



QUALITY TRANSPARENCY AND HEALTHCARE COMPETITION

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ROADMAP

1

Introduction

Background
Research Questions
Research Design
Variables

2

Transparency and Facility Location

Does transparency about healthcare quality affect local market entry?

3

Mechanism

Do physicians change their referral behavior?

4

Effects on Patients

Do patient outcomes improve?

BACKGROUND AND MOTIVATION

Competition in healthcare markets is a prominent goal of policymakers

(Katz, 2013)

- Centers for Medicare and Medicaid (CMS); Federal Trade Commission (FTC)

Healthcare markets remain far from being (highly) competitive

(Eliaison et al., 2020; Wollmann, 2021)

- Inelastic demand for medical services
- Complex regulations (e.g., fixed prices; restrictions on market entry)
- General lack of transparency

Transparency about healthcare quality is particularly important, since prices are often regulated

- Quality becomes the primary dimension along which healthcare providers can compete on

RESEARCH QUESTIONS

1

Does transparency about
healthcare quality affect
competition?

If so, how large is it?

2

Does increased
transparency, via an
increase in competition,
improve the quality of
healthcare?

Do health outcomes improve?

RELATED WORK

Transparency and disclosure regulation

Dranove and Jin (2010)

Leuz and Wysocki (2016)

Christensen et al. (2020)

Real effects of transparency on quality

Dranove et al. (2003)

Jin and Leslie (2003)

Kolstad (2013)

Christensen et al. (2017)

Johnson (2020)

Competition in healthcare

Dialysis

Eliason (2018)

Cutler et al. (2016)

Eliason et al. (2020)

Wollmann (2021)

Healthcare

Katz (2013)

Bloom et al. (2015)

Curto et al. (2021)

SETTING

U.S. Market for dialysis

- Treatment for patients experiencing a loss of kidney function
- 500,000 patients (*USRDS, 2019*)

Why is this a useful setting?

- A large oligopolistic market for a relatively standard (homogenous) product
- Most patients covered by Medicare at a cost of \$35 billion per year
1% of Federal Budget (USRDS, 2019)
Prices are fixed, i.e., competition along quality dimension
- Regulators have been concerned with quality in this market
Historical lack of transparency regarding quality
- Transparency regulation introduced

U.S. DIALYSIS INDUSTRY

Below 10-15% normal kidney function requires immediate care

- New kidney via transplant
- Machines to dialyze blood (i.e., do the kidneys' job)
3 times a week (4 hours per session)

Administered via privately-run facilities

- 7,000+ facilities
- Typically stand-alone facilities
- Serve geographically proximate patients (<10 miles)
- Medicare licenses and reimburses all facilities

U.S. DIALYSIS INDUSTRY



REGULATION

Medicare Improvements for Patients and Providers Act of 2008 (MIPPA)

Introduction of ESRD Quality Incentive Program

- Objective to promote “high quality services in renal dialysis facilities”
- Introduces “Total Performance Score” (TPS) and financial penalty for low scores
- Outlines but does not specify exact measures (e.g., suggests a measure of “anemia management”)

End of 2010/Early 2011

- Finalizes first three quality measures to be used in TPS
- First performance score to be published in January 2012 (using claims data from 2010)

TOTAL PERFORMANCE SCORE (TPS)

Who established the measures? & when?

Department of Health and Human Services (CMS)

- MIPPA requires measures endorsed by “consensus organization” (e.g., National Quality Forum)
- Proposed measure published in Federal Register in August 12, 2010
- Comment period ended September 24, 2010
- Final rule published in the Federal Register on January 5, 2011

Which measures are included in the TPS?

For 2012

- Percentage of Medicare patients with an average Hemoglobin Less Than 10.0g/dL Weight = 50%
- Percentage of Medicare patients with an average Hemoglobin Greater Than 12.0g/dL Weight = 25%
- Percentage of Medicare patients with an average Urea Reduction Ratio (URR) > 65 percent Weight = 25%

QUALITY INCENTIVE PROGRAM



U.S. DEPARTMENT of HEALTH & HUMAN SERVICES
CENTERS for MEDICARE & MEDICAID SERVICES



End-Stage Renal Disease Quality Incentive Program

2012 Certificate of Dialysis Facility Performance - Part 1

Facility CMS Certification Number: 999999

*** The information communicated below is based on 2010 data. ***

Certificate of Dialysis Facility Performance

This Facility Meets 2 of 3 Quality Standards

TOTAL PERFORMANCE SCORE	27 out of 30
National Average	26

MEASURES OF QUALITY	FACILITY SCORE	NATIONAL AVERAGE	MEETS STANDARD
Anemia Management: (Shows how well a facility keeps red blood cell counts in the target range)			
Percentage of patients with hemoglobin less than 10 grams per deciliter (g/dL)	8 of 10	8 of 10	NO
Percentage of patients with hemoglobin greater than 12 g/dL	10 of 10	10 of 10	YES
Dialysis Adequacy: (Shows how well a facility cleans blood during a dialysis treatment)			
Percentage of patients with urea reduction ratio of at least 65%	10 of 10	9 of 10	YES

Facility Name and Address

SAMPLE FACILITY
FACILITY ADDRESS
CITY, STATE ZIP CODE

Facility Director

Patrick Conway, M.D., M.Sc.

CMS Chief Medical Officer
Director, Office of Clinical Standards and Quality

Note: Dialysis facilities are required to post both parts of this Certificate prominently in a patient area.

This Certificate expires December 31, 2012.



