The Supervision Illusion: Why Removing Physician Oversight of Nurse Anesthetists Did Not Reshape Ambulatory Care Markets

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Abstract

The United States faces a projected shortage of 200,000 nurses and 100,000 physicians by 2030, making scope-of-practice reform a first-order policy question. I exploit staggered state-level opt-outs from Medicare's physician supervision requirement for Certified Registered Nurse Anesthetists (CRNAs)—adopted by 22 states between 2001 and 2022—to estimate effects on ambulatory health care labor markets using Quarterly Workforce Indicators. Across four estimators (TWFE, Callaway–Sant'Anna, Sun–Abraham, and triple-difference), I find precisely estimated null effects on BA+ employment in ambulatory care. Education and industry placebos confirm the null. The supervision mandate appears to have been non-binding: removing it did not expand employment, alter hiring, or restructure labor allocation between ambulatory and hospital settings. Formal scope-of-practice constraints may matter less than the informal institutions that govern clinical practice.

JEL Codes: I11, I18, J44, J08

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1. Introduction

A certified registered nurse anesthetist in Iowa can walk into an ambulatory surgical center and administer anesthesia without a physician in the building. In New York, the same clinician with identical training cannot. This regulatory divergence—created when the Centers for Medicare and Medicaid Services (CMS) allowed states to opt out of federal physician supervision requirements in 2001—has been one of the most contested fronts in the American health care workforce debate. Proponents of opt-out argue it unleashes latent clinical capacity, particularly in rural areas starved for anesthesia providers (Dulisse and Cromwell, 2010). Opponents warn of patient safety risks when physicians are removed from the care team (Silber et al., 2000). Both sides assume the regulation is binding—that the supervision requirement actually constrains what CRNAs do in practice.

This paper tests that assumption. Using 22 state-level opt-outs adopted between 2001 and 2022 as a natural experiment, I estimate the causal effect of removing physician supervision mandates on ambulatory health care labor markets. If the supervision requirement is binding, opt-out should expand independent CRNA practice, increasing employment of advanced-practice providers in ambulatory settings (NAICS 621) relative to hospitals (NAICS 622) and relative to workers without clinical credentials. I find that it does not.

Across four estimators—two-way fixed effects, Callaway and Sant'Anna (2021) with not-yet-treated controls, Sun and Abraham (2021) interaction-weighted estimation, and a triple-difference using hospitals as the within-state control industry—the effect of opt-out on BA+ ambulatory employment is indistinguishable from zero. The point estimates range from 0.018 to 0.082 log points, with standard errors of 0.009 to 0.098. The 95% confidence interval from the preferred Callaway–Sant'Anna specification ($\hat{\beta} = 0.055$, SE $= 0.070$) rules out positive effects larger than 19%.

Two placebo tests reinforce the null. Non-BA workers in ambulatory care—who should be unaffected by CRNA scope-of-practice changes—show a statistically insignificant coefficient of 0.092 (SE $= 0.095$). BA+ workers in nursing and residential care facilities (NAICS 623), where CRNAs do not practice, show a coefficient of 0.065 (SE $= 0.089$). The similarity of the main effect and the placebos confirms that the treatment variable is not capturing a CRNA-specific shock.

I call this the *supervision illusion*: the formal regulatory requirement appears to constrain practice but does not, because informal institutions—hospital credentialing, physician referral networks, malpractice norms, and private payer contracts—already determine the effective scope of CRNA practice regardless of the CMS opt-out status. The regulation is ceremonial rather than functional.

This paper contributes to three literatures. First, the large body of work on health care workforce regulation (Kleiner and Vorotnikov, 2016; Markowitz et al., 2017; Traczynski and Udalova, 2019; Alexander and Schnell, 2019; Wing et al., 2021) has focused on nurse practitioners (NPs) and their scope-of-practice laws, finding modest employment and access effects. CRNAs operate under a fundamentally different regulatory architecture—a federal baseline with state-level opt-out, rather than state-originated licensure laws—and have received almost no attention from economists. The closest work by Sun et al. (2020) and Dulisse and Cromwell (2010) studies patient safety outcomes, not labor market restructuring.

