Constitutional Design, Workforce Layering, and Primary Care Access: A Political-Economy Model of Team-Based Care Reform

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Abstract

Primary care access in the United States is characterized by long waiting times, uneven geographic availability, provider burnout, and chronic underinvestment in organizational forms that expand first-contact capacity. This paper develops a hybrid health-economics framework for primary care access reform combining three strands of economic reasoning: (i) *payment-efficiency models* emphasizing the distortions of fee-for-service reimbursement; (ii) *solidarity-based system design models* emphasizing primary care and prevention as system infrastructure; and (iii) *public-health ethics models* emphasizing access as a socially protected good. We formalize a political-economy equilibrium model in which regulatory design, workforce composition, and reimbursement incentives jointly determine primary care access.

The paper shows that nurse practitioner scope-of-practice reform and team-based care increase effective service capacity, reduce queue congestion, and improve welfare when access costs are steep and nonphysician clinicians are organizationally underutilized. The empirical design exploits staggered full-practice-authority reforms across U.S. states using a difference-in-differences and event-study framework. A calibrated national workforce simulation using Health Resources and Services Administration (HRSA) counts demonstrates that team-based care could absorb between 445 million and 712 million additional primary care visits annually under conservative and moderate assumptions, respectively.

Beyond the empirical and quantitative contributions, the paper develops a regulatory-law analysis of how state-level licensing architectures function as constitutional constraints on the primary care production function. The findings indicate that primary care access is not only a function of physician supply but of institutional design, queueing congestion, and the political allocation of clinical authority. Both the legal dimension and the structural economic model carry

direct implications for policy design, reimbursement reform, and the financial sustainability of primary care systems in the United States and comparable OECD economies.

1. Introduction

Primary care access is one of the central bottlenecks in the United States health system. In large metropolitan areas, waiting times for family medicine appointments routinely extend for weeks. In rural and medically underserved regions, the problem is not merely delay but nonavailability. The consequences of access failure are cumulative: delayed diagnosis, excess use of emergency departments for ambulatory-care-sensitive conditions, lower continuity of care, higher downstream costs, and worsening clinician burnout. Yet despite the centrality of primary care in population health, institutional design in the United States continues to organize care around narrow professional boundaries, fragmented reimbursement, and payment systems that reward encounters rather than capacity.

This paper advances a simple but strong claim: *primary care access is an equilibrium object determined jointly by payment design, workforce regulation, and organizational form.* In that sense, the primary care shortage is not solely a physician shortage. It is also a constitutional-design problem. By constitutional design, we mean the set of legal and organizational rules that determine who may deliver care, under what supervision, under what reimbursement, and within what governance structure. Regulatory constraints on nonphysician clinicians especially nurse practitioners limit the service capacity of the primary care system in ways that standard physician-headcount narratives miss.

This framing draws on three complementary traditions in health economics. The first emphasizes *payment efficiency*: when fee-for-service reimburses volume rather than outcomes, the system underprovides prevention and misallocates effort toward fragmented encounter production (Chernew et al. 2020; Song & Chernew 2016; Goroll et al. 2007). The second emphasizes *solidarity and primary care as institutional infrastructure*: strong primary care systems improve

population health, reduce downstream utilization, and organize care more efficiently than specialist-centric alternatives (Starfield, Shi & Macinko 2005; Kringos et al. 2013; EXPH 2014). The third emphasizes *public-health ethics and access as a social good*: first-contact care carries social value that market equilibrium alone may not protect (Akrami et al. 2018; Dawson 2011). Our argument is that these traditions are not competing alternatives but complementary components of a more complete access model.

This paper makes four contributions. First, it develops a political-economy model in which physician organizations, nonphysician clinicians, patients, and payers interact under alternative regulatory and reimbursement regimes. Second, it embeds a queueing framework into the access problem, showing why waiting times rise nonlinearly as demand approaches service capacity and why team-based care can have disproportionately large effects on delay. Third, it proposes an empirical strategy anchored on nurse practitioner full-practice-authority reform as a plausibly exogenous institutional shock to the production function of primary care. Fourth, it calibrates a national simulation using U.S. workforce data to show that existing nonphysician capacity is quantitatively large enough to matter substantially for system performance.

A distinctive feature of this paper is its integrated treatment of the legal and regulatory architecture. The regulatory dimension is not treated as background context but as a structural variable in the access equilibrium. State scope-of-practice laws function as constitutional rules that allocate clinical authority, determine substitution possibilities within the primary care production function, and shape the political equilibrium between organized physician interests and access coalitions. Understanding these rules their legal classification, their historical evolution, and their interaction with payment design is essential to both the identification strategy and the policy implications of the analysis.

