The Effects of Primary Care Physician Practice Styles on Patient Care: Evidence from Physician Relocations

Draft of Presentation Slides

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Motivation

There is a lot of variation in health care utilization across patients in the US

- There is variation across regions (see: Dartmouth Atlas), and across patients within regions
- Patients have different medical conditions and preferences for utilization, so some variation should exist
- But how much variation is the result of "supplier induced demand" rather than patient demand?

Enter the physician practice style literature and quasi-experiments using "movers"...

- Finkelstein et al. (2016) show that about 40-50% of the across-region variation in utilization is supply-induced

Motivation for Studying Primary Care

Patients receive most of their health care from primary care providers (PCP)

- Yet researchers have not tried to characterize PCP practice styles
- Patients also have little information about PCP practice styles
- Given that PCPs play a central role in health care provision, and that patients often lack of information about PCP practice styles, there may be wide scope for PCP-induced demand and hence, inefficiency in primary care markets

Research Question: Are PCPs responsible for the significant variation in utilization that we observe across patients?

Physician & Hospital Quality Literature

With the large medical claims data sets, researchers have developed ways to measure provider practice styles in different domains:

- Hospitals (Chandra & Staiger 2017, Doyle et al. 2017)
- Cardiologists (Currie et al. 2016, Doyle 2017, Molitor 2016)
- Obstetricians (Currie & MacLeod 2016, Epstein & Nicholson 2009, Epstein & Nicholson 2013)
- Emergency department physicians (Chan 2016, Silver 2016, Van Parys 2016)
- Specialists (Agha et al. 2018, Tu 2018)

Yet fewer papers have characterized PCP practice styles. Why?

- Patient-physician selection
- Incomplete data

Our Approach

1. Use a 20% sample of Medicare Part B claims from 2007-2013 to attribute Medicare patients to PCPs
2. Use Medicare Parts A/B/D claims to characterize physician practice styles in terms of beneficiary spending, utilization, and outcomes
    - We are also interested in how well PCPs follow "best clinical practice" guidelines
    - We develop risk-adjusted PCP practice style measures
3. Use breaks in PCP-patient relationships that result from physician relocations to measure changes in PCP practice styles
    - Intuition: Some patients will switch to "higher intensity" PCPs, while others will switch to "lower-intensity" PCPs
    - Do the changes in PCP practice styles affect patient outcomes following the breaks?

Research Questions

1. Do PCPs vary in their practice styles?
   - Estimate risk-adjusted models with PCP fixed effects
   - "Practice style measures" include Ln(Total Physician Spending), Ln(Outpatient Spending), #Diagnoses, and #ED Visits, among others
2. How often do PCPs relocate, which types of PCPs relocate, and who do patients switch to?
   - Plot distributions of PCP practice styles for patients affected by relocations and for patients unaffected by relocations
3. Do PCP practice styles predict health care utilization and outcomes?
   - Estimate the relationship between changes in PCP practice styles and changes in patients' utilization/outcomes
     - Methods: FD, FD+IV, Event study, DD
   - Estimate cross-correlations between changes in PCP physician spending intensity and changes in other patient outcomes

Definitions

- **Primary Care Provider (PCP):** The NPI from whom the patient receives the most Part B E&M care, and where the NPI's specialty is family practice (FP), general medicine (GM), or internal medicine (IM)
- **PCP Mover:** A PCP whose first two-digits of the billing zip code changes sometime between 2008-2013

Sample: 20% Medicare Carrier Claims

	Full Sample	Movers		Full Sample	Movers
# PCPS from 2007-2013	203,275	14,623	# Beneficiaries Per PCP		
% In sample every year	42%	38%	2007	28	23
% General Practice	5%	3%	2008	30	23
% Family Practice	46%	57%	2009	31	22
% Internal Medicine	48%	40%	2010	28	20
			2011	28	21
			2012	28	21
			2013	28	22
Total # of PCPs by Year			# E&M Claims Per PCP		
2007	127,463	9,109	2007	158	129
2008	139,138	10,835	2008	285	209
2009	140,888	11,224	2009	290	207
2010	142,660	11,517	2010	263	189
2011	140,120	11,451	2011	266	198
2012	140,478	11,608	2012	267	202
2013	141,166	11,722	2013	268	211

Sample Selection

- We drop patients under age 65
- We drop patients who move (about 5% of sample)
- We drop patients who are not continuously enrolled in Traditional Medicare for at least 2 years
- We are left with 77,910 patients affected by PCP moves that occurred between 2008-2013

Estimating Risk-Adjusted Measures of PCP Practice Styles

$$Y_{ijt} = \boldsymbol{X}_{it}'\boldsymbol{\Omega} + \delta_j + \gamma_t + \alpha_l + u_{ijt}$$

