Health IT Diffusion and Physician Density

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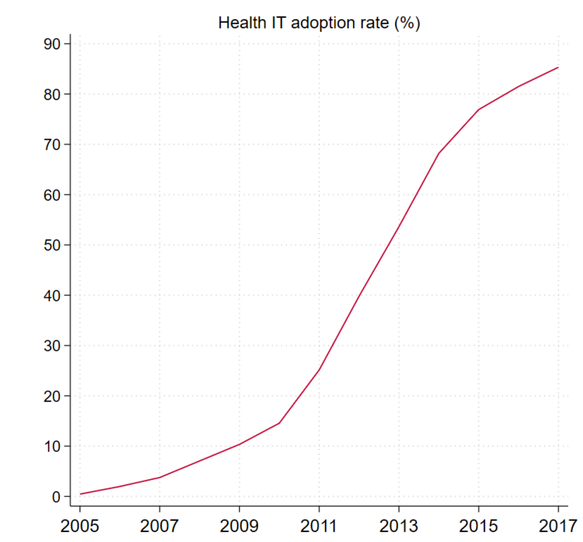
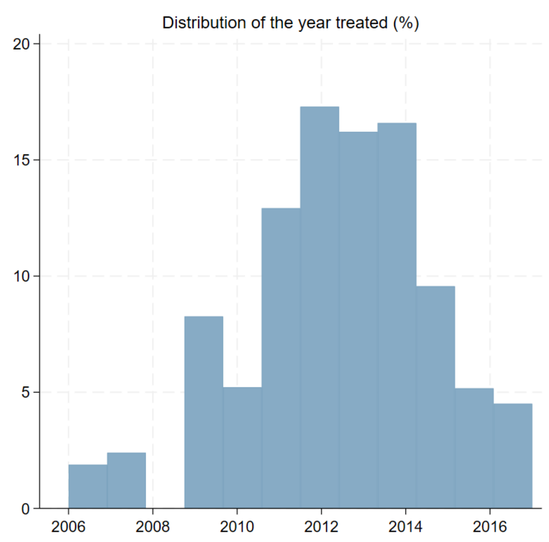
Abstract

This paper examines how the diffusion of advanced health information technology (HIT) affects the density of hospital-based (HB) physicians. Leveraging sharp county-level increases in HIT adoption driven by federal incentives, we compare physician density per 100k population in counties with rapid diffusion (treatment group) to those with slower or no uptake during our sample period (control group). Using an event-study framework, we find that HIT diffusion led to a 11.1% increase in the HB physician rate in treated counties relative to control counties, and medical and surgical specialties account for most of the increase. Moreover, the growth in HB physician density is evident, absent major consolidation activities, and contributes to overall growth in total physicians. This growth is concentrated among early-career physicians and in physician shortage areas. Mechanism tests suggest that physicians benefit financially from practicing in treated counties, with higher Medicare reimbursement and hospital profits. Outpatient surgeries rise most in counties with moderate pre-period care utilization. Various robustness checks support our results. Our findings suggest that strategic HIT investments can attract physicians, expand care capacity, and reduce geographic disparities in health care access.

Motivation

$30B HITECH Act allocation & ACA indirect incentive: rapid advanced HIT adoption
Focus: Computerized Provider Order Entry (CPOE): advanced HIT, enable automation





***Research Question*: How does advanced HIT diffusion affect aggregate hospital-based physician density at the county level?**