DATA SOURCES

Centers for Medicare & Medicaid Services (CMS)

Facility-level data on dates, location, ownership, quality scores

Physician Shared Patient Patterns

Construct physician-facility referrals

United States Renal Dialysis System

Complete patient treatment history for all U.S. patients

Link this to facilities

Facility-level inputs

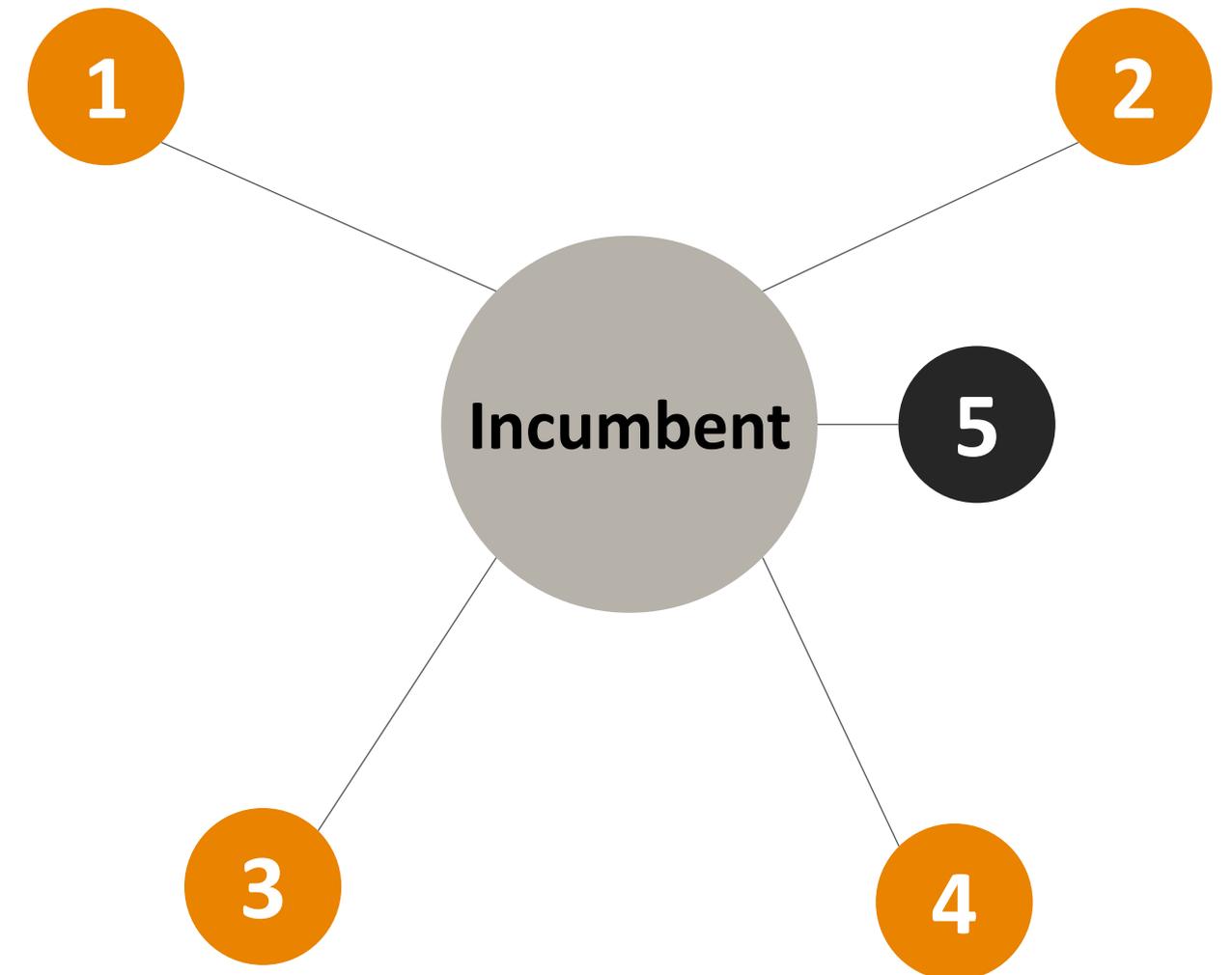
Detailed financial statement and other resource-related data at the facility level

State-level Certificate of Need law data

DEPENDENT VARIABLE: ENTRY BY COMPETITOR

Take five nearest facilities to the incumbent

- Indicator variable: Is nearest facility (e.g., facility #5) new?
- “New” defined as opening in year $t+2$; where t =year that quality score is revealed



MEASURING FACILITY QUALITY

Post period

Actual quality scores
(2012-2015)

- Medicare calculates this using lagged claims data
- January 2012 quality score based on 2010 data