- Y_{ijt} includes health care spending, utilization, and outcomes for patient i with PCP j in year t
- $\boldsymbol{X}_{it}$ is a vector of patient characteristics including sex, race, age, age^2, dual-eligibility, disability and ESRD status, and 26 comorbidities; α_l are patient locality fixed effects
- We we pool all years from $t = [2007, 2013]$; γ_t are year fixed effects
  - δ_j are PCP fixed effects that do not vary by year
  - We compute the PCP FEs using a jackknife "leave-one-out" method to avoid mechanical bias
  - We use the empirical Bayes method to adjust the PCP fixed effects

Testing the Statistical Significance of PCP FEs on Different Patient Outcomes

	Pooled	2007-13 FE
Spending Outcomes	**N**	**F-stat**
Ln(Total Spending)	26,987,569	5.95
Ln(Hospital Spending)	21,002,502	5.59
Ln(Outpatient Spending)	26,965,399	9.08
Ln(Drug Spending)	23,217,311	4.94
Ln(Other Spending)	10,321,823	2.62
Ln(Physician Spending)	26,923,751	12.10
Other Outcomes		
Ln(#Office Visits)	26,924,571	8.86
#ER Visits	27,033,334	4.32
#Diagnoses	27,033,334	12.45
Pr(Mortality=1)	27,033,334	1.78
#Readmissions	5,582,333	1.48
#Excessive Cancer Screenings	27,033,334	1.00

Notes: There are approximately 186,000 PCPs from 2007-13, and approximately 130 patients per PCP.

Value-Added of PCP Fixed Effects

Spending Outcomes	Adjusted R^2 No PCP FE	Adjusted R^2 +PCP FE	Adjusted R^2 Difference
Ln(Total Spending)	0.453	0.471	0.018
Ln(Hospital Spending)	0.336	0.362	0.026
Ln(Outpatient Spending)	0.400	0.431	0.032
Ln(Drug Spending)	0.178	0.202	0.025
Ln(Other Spending)	0.306	0.324	0.018
Ln(Physician Spending)	0.346	0.392	0.047
Other Outcomes			
Ln(#Office Visits)	0.308	0.344	0.036
#ER Visits	0.256	0.273	0.017
#Diagnoses	0.138	0.201	0.063
Pr(Mortality=1)	0.109	0.114	0.005
#Readmissions	0.109	0.121	0.012
#Excessive Cancer Screenings	0.005	0.005	0.0000

Notes: The base model without PCP fixed effects controls for patient sex, race, age, age^2, dual-eligibility, disability and ESRD status, and 26 comorbidities. The base model also controls for the first two-digits of the beneficiary's Zip Code. The one exception is that the model with the #Diagnoses as the outcome does not control for the 26 patient comorbidities.

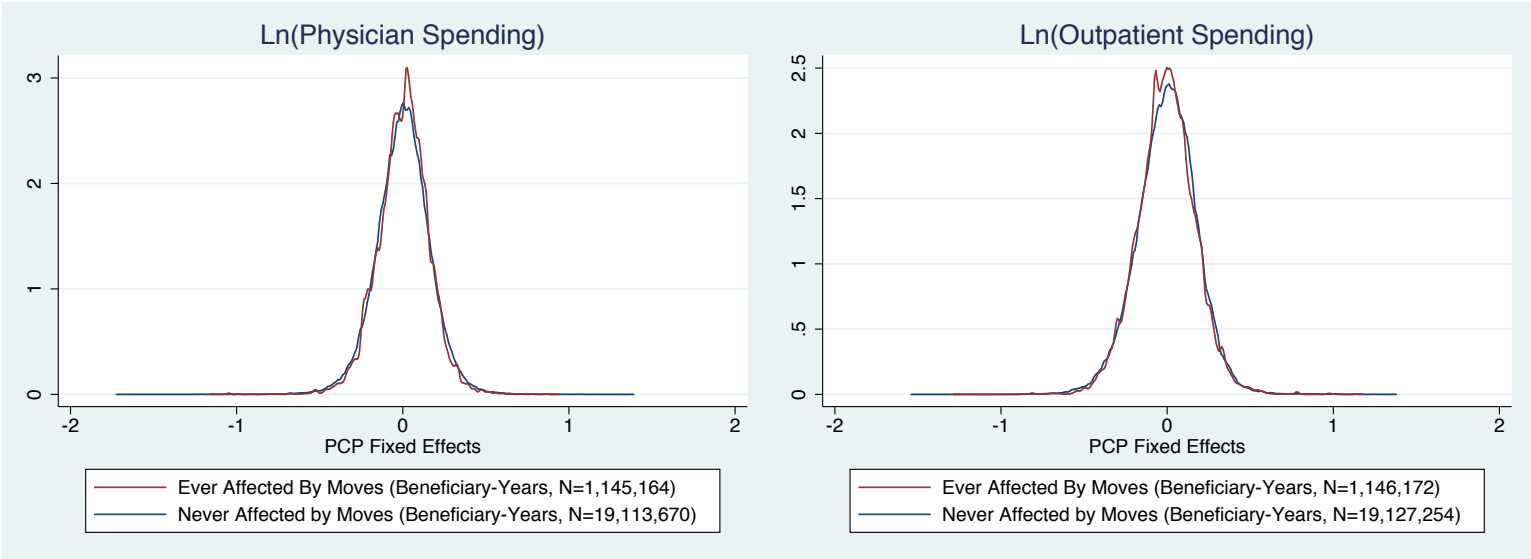
Characterizing Changes in Practice Styles