Data

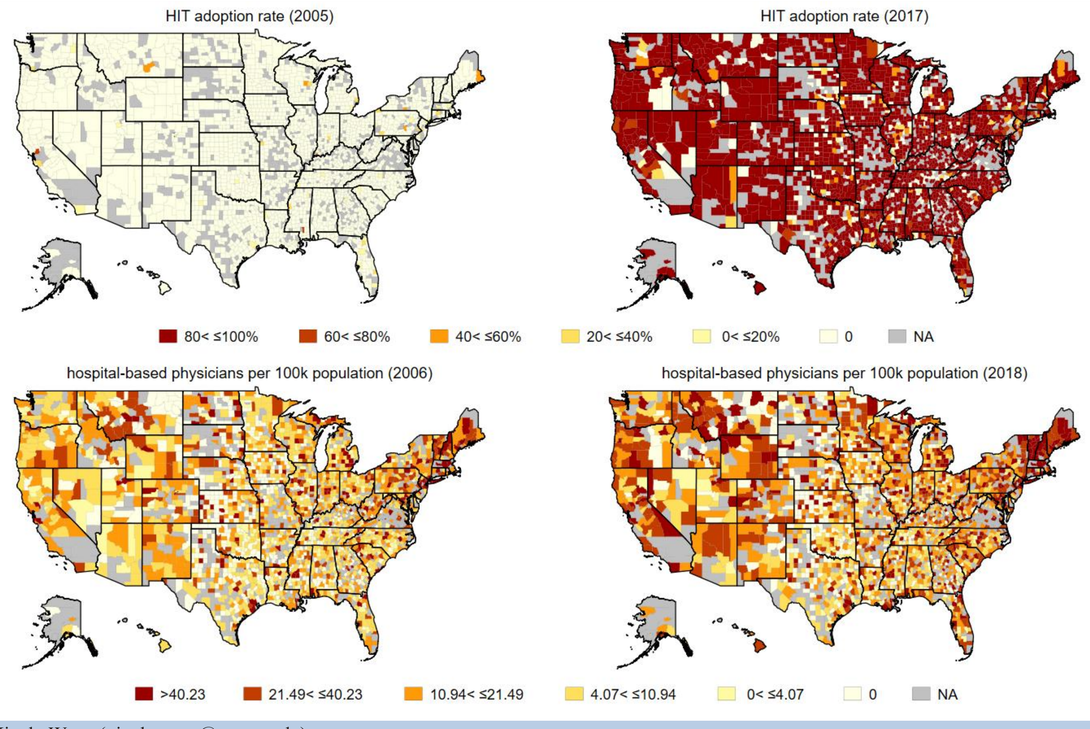
Physician supply data: Aera Health Resources Files (AHRF), our focus: Hospital-based (HB) physicians: non-federal MDs under hospital contracts providing direct patient care, measured as rate per 100k county population; then by specialty groups

Health IT adoption data: HIMSS Analytics Database, data on hospital HIT adoption CPOE adoption rate at the county-level, adjust for capacity (weighted by hospital beds)

Medicare provider and service data: CMS Medicare physician & other practitioners by provider and service dataset (available starting 2013), physician-service-year level

Market structure and profit data: Healthcare Provider Cost Reporting Information System (HCRIS), CMS; calculate hospital profit and hospital HHI within each county

Sample: ~2,394 counties 2006-2018 outcome years w/ one-year lagged HIT measures



Methods

Intuition: Define treatment/control group à la the strategy in East et al. (AER 2023). A county is treated if a sharp jump in advanced HIT adoption is detected in year τ: i) 0→ +, or ii) increase 100+% at τ (data-driven definition of local HIT diffusion)

Staggered difference-in-differences (DiD): exploits the variation in the timing of the sharp jump in county HIT adoption (De Chaisemartin & d'Haultfoeuille, 2024)

$$Y_{it} = \beta_0 + \boldsymbol{\beta_1}\, Treat_{i(t-1)} + \gamma\, X_{it} + \lambda_{st} + \delta_i + \delta_t + \varepsilon_{it}$$

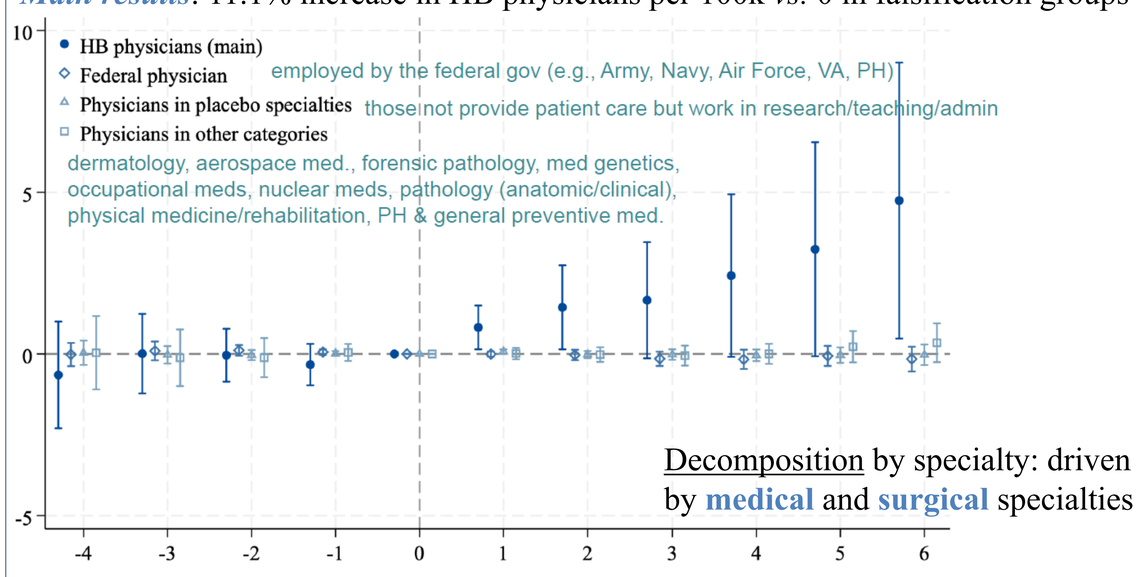
- Y_{it} : physician density in t matched with one-year lagged HIT treatment (t-1)
- X_{it}: 2005 county demographics (% aged 65+, poverty rate, income per capita, Medicare Advantage penetration, % Medicaid-eligible, and college attainment rate), each x a linear time trend to capture time variation while mitigating endogeneity from treatment, à la Dranove et al (2014)
- λ_{st}: state-specific time trends, where s denotes the state of county i
- δ_i & δ_t: county and year fixed effects; ε_{it} clustered at the state level
- Regressions are weighted by county-year level population