Pre period

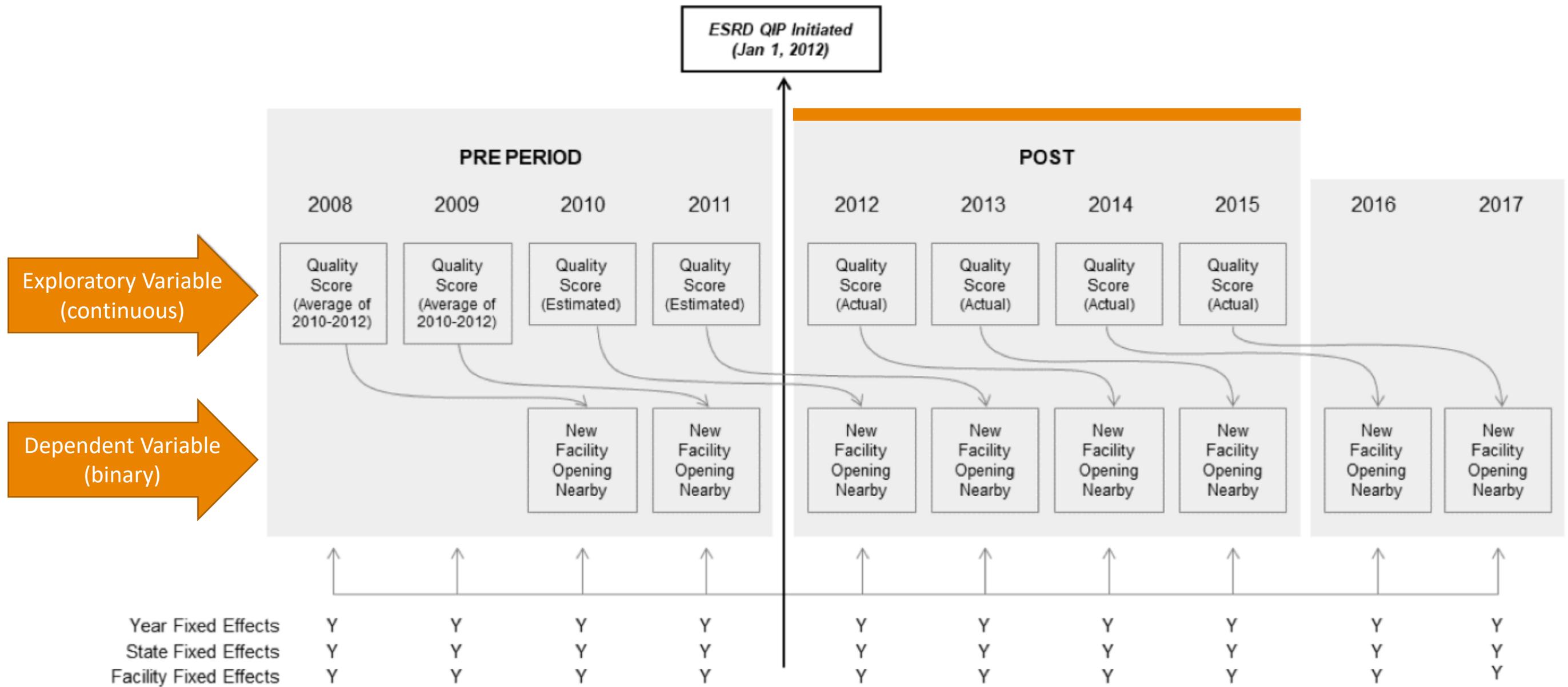
Estimated quality scores

- 2011 and 2010 quality scores calculated using 2009 and 2008 data
- 2009 and 2008 quality scores averages of 2010 to 2012 scores

A potential concern

Quality is a choice variable,
i.e., not exogenous

RESEARCH DESIGN: DIFFERENCE-IN-DIFFERENCES



DESCRIPTIVE STATISTICS

Variable	N	Mean	5th	25th	Median	75th	95th
Dependent Variables							
<i>NewNearestCompetitor</i>	38,522	0.05	0.00	0.00	0.00	0.00	0.00
<i>NewNearestCompetitor(≤ 5 miles)</i>	38,522	0.04	0.00	0.00	0.00	0.00	0.00
<i>Distance</i>	9,452	4.73	0.51	2.28	4.49	7.13	9.43
<i>NewPatients</i>	40,674	19.95	5.00	11.00	18.00	26.00	42.00
<i>ReferringPhysicians</i>	20,689	1.92	0.00	0.00	1.00	3.00	7.00
Δ <i>Nurses</i>	37,011	0.13	-0.45	-0.13	0.04	0.27	1.00
Δ <i>ClinicalStaff</i>	37,218	0.18	-0.40	-0.12	0.02	0.21	1.00
Δ <i>SocialWorkers</i>	36,781	-0.04	-0.36	-0.07	0.01	0.13	0.46
Quality Variables							
<i>Quality(Continuous)</i>	38,522	87.30	62.00	81.30	90.00	97.00	100.00
<i>Quality(Decile)</i>	38,522	0.48	0.10	0.20	0.50	0.70	1.00
<i>QualitySubscoreAddDrop</i>	41,121	0.02	0.00	0.00	0.00	0.00	1.00
<i>UnexpectedQuality</i>	30,272	9.59	-15.32	3.65	12.41	18.89	23.87
<i>BadGFR</i>	29,715	0.34	0.00	0.00	0.00	1.00	1.00
Explanatory Variables							
<i>Post</i>	38,522	0.52	0.00	0.00	1.00	1.00	1.00
Control Variables							
Δ <i>NumDialysisPatients</i>	38,522	3.29	-31.34	-5.93	0.00	8.70	46.15
<i>Rural</i>	38,522	2.06	1.00	1.00	1.00	2.00	7.00
<i>PRP</i>	38,522	0.06	0.00	0.00	0.00	0.00	0.50

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SUMMARY: EFFECTS ON COMPETITION



Quality transparency leads to new entry by rivals

- *Incumbents at or below 5th percentile of quality face 27% increase in probability of a competitor opening a nearby facility*

Conditional on entry, new facilities locate closer to low quality incumbents

No evidence of pre-trends

Robust to altering the event year; or to employing a two-stage determinants model