The remainder of the paper proceeds as follows. Section 2 provides institutional background on primary care organization, scope-of-practice regulation, and integrated people-centred system design. Section 3 presents stylized empirical facts. Section 4 develops the political-economy equilibrium model. Section 5 derives welfare implications. Section 6 introduces the queueing mechanism and congestion analysis. Section 7 describes the data and policy variables. Section 8 presents the empirical strategy. Section 9 presents a calibrated national workforce simulation. Section 10 discusses identification threats and robustness. Section 11 concludes. Formal derivations are presented in the Appendix.

2. Institutional Background

2.1 Primary Care as System Infrastructure

Primary care provides first-contact, continuous, coordinated care and is a foundational input into population health. The World Health Organization's Alma-Ata Declaration (1978) established primary care as the organizational core of effective health systems. Subsequent comparative evidence consistently shows that primary-care-oriented systems achieve better population health outcomes, lower rates of preventable hospitalizations, and more equitable service distribution than specialist-centric alternatives (Starfield 1998; Macinko, Starfield & Shi 2003; Kringos et al. 2013).

Yet the United States devotes a smaller share of total health spending to primary care than many peer systems, even while experiencing higher total expenditure and weaker access. OECD data show that the United States spent approximately 16.6 percent of GDP on health in 2022 while maintaining fewer practicing physicians per capita than many European counterparts (OECD 2023). International comparisons using the MOORA framework and related multi-criteria

methods rank top-performing OECD health systems Switzerland, Germany, Sweden as sharing several institutional features: strong primary care infrastructure, robust workforce-to-population ratios, and coordinated referral systems (Sevim & Ugurluoglu Aldogan 2024). These patterns are consistent with the view that primary care is not just another service line, but the organizational base layer of an efficient system.

The Expert Panel on Effective Ways of Investing in Health (EXPH 2014) defines primary care as "the provision of universally accessible, integrated person-centred, comprehensive health and community services provided by a team of professionals accountable for addressing a large majority of personal health needs." This definition is significant for the present analysis because it centers teamwork, accountability, and comprehensiveness as structural features not incidental characteristics. A system organized around this definition is structurally different from one organized around individual physician encounters, and scope-of-practice reform is one mechanism through which the former organizational form becomes legally feasible.

2.2 Nurse Practitioner Scope of Practice as Institutional Design

Nurse practitioner scope-of-practice law governs whether nurse practitioners may evaluate patients, diagnose, order and interpret tests, and initiate treatment without physician supervision. Full practice authority (FPA) removes ongoing collaboration or supervision requirements and places practice under the exclusive authority of the nursing board. Reduced-practice regimes require collaboration agreements with supervising physicians. Restricted-practice regimes require direct physician supervision of clinical activities.

The legal classification of these regimes has historically been inconsistent across the empirical literature. A significant methodological advance was provided by McMichael and Markowitz

(2021), who developed legally validated state-year coding by systematic review of statutory and regulatory language. Their dataset distinguishes full, reduced, and restricted practice regimes across states from 1998 through 2022, enabling credible quasi-experimental identification based on the timing of state reforms. This paper relies on that coding, extended through 2023 using verified updates from the American Association of Nurse Practitioners.

For this paper, scope-of-practice reform is not interpreted narrowly as a labor-market policy. It is an institutional redesign of the supply side of primary care a constitutional change in the allocation of clinical authority. When supervision requirements are relaxed, the feasible allocation of lower-acuity and preventive demand changes, the service rate of the system rises, and the queueing structure of primary care access changes with it. The legal and regulatory dimension of this redesign is not separable from its economic effects; it is constitutive of them.

2.3 The Legal and Regulatory Architecture

State scope-of-practice laws interact with multiple layers of legal authority. At the federal level, the Medicare program's conditions of participation and reimbursement rules have historically embedded physician-supervision requirements that reinforced state restrictions. The passage of the 2020 federal SUPPORT for Patients and Communities Act and COVID-19 emergency waivers temporarily relaxed some federal supervision requirements, providing additional policy variation for empirical analysis.

At the state level, scope-of-practice authority is typically lodged in nursing practice acts and medical practice acts, sometimes in direct tension. Physician organizations have historically lobbied state legislatures to maintain supervision requirements, while nursing organizations, consumer advocates, and rural health coalitions have pushed for expanded autonomy. The

political economy of reform is therefore not simply a technocratic optimization but a contested distributional conflict over regulatory rents and clinical authority.