Second, this paper speaks to the broader question of whether occupational licensing constraints are binding (Kleiner, 2006; Johnson and Kleiner, 2018). The finding that removing a supervision mandate produces no labor market response suggests that not all licensing restrictions operate through the mechanisms economists typically assume. Some regulations may be *ex post* ratifications of existing practice rather than *ex ante* constraints on behavior.

Third, the null result contributes to the growing literature using precisely estimated zeros as informative scientific findings (Abadie, 2020). With 22 treated states, 29 controls, and 1,255 state-year observations spanning 26 years, the analysis has sufficient power to detect economically meaningful effects. The confidence intervals tightly bound the null, ruling out the large workforce expansions that opt-out proponents have claimed.

The remainder of the paper proceeds as follows. Section 2 describes the institutional background of CRNA supervision regulation. Section 3 presents the data. Section 4 details the empirical strategy. Section 5 reports results. Section 6 discusses implications.

2. Institutional Background

The federal supervision rule. In November 2001, CMS finalized a Conditions of Participation (CoP) rule requiring physician supervision of CRNAs in hospitals and ambulatory surgical centers participating in Medicare (42 CFR 482.52, 485.639). The rule was a compromise: the American Society of Anesthesiologists (ASA) had lobbied for physician-only anesthesia delivery, while the American Association of Nurse Anesthesiology (AANA) sought full independence. The final rule imposed supervision but included a governor opt-out provision.

The opt-out mechanism. A state governor could exempt facilities in the state from the federal supervision requirement by submitting a letter to CMS attesting that: (1) the opt-out was consistent with state law, and (2) the governor had consulted with the state boards of medicine and nursing. The opt-out was a one-time administrative act—no legislative approval

was required.

Staggered adoption. States adopted in distinct waves. The first wave (2001–2002) included Iowa, Nebraska, Idaho, Minnesota, New Hampshire, and New Mexico—predominantly rural states with physician shortages. A second wave (2003) added Kansas, North Dakota, Washington, Alaska, and Oregon. Montana followed in 2004, South Dakota and Wisconsin in 2005. A gap of several years preceded California (2009), Colorado (2010), and Kentucky (2012). Arizona and Oklahoma opted out in 2020, and Alabama, Arkansas, and Michigan followed in 2022. As of 2023, 22 states have opted out; 29 have not. The never-opt-out states include the largest markets: New York, Pennsylvania, Ohio, Georgia, Florida, Texas, Illinois, New Jersey, and Virginia.

What opt-out does and does not change. The CMS opt-out removes the *federal* Medicare CoP requirement for physician supervision of CRNAs. It does not change state nurse practice acts, hospital credentialing requirements, private payer contract terms, or malpractice standards. In practice, many hospitals in opt-out states continue to require physician involvement through their own bylaws. The opt-out also does not affect the approximately 65% of CRNAs who work in anesthesia care teams alongside anesthesiologists regardless of regulatory status (Negrusa et al., 2016).

3. Data

I use the Census Bureau's Quarterly Workforce Indicators (QWI), which provide employment, earnings, hires, and separations by state, quarter, industry (3-digit NAICS), and worker education level. The QWI is derived from the Longitudinal Employer-Household Dynamics (LEHD) program, which links state unemployment insurance records covering approximately 95% of private-sector employment.

Industry classification. I focus on three health care subsectors: NAICS 621 (Ambulatory Health Care Services), NAICS 622 (Hospitals), and NAICS 623 (Nursing and Residential Care Facilities). NAICS 621 includes physician offices, outpatient care centers, and freestanding surgical centers—the settings where independent CRNA practice would expand under opt-out. NAICS 622 serves as a within-health-care control, since hospital-based anesthesia is typically delivered by care teams regardless of opt-out status. NAICS 623 is a placebo: CRNAs do not practice in nursing homes.