Heterogeneity of effects: states without barriers to entry

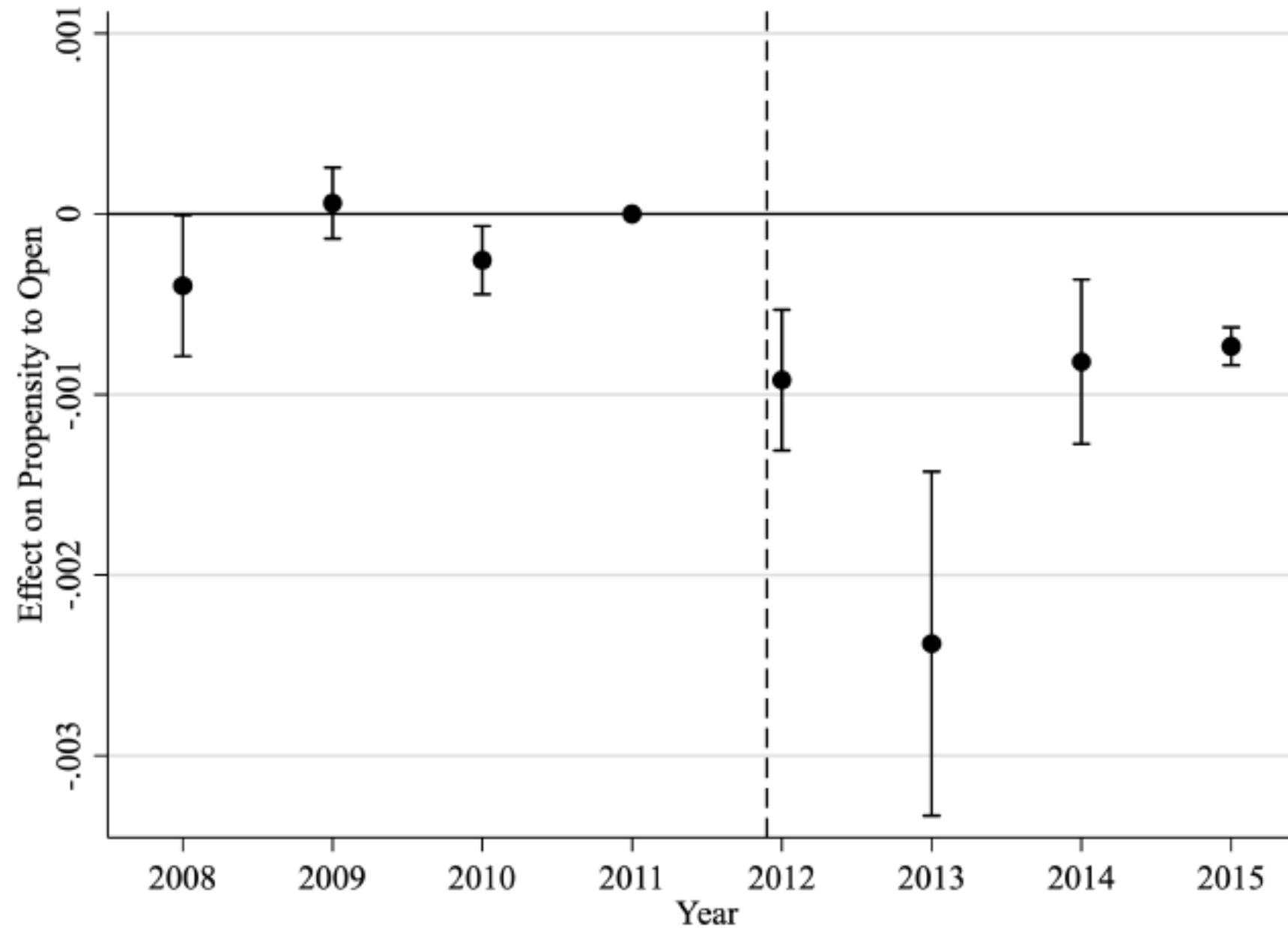
QUALITY TRANSPARENCY ON NEW FACILITY LOCATION

$$NewNearestCompetitor_{i,t+2} = \alpha + \beta_1 Post_t \times Q_{i,t} + \beta_2 Post_t + \beta_3 Q_{i,t} + \theta X_{i,t} + \tau_t + \gamma_s + \nu_i + \epsilon_{i,t}$$

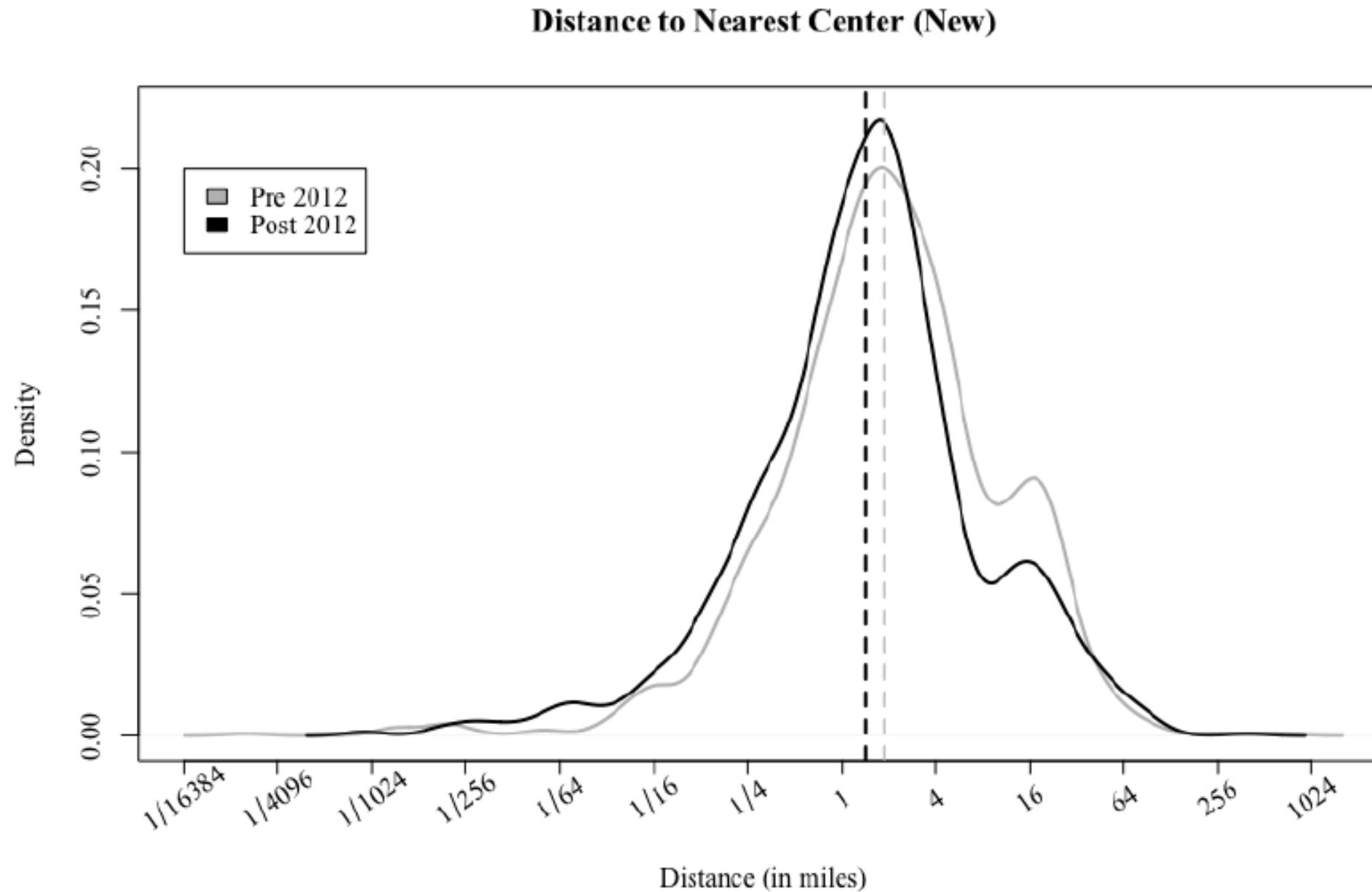
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	<i>NewNearest</i>	<i>NewNearest</i>	<i>NewNearest</i> <i>≤ 5 miles</i>	<i>NewNearest</i> <i>≤ 5 miles</i>	<i>NewNearest</i>	<i>NewNearest</i>
Quality Variable:	Continuous	Continuous	Continuous	Continuous	Decile	Decile
<i>Quality</i>	0.00032*** (3.58)	0.00058** (2.74)	0.00016** (2.41)	0.00046** (2.97)	0.00837* (2.13)	0.02055** (3.14)
<i>Post × Quality</i>	-0.00051*** (-4.49)	-0.00049** (-2.68)	-0.00042*** (-3.62)	-0.00050** (-2.87)	-0.01754** (-2.55)	-0.01471* (-2.01)
<i>PRP</i>	0.00677 (0.73)	0.01206 (1.27)	0.00705 (0.62)	0.00973 (1.03)	0.01032 (1.25)	0.01047 (1.34)
<i>Rural</i>	-0.00163* (-2.28)	0.00758 (0.60)	-0.00542*** (-6.03)	0.00696 (0.54)	-0.00162*** (-4.60)	0.00786 (0.63)
<i>ΔNumDialysisPatients</i>	0.00001 (0.23)	0.00000 (0.08)	-0.00003* (-2.14)	-0.00002 (-0.78)	0.00001 (0.21)	0.00000 (0.10)
Year Fixed Effects	yes	yes	yes	yes	yes	yes
State Fixed Effects	yes	no	yes	no	yes	no
Facility Fixed Effects	no	yes	no	yes	no	yes
Adjusted <i>R</i> ²	0.00838	0.00244	0.01102	0.00726	0.00836	0.00251
Number of Observations	38,522	38,178	38,522	38,178	38,522	38,178