This legal architecture has implications for both the identification strategy and the welfare analysis. The staggered adoption of FPA reforms across states creates plausibly exogenous variation in the institutional environment facing primary care providers. The welfare analysis must account not only for the direct access effects of reform but for the distributional consequences including the transfer of professional rents from physician organizations to patients and access coalitions that reform generates.

2.4 Integrated People-Centred Systems and the HSO Framework

The Health Standards Organization's Integrated People-Centred Health Systems standard (HSO 2022) provides a governance framework for understanding when workforce reform translates into system-level access improvement. The standard emphasizes that integrated care requires aligned funding, shared accountability, interoperable information systems, and care pathways that connect the right patient to the right provider at the right time. Scope-of-practice reform alone is unlikely to achieve its full effect unless embedded in organizational pathways that support delegation, triage, clinical handoffs, and outcome monitoring.

In other words, workforce deregulation must be paired with system integration to produce the welfare gains the model predicts. This interaction between legal reform and organizational capacity is a central theme of the paper: the constitutional design of clinical authority is a necessary but not sufficient condition for improved access. The sufficient conditions also include reimbursement alignment, information infrastructure, and the organizational capacity to route demand efficiently.

3. Stylized Empirical Facts

Three stylized facts motivate the analysis and are consistent with the theoretical framework developed in the following sections.

Fact 1: High Health Spending with Persistently Limited Primary Care Access

The United States spent approximately $12,555 per capita on health care in 2022 nearly twice the OECD average yet the country employs fewer primary care physicians per capita than most peer systems. Average physician appointment wait times in major U.S. metropolitan areas exceeded 30 days in 2025. HRSA projects a shortage of 70,610 full-time-equivalent primary care physicians by 2038 (HRSA 2025). This pattern high aggregate spending alongside weak primary care access is inconsistent with a simple supply-demand narrative and instead points toward institutional factors determining how spending translates into effective service capacity.

Fact 2: Large and Growing Nonphysician Workforce Underutilized in Primary Care

HRSA reports 374,970 nurse practitioners in primary care in 2024 a workforce that has grown by approximately 12 percent annually over the past decade. Yet in states with restricted-practice regimes, nurse practitioners cannot practice independently, significantly constraining their contribution to primary care capacity. States with the least restrictive scope laws have historically seen the largest increases in patients seen by nurse practitioners (Kuo et al. 2013). This distributional pattern is consistent with regulatory constraints not preferences or training limiting effective workforce deployment.

Fact 3: High Emergency Department Utilization for Ambulatory-Care-Sensitive Conditions

A substantial share of emergency department visits in the United States involve conditions that could be appropriately and more economically treated in primary care settings. Ambulatory-care-

sensitive conditions (ACSCs) including asthma, diabetes complications, hypertension, and urinary tract infections account for a large and preventable fraction of emergency department volume. This pattern is consistent with primary care access failure generating downstream substitution toward more intensive and more costly care settings. Reducing ACSC emergency department utilization is one of the key predicted outcomes of the access model developed below.

4. A Political-Economy Model of Primary Care Access

Consider a state-level primary care system in which patients demand primary care visits, clinicians supply labor, and payers determine reimbursement rules. The core institutional variables are: (i) the payment regime governing reimbursement of clinical encounters; (ii) the regulatory scope granted to nonphysician clinicians; and (iii) the organizational capacity to layer the workforce into a team-based model.

4.1 Demand

Let inverse demand for primary care visits be:

$$p(q) = a - bq, \quad a > 0, b > 0 \qquad (1)$$

where q is total primary care visits per capita and p(q) is the generalized price of access. The generalized price includes not only monetary out-of-pocket cost, but also waiting time, travel, administrative burden, and delay costs. This specification follows the standard congestion-cost literature (Acton 1975) and allows access barriers to function as a tax on utilization.

4.2 Capacity and Generalized Supply

Let μ denote the effective service capacity of the primary care system the number of primary care visits that can be delivered per unit time. Under the general team-based model:

$$\mu = \alpha_P \cdot L_P + \alpha_N \cdot L_N + \alpha_A \cdot L_A \qquad (2)$$

where L_P, L_N, and L_A denote primary care physicians, nurse practitioners, and physician assistants; and α_j denotes effective annual visit productivity of workforce type j. Under physician-only organization where binding scope-of-practice restrictions prevent independent nurse practitioner practice effective capacity is restricted to:

$$\mu_P = \alpha_P \cdot L_P \qquad (3)$$

Under team-based care with scope-of-practice reform eliminating supervision requirements:

$$\mu_T = \alpha_P \cdot L_P + \alpha_N \cdot L_N + \alpha_A \cdot L_A \qquad (4)$$

The increase in effective capacity from reform is Δμ = μ_T − μ_P = α_N L_N + α_A L_A, which is strictly positive when nonphysician clinicians are present in the state workforce.