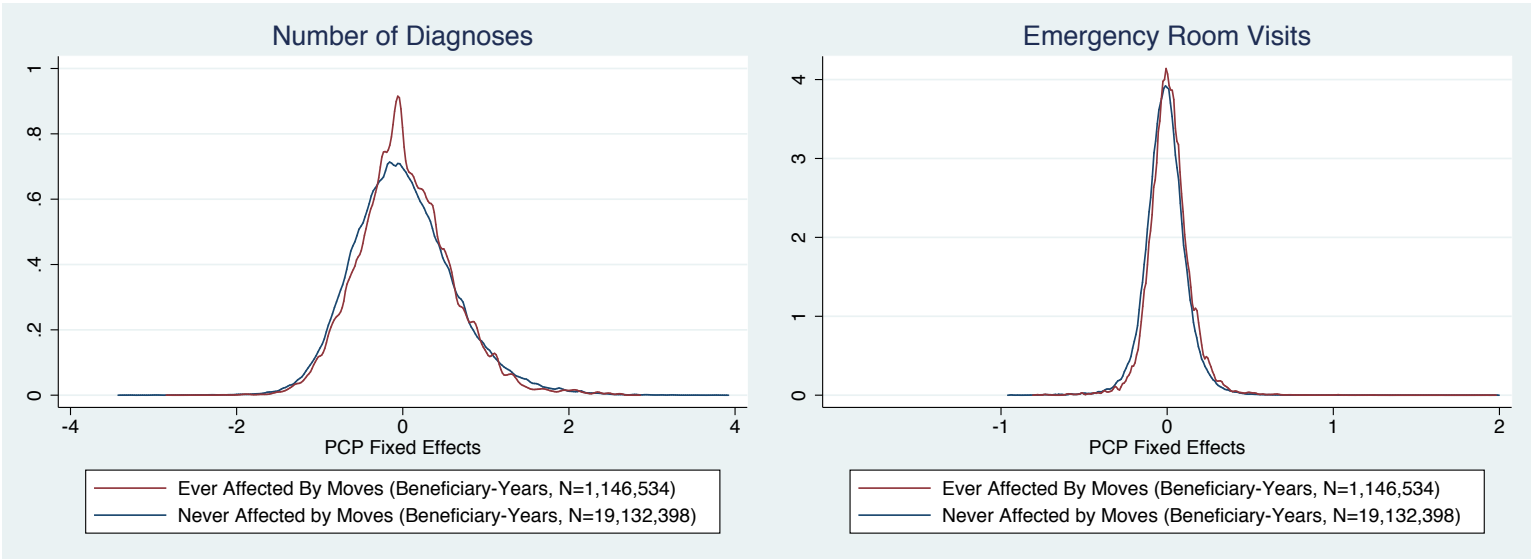
From our risk-adjusted model we estimated the PCP fixed effects:

$$Y_{ijt} = \boldsymbol{X}_{it}'\boldsymbol{\Omega} + \delta_{ij} + \gamma_t + \alpha_l + u_{ijt}$$

- Recall that δ_{ij} represent PCP fixed effects that do not vary by year
- Post-estimation, we restrict the sample to patients i whose PCPs move in year t
- We define: $\Delta PCP_FE_{it} = \Delta\hat{\delta}_{it} = \hat{\delta}_k - \hat{\delta}_j$
  - $\hat{\delta}_j$ is the original PCP FE (the PCP who relocated)
  - $\hat{\delta}_k$ is the new PCP's FE

Distributions of PCP Fixed Effects





A Test of Identification

- Our identifying assumption is that PCP relocations do not cause patients to change their behavior and sort to new PCPs based on those unobservable behavioral changes
- To indirectly test the assumption, we regress changes in PCP fixed effects on observable characteristics of patients, with year and location fixed effects:

$$Z\Delta PCP_FE_{it} = \boldsymbol{X}_{it}'\boldsymbol{\Omega} + \gamma_t + \alpha_l + u_{it}$$

- If observable patient characteristics are correlated with changes in PCP practice styles, then time-varying unobservable characteristics may also be correlated, and that creates problems for identification
- If observable patient characteristics are uncorrelated with changes in PCP practice styles, then time-varying unobservables may still be correlated with the changes, but it's arguably less likely