Interquartile downward shift in quality: 20% increase in market entry

QUALITY TRANSPARENCY ON NEW FACILITY LOCATION



QUALITY TRANSPARENCY ON NEW FACILITY LOCATION



DISTANCE FROM INCUMBENTS

$$\begin{aligned} \text{Log}(\text{Distance})_{i,t+2} = & \alpha + \beta_1 \text{Post}_t \times Q_{i,t} + \beta_2 \text{Post}_t + \beta_3 Q_{i,t} + \theta X_{i,t} \\ & + \tau_t + \gamma_s + \nu_i + \epsilon_{i,t} \end{aligned}$$

	(1)	(2)	(3)	(4)
Dependent Variable:	<i>Log(Distance)</i>	<i>Log(Distance)</i>	<i>Log(Distance)</i>	<i>Log(Distance)</i>
Quality Variable:	Continuous	Continuous	Decile	Decile
<i>Quality</i>	0.00066 (1.38)	-0.00008 (-0.11)	0.01851 (1.72)	-0.00784 (-0.37)
<i>Post × Quality</i>	0.00255*** (8.87)	0.00132*** (3.97)	0.09178*** (10.09)	0.03132 ** (2.97)
Controls	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
State Fixed Effects	yes	no	yes	no
County Fixed Effects	no	yes	no	yes
Adjusted R^2	0.21240	0.28674	0.21212	0.28666
Number of Observations	9,449	9,248	9,449	9,248