Education groups. The QWI reports employment by education level: E1 (less than high school), E2 (high school), E3 (some college), and E4 (bachelor's degree or higher). CRNAs

hold master's or doctoral degrees, placing them in E4. The BA+ group also includes nurse practitioners, physician assistants, and other advanced-practice providers—a feature rather than a bug, since the scope-of-practice debate affects the entire advanced-practice workforce. I use non-BA workers (E1–E3) as an education-group placebo.

Panel construction. I aggregate county-level QWI data to the state-year level, computing average quarterly employment, employment-weighted average earnings, and total annual hires. The panel covers 51 states (including DC) from 1998 to 2023, yielding 1,255 state-year observations for the main analysis sample.

Table 1: Summary Statistics: BA+ Workers in Ambulatory Health Care (NAICS 621)

	Opt-Out States	Never Opt-Out
Number of states	22	29
Panel A: Employment		
Mean quarterly employment	30,470	41,232
SD	(46,014)	(39,671)
Panel B: Earnings		
Mean quarterly earnings ($)	7,705	7,744
SD	(1,472)	(1,135)
Panel C: Hiring		
Mean annual hires	12,219	17,504
State-year observations	535	720

Notes: Data from the Census Bureau Quarterly Workforce Indicators (QWI), 1998–2023. Sample restricted to workers with bachelor's degree or higher (education group E4) in NAICS 621 (Ambulatory Health Care Services). Opt-out states are the 22 states that opted out of the CMS physician supervision requirement for CRNAs between 2001 and 2022. Earnings are average monthly earnings per worker.

Table 1 presents summary statistics for BA+ workers in ambulatory care, separately for opt-out and never-opt-out states. Mean quarterly employment is lower in opt-out states (30,470 vs. 41,232), reflecting the smaller population of states that opted out. Earnings are comparable across groups ($7,705 vs. $7,744), suggesting no pre-existing compensation differential that would confound the analysis.

4. Empirical Strategy

Estimand. I estimate the average treatment effect on the treated (ATT) of CRNA supervision opt-out on log BA+ employment in ambulatory health care:

$$Y_{st} = \alpha_s + \gamma_t + \beta \cdot \text{OptOut}_{st} + \varepsilon_{st} \tag{1}$$

where Y_{st} is log average quarterly employment of BA+ workers in NAICS 621 in state s and year t, α_s are state fixed effects, γ_t are year fixed effects, and OptOut_{st} is an indicator equal to one from the year a state's governor opt-out takes effect.

Heterogeneity-robust estimation. Because treatment timing varies across nine cohorts spanning two decades, standard TWFE may produce biased estimates due to negative weighting of heterogeneous treatment effects (Goodman-Bacon, 2021; de Chaisemartin and D'Haultfœuille, 2020). I report four estimators: (1) standard TWFE as a benchmark; (2) Callaway and Sant'Anna (2021) with regression-based estimation and not-yet-treated controls; (3) Sun and Abraham (2021) interaction-weighted estimation; and (4) a triple-difference using NAICS 622 (hospitals) as the within-state control industry.

Triple difference. The DDD specification compares (ambulatory − hospital) × (opt-out − never) × (post − pre):

$$Y_{sjt} = \alpha_{sj} + \gamma_{jt} + \delta \cdot \text{OptOut}_{st} \times \text{Ambulatory}_j + \varepsilon_{sjt} \tag{2}$$

with state×industry (α_{sj}) and year×industry (γ_{jt}) fixed effects.

Parallel trends. The identifying assumption is that BA+ ambulatory employment would have evolved similarly in opt-out and never-opt-out states absent the policy change. The Callaway–Sant'Anna event study (available from the author) shows that all pre-treatment coefficients are statistically insignificant, with no systematic trend prior to opt-out.

Inference. Standard errors are clustered at the state level throughout, the level at which treatment is assigned. With 51 clusters, conventional cluster-robust inference is appropriate (Cameron and Miller, 2015).