A Test of Identification

F-test for joint significance of patient characteristics	**p-value**
Z-ΔPCP FE: Ln(Total Spending)	0.441
Z-ΔPCP FE: Ln(Hospital Spending)	0.758
Z-ΔPCP FE: Ln(Outpatient Spending)	0.534
Z-ΔPCP FE: Ln(Drug Spending)	0.555
Z-ΔPCP FE: Ln(Other Spending)	0.166
Z-ΔPCP FE: Ln(Physician Spending)	0.082
Z-ΔPCP FE: Ln(#Office Visits)	0.110
Z-ΔPCP FE: #ER Visits	0.667
Z-ΔPCP FE: #Diagnoses	0.931
Z-ΔPCP FE: Pr(Mortality=1)	0.027
Z-ΔPCP FE: #Readmissions	0.000
Z-ΔPCP FE: #Excessive Cancer Screenings	0.339

Notes: The table reports p-values associated with tests of joint statistical significance for patient sex, age, race, and eligibility status in regressions that attempt to predict changes in PCP fixed effects for patients who were affected by PCP relocations.

Estimating the Relationship Between PCP Practice Styles and Health Care Utilization

$$\Delta Y_{ijt} = \Delta \boldsymbol{X}_{it}' \boldsymbol{\Omega} + \Delta \hat{\delta}_{it} + \Delta \gamma_t + \Delta v_{ijt}$$

- We estimate a first-differences model
- ΔY_{ijt} is the change in beneficiary i's utilization from year $t-1$ to t, and $T = 2$
- $\boldsymbol{X}_{it}$ is a vector of time-varying patient characteristics including age, age^2, dual-eligibility, disability and ESRD status
- $\Delta \hat{\delta}_{it} = \hat{\delta}_k - \hat{\delta}_j$ is the change in PCP practice style for patient i switching from PCP j (original PCP) to PCP k (new PCP)

First-Year Effects of PCP Practice Styles on Patient Utilization

Patients Affected by PCP Moves	**(1) ΔLn(Total Spend)**	**(2) ΔLn(Hosp Spend)**	**(3) ΔLn(Out Spend)**	**(4) ΔLn(Drug Spend)**	**(5) ΔLn(Other Spend)**	**(6) ΔLn(Phys Spend)**
Z-Δ PCP Fixed Effect	0.0541***	0.0748***	0.0686***	0.0241***	0.0401**	0.0809***
	(11.22)	(8.84)	(15.49)	(3.99)	(3.11)	(26.44)
Elasticity	0.32	0.27	0.38	0.08	0.20	0.48
1-STD Deviation	0.17	0.28	0.18	0.29	0.20	0.17
N	78,117	57,683	78,074	62,862	22,175	77,902

	(7) ΔLn(#Office Visits)	**(8) Δ#ED Visits**	**(9) Δ#Diagnoses**	**(10) ΔPr(Mortality)**	**(11) Δ#Readmissions**	**(12) Δ#Excess Screens**
Z-Δ PCP Fixed Effect	0.0645***	0.00742	0.187***	0.00171*	0.0195	-0.00147
	(23.55)	(1.32)	(24.04)	(2.58)	(0.93)	(-0.41)
Elasticity	0.46	0.06	0.31	0.21	0.39	-0.15
1-STD Deviation	0.14	0.13	0.61	0.008	0.049	0.010
N	77,910	78,117	78,117	78,117	6,034	78,117

Notes: Regressions are estimated in first-differences and include controls for changes in age, dual-eligibility, disability and ESRD status. Regressions also control for year fixed effects. Standard errors are clustered at first 2-digit zip code-level. t-statistics are in parentheses. The change in Y is evaluated using the year before the PCP relocates and the first year after the PCP relocates.

Constructing an Instrument for $\Delta\hat{\delta}_{it}$

We use mean reversion to predict the types of PCPs that patients will visit after their original PCPs relocate

- Intuition: If the patient's old PCP was in the top 10% of the spending distribution compared to other PCPs in the same locality, then his/her patients will be more likely to switch to lower-spending PCPs the following year
- $Instrument_{it} = \hat{\delta}_{ij} - \bar{\hat{\delta}}_{l}$ where $\bar{\hat{\delta}}_{l}$ is the average PCP FE in locality l

Then the first stage is:

$$\Delta\hat{\delta}_{it} \quad = \quad \beta_1 Instrument_{it} + \Delta \boldsymbol{X}_{it}' \boldsymbol{\Omega} + \Delta\gamma_t + \Delta v_{ijt}$$

First Stage Using Mean Reversion Instrument

First stage	(1) ΔPCP FE Ln(Total Spend)	(2) ΔPCP FE Ln(Hosp Spend)	(3) ΔPCP FE Ln(Out Spend)	(4) ΔPCP FE Ln(Drug Spend)	(5) ΔPCP FE Ln(Other Spend)	(6) ΔPCP FE Ln(Phys Spend)
Old PCP FE - Local Avg PCP FE	-0.779***	-0.635***	-0.627***	-0.700***	-0.767***	-0.683***
	(-61.49)	(-35.97)	(-37.23)	(-42.19)	(-18.90)	(-49.89)
N	78,117	57,683	78,074	62,862	22,175	77,902