New entrants choose to locate at shorter distances to low-quality incumbents

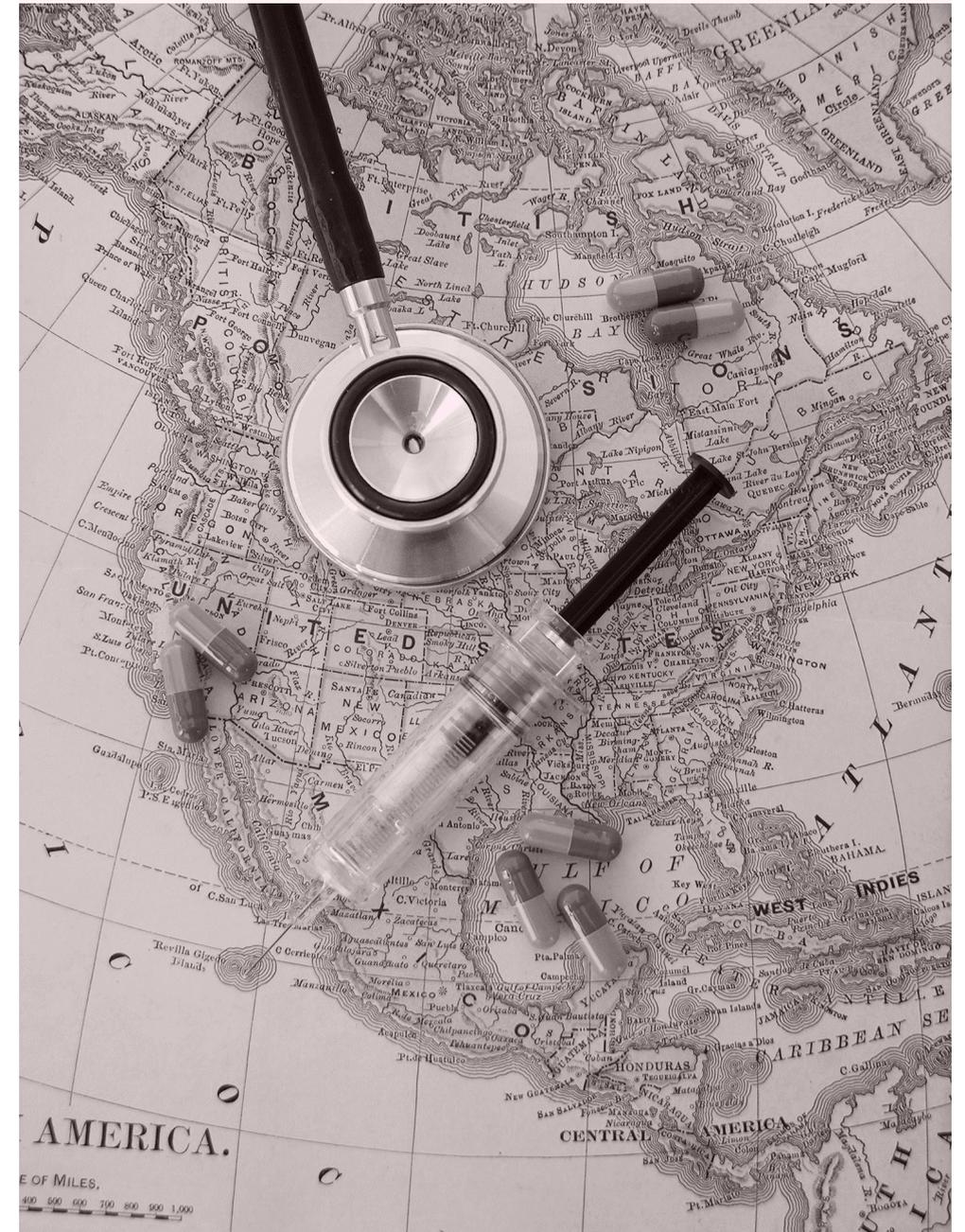
HETEROGENEOUS EFFECTS: CON VS. NON-CON

Across-state differences in Certificate of Need (CON) laws

Eleven states still require dialysis providers to demonstrate local need without regard to quality

State regulators evaluate applications to open new facilities on factors that do not include quality

We expect that transparency regulation will be less effective in CON states



HETEROGENEOUS EFFECTS: CON VS. NON-CON

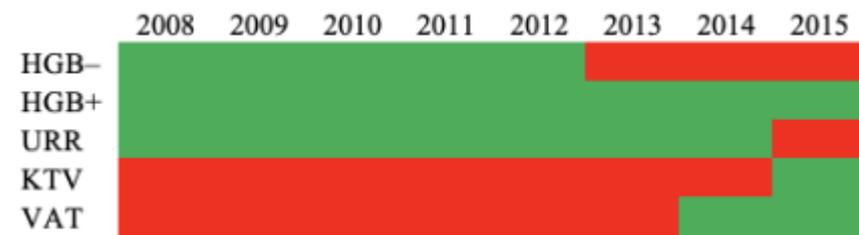
$$NewNearestCompetitor_{i,t+2} = \alpha + \beta_1 Post_t \times Q_{i,t} + \beta_2 Post_t + \beta_3 Q_{i,t} + \theta X_{i,t} + \tau_t + \gamma_s + \nu_i + \epsilon_{i,t}$$

	(1)	(2)
Dependent Variable:	<i>NewNearest</i>	<i>NewNearest</i>
Quality Variable:	Continuous	Continuous
Sample:	Non-CON	CON
<i>Quality</i>	0.00058*** (3.58)	0.00052 (0.76)
<i>Post</i> × <i>Quality</i>	-0.00068** (-3.44)	0.00064 (1.18)
Controls	yes	yes
Year Fixed Effects	yes	yes
Facility Fixed Effects	yes	yes
Adjusted <i>R</i> ²	0.00110	0.01627
Number of Observations	32,703	5,475
Difference in coeff (Wald Test)		5.16*

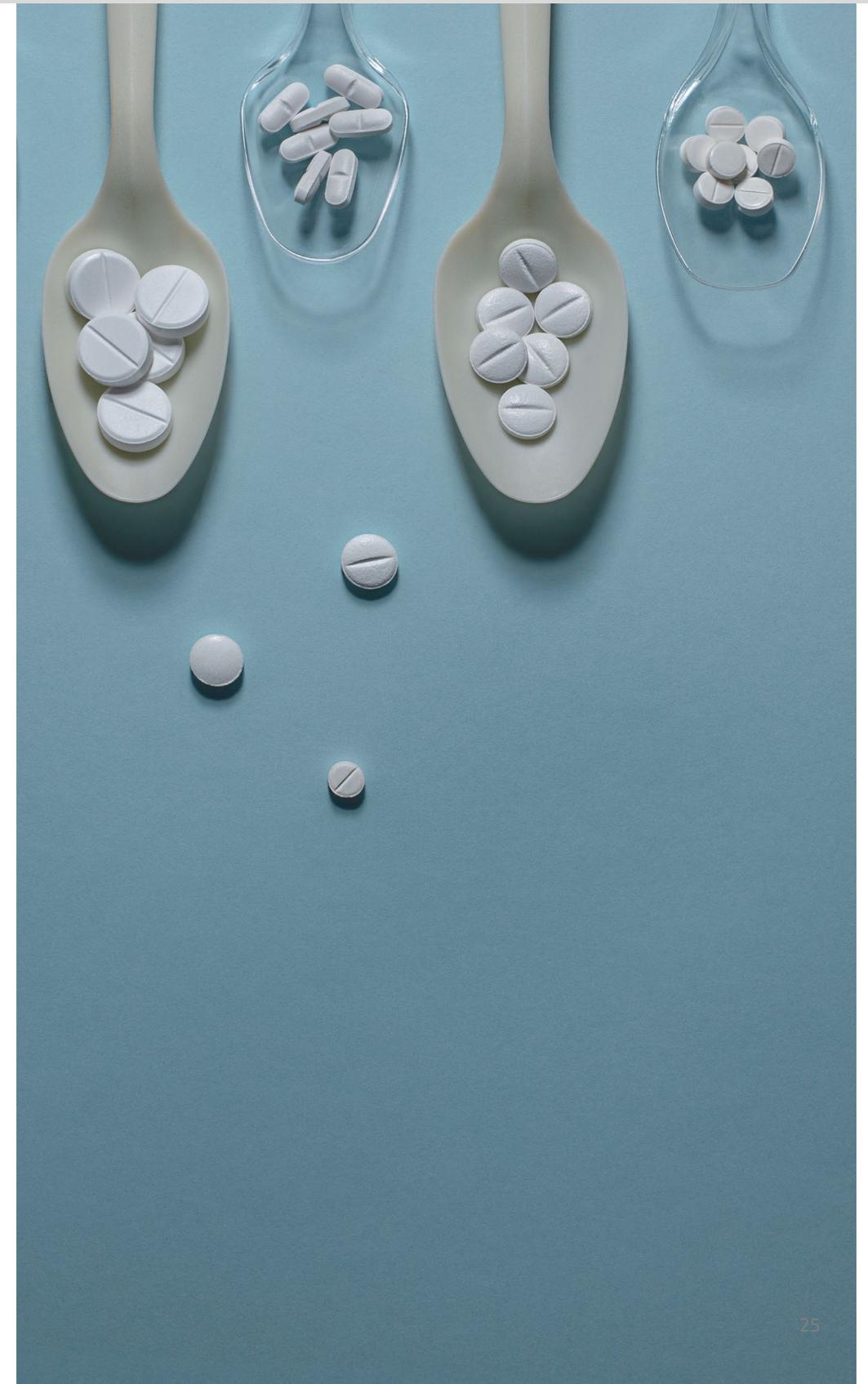
Effects only present in states that allow unfettered entry