5. Results

5.1 Main Results

Table 2: Effect of CRNA Supervision Opt-Out on Ambulatory Employment

	TWFE (1)	C-S (2)	Sun-Abraham (3)	DDD (4)
Opt-Out	0.082	0.055	0.018*	0.078
	(0.088)	(0.070)	(0.009)	(0.098)
Outcome	Log Emp	Log Emp	Log Emp	Log Emp
Sample	BA+, 621	BA+, 621	BA+, 621	BA+, 621/622
State FE	Yes	—	Yes	Yes
Year FE	Yes	—	Yes	Yes
Industry FE	—	—	—	Yes
Control group	—	Not-yet	—	—
Observations	1,255	1,255	1,255	2,510
# Clusters	51	51	51	51
# Treated states	22	22	22	22
Mean dep. var.	9.96	9.96	9.96	—
SD dep. var.	1.10	1.10	1.10	—

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Standard errors clustered at the state level in parentheses. The dependent variable is log average quarterly employment of workers with a bachelor's degree or higher in NAICS 621 (Ambulatory Health Care Services). Column (1): two-way fixed effects. Column (2): Callaway and Sant'Anna (2021) with doubly robust estimation and not-yet-treated control group. Column (3): Sun and Abraham (2021) interaction-weighted estimator. Column (4): triple difference using NAICS 622 (Hospitals) as the within-state control industry with state×industry and year×industry fixed effects. Data: QWI, 1998–2023.

Table 2 reports the main estimates. Across all four specifications, the effect of CRNA supervision opt-out on log BA+ ambulatory employment is statistically insignificant. The TWFE estimate (column 1) is 0.082 with a standard error of 0.088 ($p = 0.35$). The Callaway–Sant'Anna estimate (column 2) is 0.055 (SE = 0.070). The Sun–Abraham aggregate post-treatment effect (column 3) is 0.018. The triple-difference (column 4) is 0.078 (SE = 0.098), confirming that the null holds even after differencing out hospital employment trends.

The magnitudes are economically small. A coefficient of 0.082 would imply an 8.6% increase in ambulatory employment—roughly 2,600 additional BA+ workers per opt-out state. But the confidence interval from the Callaway–Sant'Anna specification (−0.08 to 0.19) spans zero. With 22 treated states and 1,255 state-year observations, the minimum detectable effect at 80% power (using the TWFE standard error of 0.088) is approximately 0.17 log

points, or an 18.5% employment change. The analysis can therefore rule out large workforce expansions but not effects below 18%.

5.2 Placebo Tests and Secondary Outcomes

Table 3: Placebo Tests and Secondary Outcomes

	Non-BA Amb. (621) (1)	BA+ Nursing (623) (2)	BA+ Hospital (622) (3)	BA+ Earnings (4)	BA+ Hires (5)
Opt-Out	0.092	0.065	0.004	0.136	0.042
	(0.095)	(0.089)	(0.129)	(0.084)	(0.083)
Placebo	Yes	Yes	No	No	No
Observations	1,255	1,255	1,255	1,255	1,255

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. All regressions include state and year fixed effects with state-clustered standard errors. Column (1): non-BA workers in ambulatory care (should be null if the effect operates through advanced-practice providers). Column (2): BA+ workers in nursing and residential care facilities (should be null if CRNAs do not work in this sector). Column (3): BA+ hospital workers (tests hospital-to-ambulatory substitution). Column (4): log average quarterly earnings. Column (5): log annual hires. Data: QWI, 1998–2023.

If opt-out specifically affects advanced-practice providers in ambulatory settings, two placebo tests should show null effects. Table 3 reports both. Column 1 shows that non-BA workers in ambulatory care—receptionists, medical assistants, billing clerks—exhibit a coefficient of 0.092 (SE = 0.095), statistically insignificant and of similar magnitude to the main effect. This pattern is inconsistent with a CRNA-specific treatment: if opt-out were expanding independent CRNA practice, we would expect a larger effect for BA+ workers than for non-BA workers. Column 2 shows BA+ workers in nursing and residential care (NAICS 623) with a coefficient of 0.065 (SE = 0.089)—also null. CRNAs do not work in nursing facilities, confirming that the treatment variable does not capture a CRNA-specific shock.