First stage	(7) ΔPCP FE Ln(#Office Visits)	(8) ΔPCP FE #ER Visits	(9) ΔPCP FE #Diagnoses	(10) ΔPCP FE Pr(Mortality)	(11) ΔPCP FE #Readmissions	(12) ΔPCP FE #Excess Screens
Old PCP FE - Local Avg PCP FE	-0.753***	-0.735***	-0.689***	-0.842***	-0.915***	-0.994***
	(-34.06)	(-16.63)	(-33.39)	(-15.41)	(-40.44)	(-106.24)
N	77,910	78,117	78,117	78,117	6,034	78,117

First Difference Results vs. First Difference+IV Results: Part 1

FD and FD+IV Results	(1) ΔLn(Total Spend) FD	(2) ΔLn(Total Spend) IV	(3) ΔLn(Hosp Spend) FD	(4) ΔLn(Hosp Spend) IV	(5) ΔLn(Out Spend) FD	(6) ΔLn(Out Spend) IV
Z-Δ PCP Fixed Effect	0.0541***	0.0655***	0.0748***	0.0775***	0.0686***	0.0807***
	(11.22)	(8.30)	(8.84)	(3.87)	(15.49)	(9.41)
N	78,117	78,117	57,683	57,683	78,074	78,074

FD and FD+IV Results	(7) ΔLn(Drug Spend) FD	(8) ΔLn(Drug Spend) IV	(9) ΔLn(Other Spend) FD	(10) ΔLn(Other Spend) IV	(11) ΔLn(Phys Spend) FD	(12) ΔLn(Phys Spend) IV
Z-Δ PCP Fixed Effect	0.0241***	0.0276**	0.0401**	0.0642**	0.0809***	0.0795***
	(3.99)	(2.58)	(3.11)	(2.61)	(26.44)	(16.66)
N	62,862	62,862	22,175	22,175	77,902	77,902

First Difference Results vs. First Difference IV Results: Part 2

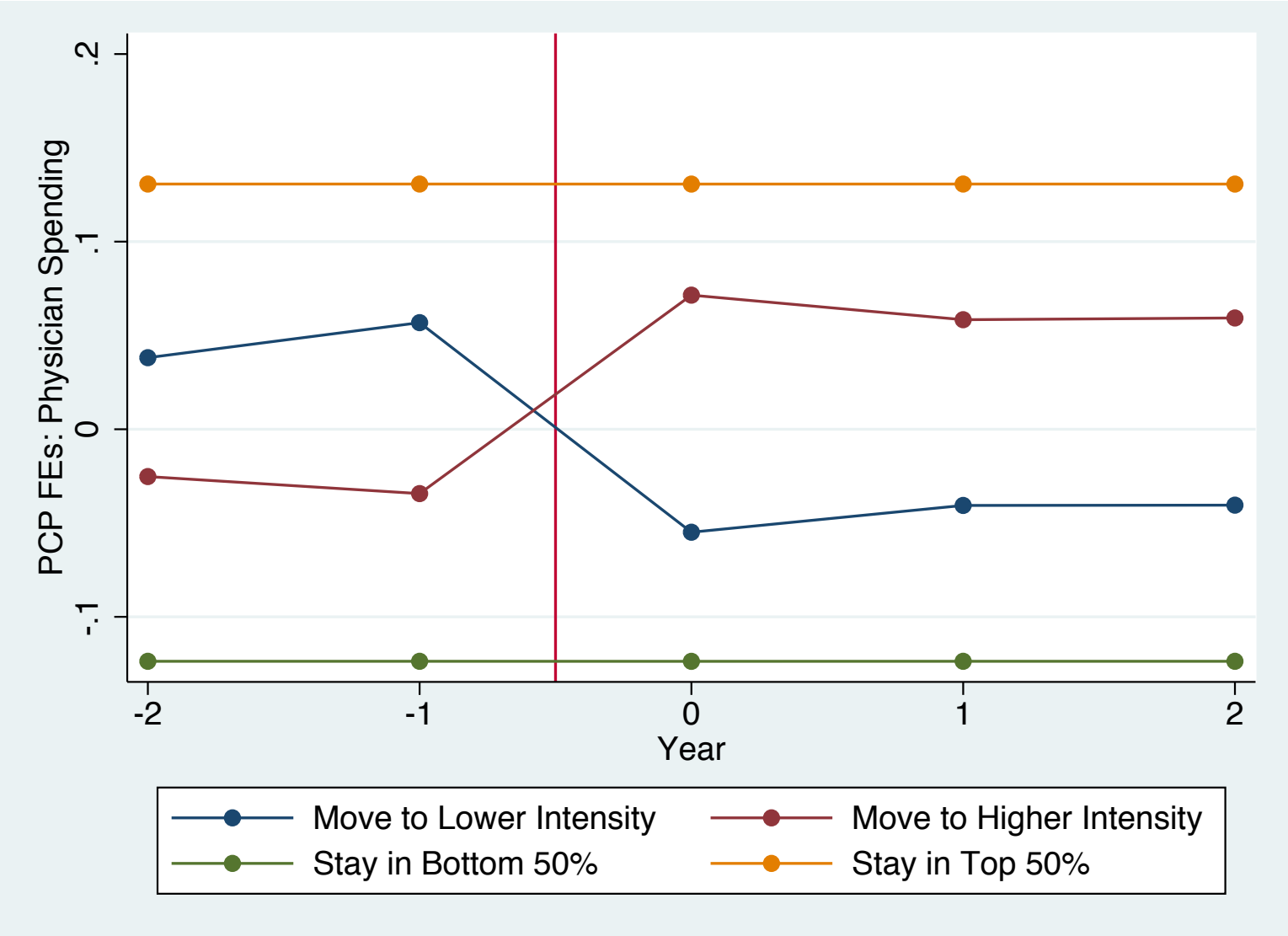
FD and FD+IV Results	(1) ΔLn(#Office Visits) FD	(2) ΔLn(#Office Visits) IV	(3) Δ#ER Visits FD	(4) Δ#ER Visits IV	(5) Δ#Diagnoses FD	(6) Δ#Diagnoses IV
Z-Δ PCP Fixed Effect	0.0645***	0.0651***	0.00742	0.00501	0.187***	0.155***
	(23.55)	(17.32)	(1.32)	(0.61)	(24.04)	(10.17)
N	78,117	78,117	78,117	78,117	78,117	78,117