Event study specification: dCDH 2024 dynamic adjustment, treatment starts in t=1

$$Y_{it} = \beta_0 + \sum_{\tau=-4,\,\tau\neq 0}^{6} \boldsymbol{\beta_1^{\tau}} \times 1\{t=\tau\} EverTreated_i + \gamma X_{it} + \lambda_{st} + \delta_i + \delta_t + \varepsilon_{it}$$

Results

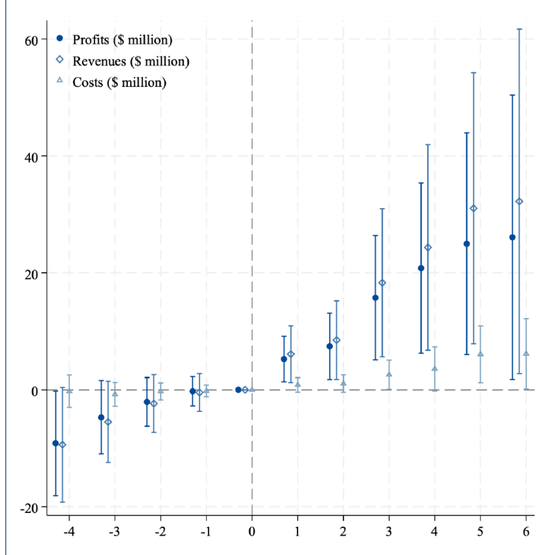
Main results: 11.1% increase in HB physicians per 100k *vs.* 0 in falsification groups



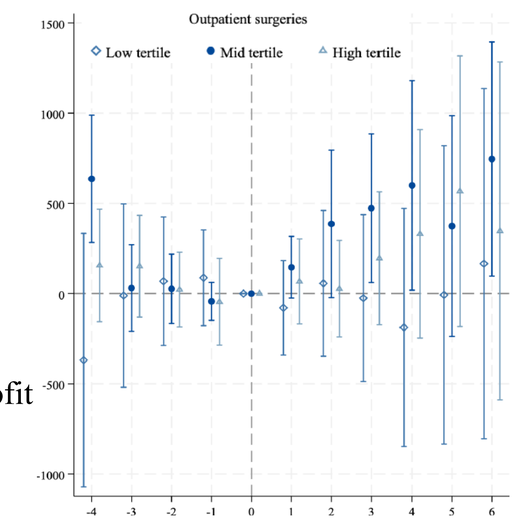
Decomposition by specialty: driven by **medical** and **surgical** specialties

Are results driven by *physician practice consolidation* or *expanding firm boundaries*? No. Similar results in subsample of counties with limited vertical integrations or mergers & acquisitions; total physician and high-HB physician densities also rise.

By age & area: rise mainly in early-career docs (≤ 45yo) & physician shortage areas.



Mechanism: increased financial returns to physicians (Medicare-allowed $ and # Medicare services per doc) and hospitals (higher profits driven by revenue increase)



Care utilization: sig. increase in outpatient surgical operations (often elective, w/ high profit margins) in areas with mid-tertile pre-period utilization (geo w/ decent growth potentials)

Robustness checks: alternative subsamples, model specifications, staggered DiD estimators (e.g., Borusyal et al., 2024; Callaway & Sant'Anna, 2021; Sun & Abraham, 2021), other advanced HIT (Physician Documentation). All are robust.

Conclusions & Discussion

- We find aggregate HB physician supply increases after rapid diffusion of advanced HIT, esp among medical/surgical specialties (tied w/ data, scheduling, coordination)
- Driven by early-career physicians (age≤45), in areas w/ excess demand for care.
- Mechanisms: treated counties showed better financial performance (docs/hosp.)
- HIT investment can attract docs to needed areas & reduce disparity in care access.

Working paper at: https://ssrn.com/abstract=5159315 (Suggestions are welcome!)