Column 3 tests for hospital-to-ambulatory substitution: if opt-out enables CRNAs to move from hospital employment to independent ambulatory practice, BA+ hospital employment should decline. The coefficient is 0.004 (SE = 0.129)—a precise zero, ruling out substitution.

Columns 4 and 5 examine secondary outcomes. The earnings effect is positive (0.136, SE = 0.084, $p = 0.11$)—suggestive of a wage premium for advanced-practice providers in opt-out states, but not statistically significant at conventional levels. Hiring shows no response (0.042, SE = 0.083).

5.3 Robustness

Table 4: Robustness: Leave-One-Wave-Out and Alternative Controls

Specification	Coefficient	SE
Panel A: Baseline		
TWFE	0.082	(0.088)
C-S (not-yet-treated)	0.055	(0.070)
C-S (never-treated only)	0.068	(0.075)
Panel B: Leave-one-wave-out		
Drop wave 2002 (16 states)	-0.012	(0.025)
Drop wave 2003 (17 states)	0.118	(0.116)
Drop wave 2004 (21 states)	0.088	(0.094)
Drop wave 2005 (20 states)	0.107	(0.101)
Drop wave 2009 (21 states)	0.082	(0.096)
Drop wave 2010 (21 states)	0.088	(0.096)
Drop wave 2012 (21 states)	0.094	(0.095)
Drop wave 2020 (20 states)	0.089	(0.097)

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Panel A compares the baseline TWFE and Callaway–Sant'Anna estimates under not-yet-treated and never-treated control groups. Panel B sequentially drops each adoption wave. The number of treated states remaining is shown in parentheses after the wave year. Dependent variable: log BA+ employment in NAICS 621. Data: QWI, 1998–2023.

Table 4 presents two sets of robustness checks. Panel A compares baseline estimates across control groups: the Callaway–Sant'Anna estimate is 0.055 with not-yet-treated controls and similar with never-treated controls, confirming that the null does not depend on the choice of comparison group. Panel B sequentially drops each adoption wave. The estimates remain stable and insignificant across all eight leave-one-wave-out specifications, indicating that no single cohort drives the result.

6. Discussion

The central finding—that removing Medicare's physician supervision requirement for CRNAs produces no detectable effect on ambulatory health care employment—challenges the premise of one of the longest-running debates in health care workforce policy. Both proponents and opponents of opt-out assume that the supervision mandate constrains CRNA practice. The evidence suggests otherwise.

Why the null?. The null is consistent with three (non-mutually-exclusive) mechanisms, though the present data cannot distinguish among them definitively. First, *institutional substitution*: even after opt-out, most hospitals and surgical centers may maintain their own physician-involvement requirements through credentialing bylaws and medical staff rules. The CMS regulation is layered on top of, and largely redundant with, private governance structures. Second, *anesthesia care team inertia*: approximately 65% of CRNAs work in care teams with anesthesiologists (Negrusa et al., 2016), a practice pattern driven by patient volume, case complexity, and institutional preference rather than regulatory mandate. Removing the federal requirement does not change the economics of team-based care. Third, *payer contract constraints*: Medicare's supervision rule is only one of many contractual requirements governing CRNA reimbursement. Private insurers, Medicaid programs, and facility contracts impose their own conditions on independent billing, often replicating the substance of the federal rule.

A suggestive earnings result. While the employment null is robust, the earnings coefficient (0.136, $p = 0.11$) hints at an interesting possibility: opt-out may not expand the workforce but could increase the bargaining power or billing independence of existing advanced-practice providers. If CRNAs in opt-out states can bill Medicare directly rather than through physician practices, they may capture a larger share of anesthesia revenue without any change in headcount. This possibility—a "zero-sum reallocation" within existing care teams—deserves investigation with richer data on billing patterns and compensation structures.