FD and FD+IV Results	(7) ΔPr(Mortality) FD	(8) ΔPr(Mortality) IV	(9) Δ#Readmissions FD	(10) Δ#Readmissions IV	(11) Δ#Excess Screens FD	(12) Δ#Excess Screens IV
Z-Δ PCP Fixed Effect	0.00171*	-0.00523**	0.0195	0.0352	-0.00147	0.00727
	(2.58)	(-3.29)	(0.93)	(0.93)	(-0.41)	(1.61)
N	78,117	78,117	6,034	6,034	78,117	78,117

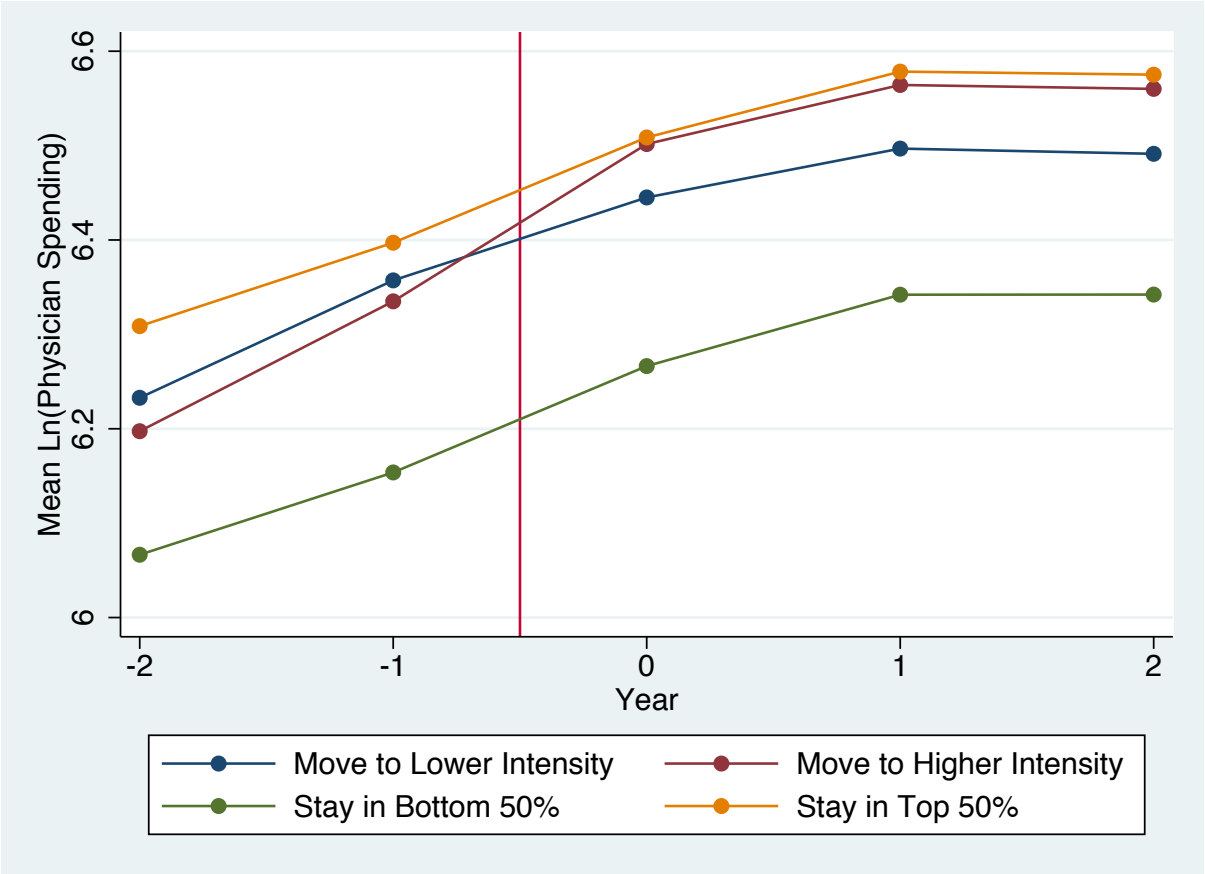
Event Study Plot

- Restrict sample to patients with 5 consecutive years of data
- Keep sample of patients affected by relocations (treatment group) and sample of patients who stay with same PCPs over the time period (control group)
- Impute a "fake PCP relocation" date to the control group
- Keep patients whose PCPs relocated between 2009-2011
- Define event time from 2 years before the move to 2 years after the move
- Divide patients affected by moves into 2 groups: (1) patients switching to relatively higher intensity PCPs vs. (2) patients switching to relatively lower-intensity PCPs
- Divide control group patients into 2 groups: (3) patients with PCPs in the top half of the ln(physician spending) distribution vs. (4) patients with PCPs in the bottom half of the ln(physician spending) distribution

Event Study: Δ in PCP FEs for Ln(Physician Spending)



Event Study: Δ in Ln(Physician Spending) for Patients



- Patients who switch to higher-spending physicians see their spending immediately increase
- Physician spending increases over time for all patients as they get older

Difference-in-Differences Estimation

$$\begin{aligned} Y_{ist} &= \beta_1(\Delta\hat{\delta}_{it} \times Move_i \times Post_s) + \beta_2(Move_i \times Post_s) \\ &+ \psi_s + \gamma_t + \tau_i + e_{ist} \end{aligned}$$

for beneficiary i in event time s in year t

- Use the event study sample
  - Includes patients who were affected by PCP moves ($Move_i = 1$) vs. patients who stayed with the same PCP throughout the time period ($Move_i = 0$)
- Define the post-move period ($Post_s = 1$) after the PCP moves
- ψ_s are event-time FEs, γ_t are year FEs, τ_i are patient FEs
- β_2 is the "disruption effect" of PCP moves on patient outcomes
