

Ability, Learning, and Career Path of Cardiac Specialists

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- Programs aimed at incentivizing improvements to quality of care
 - Physician "report card"
 - Quality measures become publically available (typically risk-adjusted mortality rates)
 - Pay-for-performance programs
 - Ties reimbursement directly to measurable outcomes

Motivation

- Programs aimed at incentivizing improvements to quality of care
 - Physician "report card"
 - Quality measures become publically available (typically risk-adjusted mortality rates)
 - Pay-for-performance programs
 - Ties reimbursement directly to measurable outcomes
- Do doctors change their referral patterns based on information about specialist quality, and how does that change specialist behavior?

- Lower quality specialists are more likely to stop practicing
- Lower quality specialists are potentially more likely to move to capacity constrained markets to avoid referral reduction
- Referring doctors try to allocate patients to higher quality doctors

- Medicare Part B claims from 1996-2005 — includes procedure/diagnosis codes, charges submitted, payment information, etc.
- Interventional cardiologists (IC) and cardiothoracic surgeons (CT)
- Medicare Physician Identification and Eligibility Registry (MPIER) — physician data
- Medicare Denominator — patient demographic data
- Use patient mortality and risk factors to create doctor quality measures

$$y_{ijt}^* = x_{ijt}\beta + \sigma_u u_i + v_{ijt}$$

where $u_i \sim \mathcal{N}(0, 1)$

$$y_{ijt} = \mathbf{1}\{y_{ijt}^* > 0\}$$

$$\mathbb{E}[v_{ijt} | u_i, x_{ijt}] = \bar{x}_i \gamma$$

- y_{ijt}^* : latent variable of patient mortality
- x_{ijt} : patient and procedure characteristics
- \bar{x}_i : mean of x_{ijt} at the doctor level
- u_i : aspects correlated with doctor quality

$$y_j^* = \beta_0 + \beta_1 Q_j + \beta_3 X_j + v_j$$

$$y_i = \mathbf{1}\{y_i^* > 0\}$$

- y_i^* : latent variable of dropout/moving/etc
- Q_i : quality measure for doctor
- X_j : vector of doctor characteristics

Table 3: Analysis of Dropout Behavior

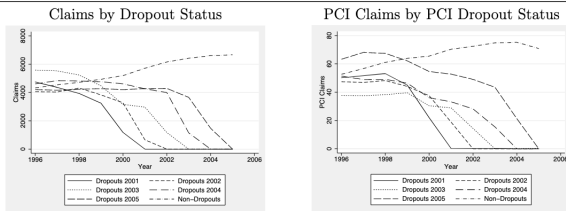
PCI/CABG dropout	ICs			CT Surgeons		
	(1)	(2)	(3)	(4)	(5)	(6)
Doctor Quality	-0.99 (0.44)	-0.84 (0.40)	-0.79 (0.39)	-3.24 (0.78)	-2.01 (0.74)	-2.45 (0.68)
Foreign School	-2.58 (1.07)	-3.64 (0.88)	-3.77 (0.86)	-2.58 (1.07)	-3.64 (0.88)	-1.44 (1.94)
Prestigious School	0.01 (1.29)	-1.29 (1.04)	-2.16 (1.01)	0.01 (1.29)	-1.29 (1.04)	0.16 (1.79)
HRR size (beneficiaries)	-0.20 (0.54)	-0.10 (0.49)	0.01 (0.48)	-0.39 (0.93)	0.58 (0.87)	-0.40 (0.84)
HRR size (reimbursement)	-0.39 (0.55)	-0.18 (0.51)	0.11 (0.48)	-2.83 (0.96)	-3.61 (0.96)	2.40 (0.89)
Cohort fixed effects		Yes	Yes		Yes	Yes
N	4228	4228	3987	2814	2814	2377
Pseudo R-squared	0.0047	0.081	0.040	0.012	0.14	0.073
Medicare dropout						
Doctor Quality	-0.31 (0.23)	-0.17 (0.15)	-0.18 (0.16)	-2.66 (0.67)	-1.24 (0.54)	-1.61 (0.49)
Foreign School	0.19 (0.62)	-0.30 (0.36)	-0.32 (0.37)	0.19 (0.62)	-0.30 (0.35)	0.15 (1.45)
Prestigious School	1.07 (0.78)	0.24 (0.45)	0.02 (0.46)	1.07 (0.78)	0.24 (0.45)	-0.12 (1.31)
HRR size (beneficiaries)	0.58 (0.28)	0.41 (0.20)	0.35 (0.20)	-0.32 (0.81)	0.56 (0.65)	-0.17 (0.63)
HRR size (reimbursement)	-0.77 (0.31)	-0.51 (0.22)	-0.32 (0.22)	-2.36 (0.84)	-2.85 (0.68)	-2.31 (0.66)
Cohort fixed effects		Yes	Yes		Yes	Yes
N	4228	4006	3765	2814	2814	2377
Pseudo R-squared	0.011	0.13	0.073	0.014	0.18	0.11