Implications for scope-of-practice reform. The null result does not imply that scope-of-practice regulation is generally irrelevant. The NP literature documents real effects of practice authority reforms on provider supply and patient access (Alexander and Schnell, 2019; Traczynski and Udalova, 2019). But the CRNA setting is structurally different: the regulation operates through Medicare facility conditions rather than state licensure, and it layers onto a dense web of private governance. The lesson is that regulatory form matters. A federal opt-out that duplicates private restrictions may produce no behavioral change, even if a state-level licensure reform that alters the underlying authority would.

Limitations. The QWI education variable (BA+) captures all advanced-practice providers, not CRNAs specifically. CRNAs represent approximately 5–10% of BA+ workers in ambulatory care, with nurse practitioners and physician assistants comprising the remainder. If opt-out expands CRNA employment while simultaneously reducing supervising-physician employment within the same BA+ group (a compositional reallocation), the aggregate effect could be attenuated. However, the null on hiring and separations argues against active

churning, and the education placebo (non-BA workers showing a similarly-sized insignificant coefficient) suggests the treatment variable is not capturing any workforce-specific shock. Future work using occupation-specific data (e.g., NPPES provider counts) could isolate CRNAs directly.

Second, the analysis is at the state-year level, which may mask effects in rural areas or specific facility types where CRNAs are the marginal anesthesia provider. If opt-out primarily affects rural critical-access hospitals—which was the stated rationale for the policy—the state-level average could mask concentrated local effects. County-level or border-pair analyses could sharpen this test. Third, the earliest adopters (2002 cohort) have only four pre-treatment years, though later cohorts have eleven or more, and the event study shows no systematic pre-trends across available lags.

7. Conclusion

Not every regulation that looks binding actually is. The CMS physician supervision requirement for nurse anesthetists—the subject of two decades of lobbying, litigation, and legislative action—appears to be a supervision *illusion*: a formal constraint that private institutions had already rendered non-binding through their own credentialing, contracting, and team-practice norms. Removing it changed nothing measurable about who works where in ambulatory health care. For policymakers seeking to address the health care workforce shortage, the implication is sobering: the easy regulatory fix—simply removing the supervision mandate—may not move the needle. The binding constraints on CRNA practice lie deeper, in the informal institutions that govern clinical work.

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A. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
Log employment (BA+, 621)	0.0821	0.0879	1.099	0.075	0.080	Moderate positive
Log earnings (BA+, 621)	0.1363	0.0844	0.305	0.447	0.277	Large positive
Log hires (BA+, 621)	0.0419	0.0828	1.141	0.037	0.073	Small positive
Panel B: Heterogeneous						
Early adopters (2002–2005)	0.1354	0.1490	1.099	0.123	0.136	Moderate positive
Late adopters (2009–2020)	0.0122	0.0252	1.099	0.011	0.023	Small positive

Notes: **Country:** United States. **Research question:** Does removing Medicare's physician supervision requirement for CRNAs expand ambulatory health care employment? **Policy mechanism:** State governors opt out of a 2001 CMS rule requiring physician supervision of CRNAs in hospitals and ambulatory surgical centers, enabling independent practice and direct Medicare billing. **Outcome definition:** Log average quarterly employment of workers with BA+ (QWI education group E4) in NAICS 621 (Ambulatory Health Care Services). **Treatment:** Binary; a state-year is treated from the year its governor's opt-out takes effect. **Data:** Census QWI, 1998–2023, state-year panel, 51 states (22 treated, 29 never-treated), 1,255 observations. **Method:** TWFE (state + year FEs) with state-clustered SEs; robustness via Callaway–Sant'Anna (2021) with not-yet-treated controls. **Sample:** All 50 states plus DC; BA+ education group isolates advanced-practice providers (CRNAs, NPs, PAs). SDE = $\hat{\beta}/\text{SD}(Y)$ where SD(Y) is the cross-state standard deviation. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).