STAGGERED ADDITION AND DROPPING OF SUBSCORES

- CMS reviews measures in quality score each year and adjusts accordingly
- Take advantage of facility performance on subscores added and dropped over our sample period



- Measure whether add / drop of subcomponent helps (+1) or hurts (-1) a facility's quality score (and 0 otherwise)



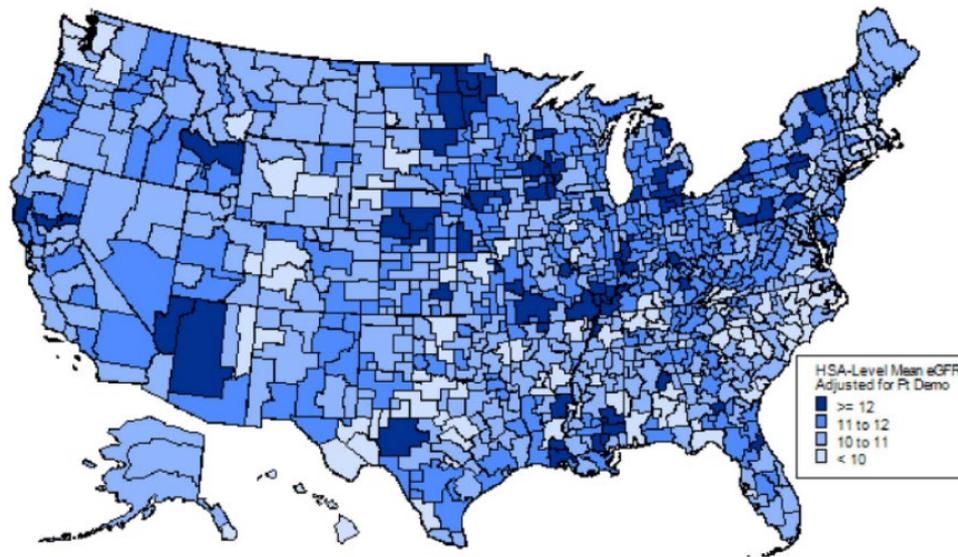
STAGGERED ADDITION AND DROPPING OF SUBSCORES

$$NewNearestCompetitor_{i,t+2} = \alpha + \beta_1 QualitySubscoreAddDrop + \theta X_{i,t} + \tau_t + \gamma_s + \nu_i + \epsilon_{i,t}$$

	(1)	(2)
Dependent Variable:	<i>NewNearest</i>	<i>NewNearest</i>
Quality Variable:	Ordered Categorical	Ordered Categorical
<i>QualitySubscoreAddDrop</i>	-0.01225** (-3.48)	-0.01160** (-2.98)
Controls	yes	yes
Year Fixed Effects	yes	yes
State Fixed Effects	yes	no
Facility Fixed Effects	no	yes
Adjusted R^2	0.00894	0.00223
Number of Observations	41,121	40,850

Competitors more likely to open new facilities nearby low-quality incumbents

INSTRUMENTAL VARIABLE ANALYSIS



Need an instrument that exogenously determines quality for a facility

We rely on referring physicians' preferences (judgements) regarding when to initiate dialysis treatment

- *Prior evidence shows that physicians differ in preferences (early vs. late initiation)*
- *Level of patient's kidney function (i.e., GFR measure) drives this decision*

INSTRUMENTAL VARIABLE TESTS

	OLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Dependent Variable:	<i>NewNearest</i>	<i>NewNearest</i>	<i>NewNearest</i> $\leq 5 \text{ miles}$	<i>NewNearest</i>
Quality Variable:	Continuous	Continuous	Continuous	Decile
<i>Quality</i>	0.00058** (2.74)	-0.01726* (-1.98)	-0.01180* (-2.10)	0.02242 (1.30)
<i>Post</i> × <i>Quality</i>	-0.00049** (-2.68)	-0.00123** (-2.85)	-0.00103** (-3.19)	-0.03082** (-2.37)
Facility Controls	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Facility Fixed Effects	yes	yes	yes	yes
Adjusted R^2	0.00244	0.00561	0.01663	0.00561
Number of Observations	38,178	29,715	29,715	29,715

Results robust (3x stronger even) to using GFR as instrument for facility quality

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PATIENT REFERRALS

$$\begin{aligned} \text{NewPatients}_{i,t} = & \alpha + \beta_1 \text{Post}_t \times \text{NewNearest}_{i,t} \times Q_{i,t} + \beta_2 \text{NewNearest}_{i,t} \times Q_{i,t} \\ & + \beta_3 \text{Post}_t \times \text{NewNearest}_{i,t} + \beta_4 \text{Post}_t \times Q_{i,t} \\ & + \beta_5 \text{Post}_t + \beta_6 \text{NewNearest}_{i,t} + \beta_7 Q_{i,t} + \theta X_{i,t} + \tau_t + v_i + \epsilon_{i,t}, \end{aligned}$$

Panel A. New Patient Behavior after Market Entry

	(1)	(2)
Dependent Variable:	<i>NewPatients</i>	<i>NewPatients</i>
Quality Variable:	Continuous	Continuous (New entrant within 5 miles)
<i>Post</i> × <i>NewNearest</i> × <i>Quality</i>	0.076** (2.22)	0.101** (2.56)
Controls	yes	yes
Year Fixed Effects	yes	yes
Facility Fixed Effects	yes	yes
Adjusted R^2	0.705	0.705
Number of Observations	40,674	40,674

Moving from 95th to 5th percentile of quality reduces new patients referred from nephrologists by 32% of typical new patients per year

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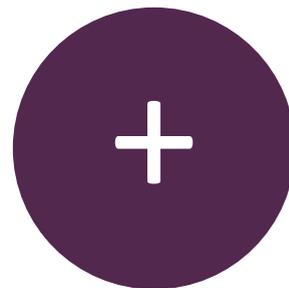
4

Effects on Patients

Do patient outcomes improve?