- β_1 is the "practice style effect" of PCP moves on patient outcomes

Difference-in-Differences Results

	(1) Ln(Phys Spend)	(2) Ln(Phys Spend)
Move*Post*Z-Δ PCP FE	0.057***	
	(15.19)	
Move*Post	0.041***	
	(11.42)	
Move*Post*Increase PCP FE		0.088***
		(17.36)
Move*Post*Decrease PCP FE		-0.006
		(-1.22)
Event Time FEs	Yes	Yes
Year FEs	Yes	Yes
Patient FEs	Yes	Yes
N	4,207,412	4,207,412
Adjusted R^2	0.633	0.634

Correlations Across PCP Practice Style Measures

Correlations	PCP Fixed Effect Ln(Physician Spend)
FE: Ln(Total Spending)	0.34
FE: Ln(Hospital Spending)	-0.11
FE: Ln(Outpatient Spending)	0.72
FE: Ln(Drug Spending)	0.09
FE: Ln(Other Spending)	-0.11
FE: Ln(Physician Spending)	1.00
FE: Ln(#Office Visits)	0.85
FE: #ED Visits	-0.14
FE: #Diagnoses	0.14
FE: Pr(Mortality=1)	-0.13
FE: #Readmissions	-0.05
FE: #Excessive Cancer Screenings	0.01

- Physician spending is positively correlated with office visits and #diagnoses
- Physician spending is negatively correlated with ED visits and mortality

Effects of Physician Spending on Other Patient Outcomes

Patients Affected by PCP Moves	(1) ΔLn(Total Spend)	(2) ΔLn(Hosp Spend)	(3) ΔLn(Out Spend)	(4) ΔLn(Drug Spend)	(5) ΔLn(Other Spend)	(6) ΔLn(Phys Spend)
Z-ΔLn(Physician Spend) FE	0.0372***	0.0286**	0.0540***	0.0213***	0.00862	0.0809***
	(6.73)	(2.79)	(12.18)	(3.53)	(0.71)	(26.44)
N	78,117	57,683	78,074	62,862	22,175	77,902
	(7) ΔLn(#Office Visits)	**(8) Δ#ED Visits**	**(9) Δ#Diagnoses**	**(10) ΔPr(Mortality)**	**(11) Δ#Readmissions**	**(12) Δ#Excess Screens**
Z-ΔLn(Physician Spend) FE	0.0608***	0.00539	0.0339***	-0.000365	-0.000623	0.000446
	(23.75)	(0.96)	(3.73)	(-0.53)	(-0.05)	(0.12)
N	77,910	78,117	78,117	78,117	6,034	78,117

Notes: Regressions are estimated in first-differences and include controls for changes in age, dual-eligibility, disability and ESRD status. Regressions also control for year fixed effects. Standard errors clustered at first 2-digit zip code-level. t-statistics are in parentheses. Change in Y is evaluated using the year before the PCP change and the first year after the PCP change.

