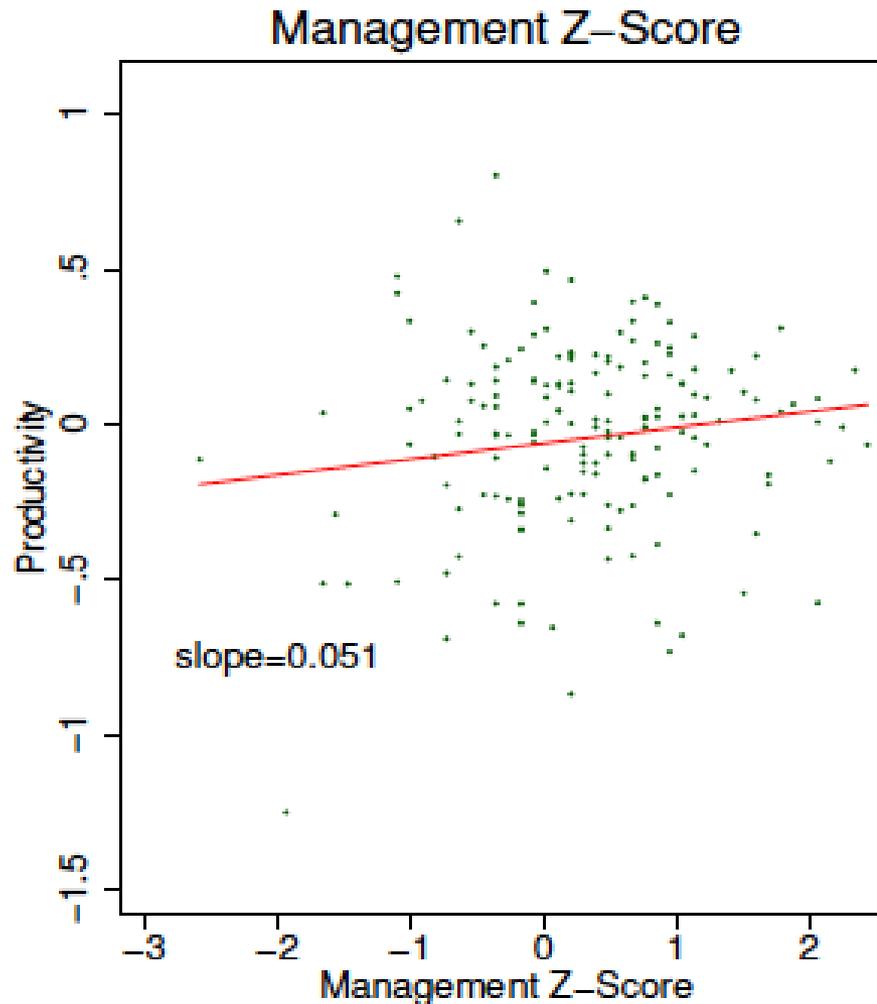
MAGNITUDES

- A **1.5** percentage points fall in AMI is an 8.8% falls in death rates
- Kessler-McLennan (2000) simulate increase in HHI from moving from area with least to most competition in US
 - AMI mortality declines by **1.5** percentage points

Dispersion of management quality in US hospitals, schools & manufacturing (To be explained later!)



In US Hospitals “TFP” higher when management score higher



(4b)

Source: Chandra et al (2013)

Notes: TFP is AMI survival rates adjusted for all inputs (procedures weighted by Medicare reimbursement prices)