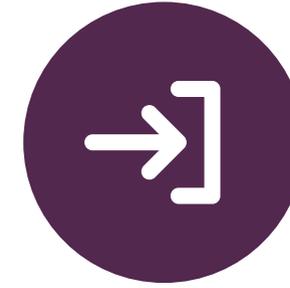
PATIENT HEALTHCARE OUTCOMES

$$\begin{aligned}
 HealthOutcomes_{i,j,t+2} = & \alpha + \beta_1 Post_t \times New_{j,t} \times dQ_{j,t} + \beta_2 New_{j,t} \times dQ_{j,t} \\
 & + \beta_3 Post_t \times New_{j,t} + \beta_4 Post_t \times dQ_{j,t} \\
 & + \beta_5 Post_t + \beta_6 New_{j,t} + \beta_7 dQ_{j,t} + \theta X_{j,t} + \omega Z_{i,t} + \tau_t + v_j + \epsilon_{i,j,t}
 \end{aligned}$$



Hospitalizations

*40% of Medicare spending on dialysis
(\$13-\$15 billion annually)*



Facility Inputs

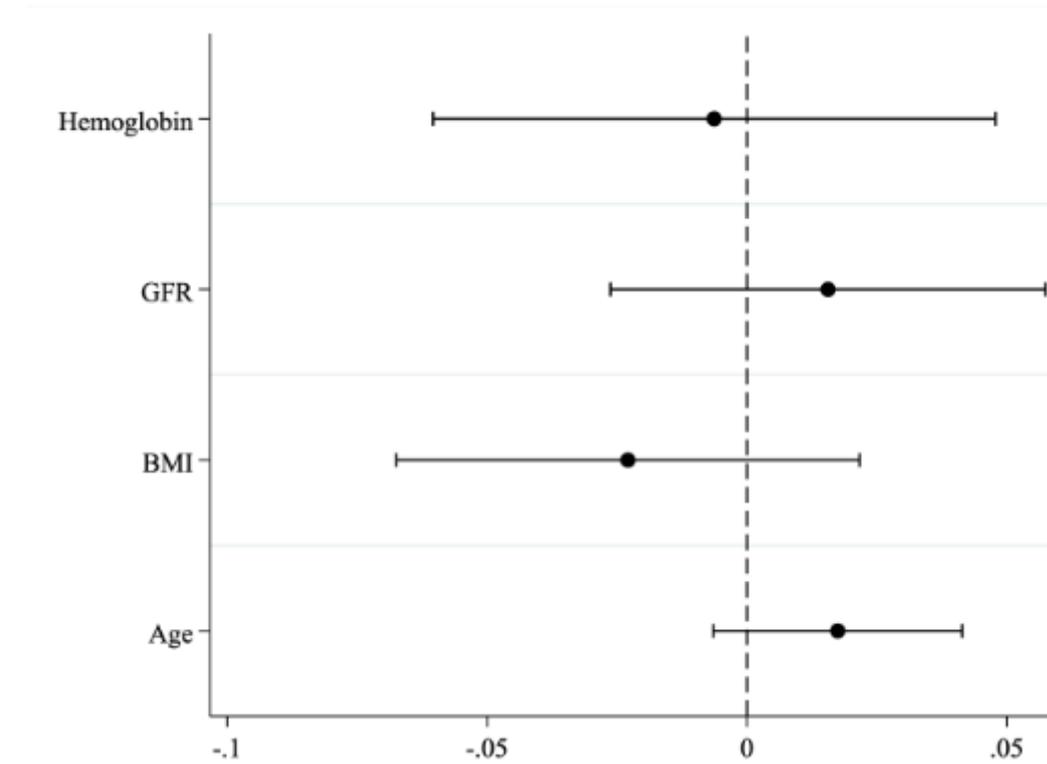
*Spending on staff working with
patients*

PATIENT HEALTHCARE OUTCOMES

	(1)	(2)	(3)	(4)
Dependent Variable:	<i>Hospitalization</i>	<i>Hospitalization</i>	<i>Hospitalization</i>	<i>Hospitalization</i>
Quality Variable:	1 = New entrant has better quality	Continuous = New entrant quality score minus incumbent quality score	1 = New entrant (within 5 miles) has better quality	Continuous = New entrant (within 5 miles) quality score minus incumbent quality score
<i>Post</i> × <i>NewNearest</i> × <i>dQuality</i>	-0.0178** (-2.44)	-0.000483** (-5.12)	-0.0150* (-1.95)	-0.000506*** (-4.32)
Facility Controls	yes	yes	yes	yes
Patient Fixed Effects	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
Adjusted R^2	0.0800	0.0800	0.0800	0.0800
Number of Observations	4,508,340	4,508,340	4,508,340	4,508,340

Pr(hospitalization) down 8.5% relative to mean rate of 21.2% per year

PATIENT HEALTHCARE OUTCOMES: NO EVIDENCE OF GAMING



MECHANISM: FACILITY INPUTS

Dependent Variable:	(1) $\Delta Nurses$	(2) $\Delta Clinical Staff$	(3) $\Delta Social Workers$
<i>Post</i> × <i>NewNearest</i> × <i>dQuality</i>	0.610*** (3.54)	0.105 (0.30)	0.807** (3.21)
Controls	yes	yes	yes
Year Fixed Effects	yes	yes	yes
Facility Fixed Effects	yes	yes	yes
Adjusted R^2	0.105	0.158	0.105
Number of Observations	37,011	37,218	37,422

Increased investment in nurses and social workers at low-quality incumbents

CONCLUSION



Quality transparency increases the probability that competitors open new facilities nearby low-quality rivals



Physicians refer new patients to better-quality competitors



Reduced probability of hospitalizations



Incumbents' investment in quality is likely driver of these effects

THANK YOU!