(Re-)Considering Patient-Physician Selection

- We focused on patients affected by PCP relocations because we were concerned about patient-PCP selection
- The classic story is that patients who prefer more medical care will choose PCPs who are relatively high-spenders
  - Then the observed variation across patients in medical spending is due to patient demand, not PCP practice styles (or "physician-induced demand")
  - The classic story assumes that patients have a lot of information
- An alternative patient-PCP selection story is that PCPs only treat patients whose demand for care matches their practice styles
- Both stories rely on patients and PCPs knowing their own types as well as the other's type

(Re-)Considering Patient-Physician Selection

- We argued that PCP relocations represent plausibly exogenous events *from the patient's perspective*, and that relocations would not affect patient demand for medical care *at the time of the relocation*
- But was it necessary to use such a "quasi-experiment?"
  - How biased would our estimates have been if we used a sample of patients who switched PCPs *for any reason*?
    - This strategy would remove fixed differences in demand across patients, but not within patients over time
  - How biased would our estimates have been if we used the full sample of patients, including those who never switched PCPs?
    - This strategy would combine the cross-sectional variation across patients in PCP practice styles with the time-varying variation, allowing for maximum selection possibilities
- Why does this matter?
  - Because concerns about endogeneity limit the types of research questions we can pursue

Examining Bias Due to Patient-PCP Selection

	(1) Ln(Phys Spend) All	(2) Ln(Phys Spend) All	(3) Ln(Phys Spend) All	(4) Ln(Phys Spend) Patients Switch	(5) Ln(Phys Spend) PCP Moves
ZLn(Physician Spend) FE	0.170***	0.164***	0.0985***	0.0845***	0.0708***
	(0.00259)	(0.00133)	(0.00147)	(0.00163)	(0.00364)
Elasticity	1.05	1.00	0.61	0.49	0.44
1-STD Deviation	0.163	0.163	0.163	0.172	0.159
Beneficiary Characteristics	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Zip Code Clustered SE	YES	YES	YES	YES	YES
2-Digit Bene Zip Code FE	NO	YES	N/A	N/A	N/A
Beneficiary FE	NO	NO	YES	YES	YES
T=2	NO	NO	NO	YES	YES
Adjusted R^2	0.0808	0.129	0.612	0.611	0.639
N	20,258,834	20,258,834	20,258,834	4,177,155	155,031

- Controlling for beneficiary fixed effects reduces bias significantly
- Estimates do not change much beyond that, so it's not clear that the quasi-experiment is absolutely necessary

Discussion

- Primary care physicians have the largest effects on physician spending, outpatient spending, and the number of diagnoses patients receive
- Following PCP relocations:
  - There are small disruption effects $\rightarrow$ physician spending increases by 4%
  - The overall effect on physician spending is asymmetric $\rightarrow$ patients switching to higher spending PCPs spend 8% more, while patients switching to lower spending physicians do not spend less
- Results are robust to using an IV strategy that exploits mean reversion within localities
- Quasi-experimental results do not differ much from panel data estimates with patient fixed effects

Things To Do Next

- Re-create event study from Finkelstein et al. (2016) using an unbalanced panel of patients
- Show how identifying variation relates to PCP practice type. Are the effects identified from patients who switch practices?
- Add additional practice style measures related to clinical practice guidelines
  1. Ischemic heart disease
  2. Diabetes

Appendix: How To Measure Quality Primary Care?

- **Process measures: Are PCPs doing the right things?**
  - Share of patient population receiving adequate preventive care
  - Share of chronic condition patient population receiving appropriate treatment (incl. prescription drugs)
  - Share of chronic condition patient population seeing necessary specialists (e.g., referral intensity)
  - Share of patient population with new diagnoses of chronic conditions made at hospitals
- **Outcome measures: Are patients having good outcomes?**
  - Lower mortality
  - Fewer preventable hospitalizations or ED visits
  - Less patient turnover (e.g., revealed preference)

Appendix: Examples of Best Clinical Practices

Process measures: Are PCPs doing the right things?

1. U.S. Preventive Task Force: 17 recommendations
   - Screening
2. American College of Physicians: 25 recommendations
   - Screening, diagnosis, and treatment
3. AHRQ National Guideline Clearinghouse: 349 recommendations
   - Many searchable options
4. Choosing Wisely: 309 recommendations for geriatric population
   - "Don't do ..."