Table 4: Analysis of Moving Behavior

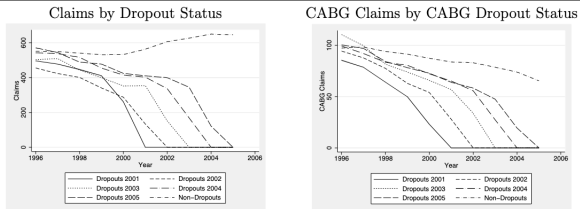
Change in zipcode	ICs			CT Surgeons		
	(1)	(2)	(3)	(4)	(5)	(6)
Doctor Quality	-1.63 (0.77)	-1.45 (0.78)	-1.60 (0.83)	-1.83 (0.94)	-2.30 (0.99)	-2.43 (1.13)
Foreign School	0.38 (1.89)	1.82 (1.92)	2.65 (2.02)	-3.74 (2.59)	4.41 (2.89)	2.28 (3.38)
Prestigious School	-2.46 (2.19)	-2.19 (2.22)	-1.87 (2.35)	-3.85 (2.39)	-2.19 (2.50)	-1.64 (2.86)
HRR size (beneficiaries)	1.19 (0.88)	0.97 (0.89)	0.87 (0.94)	3.93 (1.10)	3.30 (1.13)	3.02 (1.28)
HRR size (reimbursement)	-0.70 (0.89)	-0.75 (0.91)	-0.49 (0.95)	-2.43 (1.10)	-2.06 (1.14)	-2.07 (1.30)
Cohort fixed effects		Yes	Yes		Yes	Yes
N	4228	4228	3722	2814	2814	2186
Pseudo R-squared	0.0013	0.014	0.0090	0.0052	0.048	0.045
Change in HRR						
Doctor Quality	-0.77 (0.52)	-0.55 (0.51)	-0.83 (0.53)	-2.57 (0.81)	-3.26 (0.81)	-2.95 (0.92)
Foreign School	2.24 (1.46)	4.08 (1.45)	5.16 (1.53)	-7.43 (2.03)	1.75 (2.58)	2.76 (3.06)
Prestigious School	1.68 (1.70)	2.38 (1.69)	1.98 (1.75)	-2.05 (1.99)	0.16 (2.06)	-0.74 (2.33)
HRR size (beneficiaries)	-2.06 (0.66)	-2.25 (0.63)	-2.17 (0.65)	-1.33 (0.95)	-2.28 (0.95)	-1.93 (1.08)
HRR size (reimbursement)	0.19 (0.68)	0.11 (0.66)	0.37 (0.68)	0.50 (0.94)	0.91 (0.93)	0.77 (1.07)
Cohort fixed effects		Yes	Yes		Yes	Yes
N	4149	4149	3728	2778	2729	2145
Pseudo R-squared	0.0045	0.059	0.066	0.0083	0.090	0.087

Figure 2: Time Trends in Claim Volumes by Dropout Status

ICs



CT surgeons



- How generalizable are these results?
- Differential effects across capacity constrained vs non-capacity constrained patients
- Is mortality the best quality outcome?