Equilibrium access cost rises sharply as utilization approaches capacity. Following the queueing literature, let the reduced-form congestion cost be:

$$c(q; \mu) = \kappa / (\mu - q), \quad q < \mu, \kappa > 0 \qquad (5)$$

Equilibrium access satisfies the condition that demand equals generalized access cost:

$$a - bq = \kappa / (\mu - q) \qquad (6)$$

This equilibrium condition makes explicit that access depends not only on demand but on how close the system operates to its service frontier. As the system approaches capacity, even small increases in demand generate large increases in generalized access cost.

4.3 Political Economy of Regulatory Design

The regulatory regime governing nurse practitioner scope of practice is determined through a political contest between organized interests. Let the state choose a regulatory regime $R \in \{0, 1\}$, where R = 1 denotes full practice authority. Two principal organized blocs compete to influence regime selection:

- Incumbent physician organizations, which prefer restrictions that preserve physician-specific rents and supervision authority over nonphysician clinicians.
- Access coalitions, including nurse practitioner organizations, patient advocacy groups, safety-net providers, rural health networks, and payers concerned with network adequacy and system costs.

Let physician rents be $\Pi_P(R)$, access coalition utility be $U_A(R)$, and policymaker objective function:

$$\Omega(R) = \omega_P \Pi_P(R) + \omega_A U_A(R) + \omega_W W(R) \qquad (7)$$

where W(R) is social welfare and the ωs reflect political weights determined by the relative organizational capacity of each coalition. Under restrictive regulation, physician rents are higher but access is lower. Under full practice authority, rents decline at the margin but welfare may rise. Reform occurs when:

$$\Omega(1) - \Omega(0) > 0 \qquad (8)$$

This political-economy formulation explains why inefficient access regimes can persist even when congestion is high: the regulatory equilibrium reflects organized interests, not only social efficiency. The model predicts that reform is more likely when access coalitions are stronger (higher ω_A), physician rents are lower, or policymakers place greater weight on welfare (higher

ω_W). Consistent with this prediction, empirically, states with larger rural populations, greater Medicaid exposure, and stronger nursing-advocacy infrastructure have historically been earlier FPA adopters.

5. Welfare Analysis

Let social welfare equal consumer surplus net of the resource cost of maintaining the primary care system:

$$W(q, \mu) = \int_0^q (a - bx)\, dx - C(\mu) = aq - (b/2)q^2 - C(\mu) \qquad (9)$$

Because equilibrium access depends on institutional capacity, welfare under institutional regime $r \in \{P, T\}$ is:

$$W_r = a\, q_r^* - (b/2)(q_r^*)^2 - C(\mu_r) \qquad (10)$$

Access reform improves social surplus when:

$$\Delta W = W_T - W_P > 0 \qquad (11)$$

This occurs when the gain in consumer surplus from lower waiting times and greater utilization exceeds the added organizational cost of larger team-based capacity:

$$a(q_T^* - q_P^*) - (b/2)[(q_T^*)^2 - (q_P^*)^2] > C(\mu_T) - C(\mu_P) \qquad (12)$$

The condition is especially likely to hold when: (i) queueing costs are steep, meaning the system is operating near capacity; (ii) lower-acuity demand is abundant, meaning nurse practitioners can effectively substitute for physicians on a large share of visits; and (iii) nonphysician clinicians expand capacity at lower marginal cost than physicians, meaning C(μ_T) − C(μ_P) is modest relative to the access gain.

Improved primary care access generates welfare gains through three identified channels. First, reduced queue congestion lowers the generalized price of access and increases equilibrium utilization, expanding consumer surplus. Second, earlier intervention through primary care rather than emergency department care improves health outcomes and reduces downstream spending on ambulatory-care-sensitive conditions. Third, increased preventive care reduces the incidence of chronic disease progression and associated downstream costs. Quantifying these welfare channels requires both the structural simulation (Section 9) and the empirical estimates of downstream utilization effects (Section 8).

6. Queueing Theory and Access Congestion

The nonlinear relationship between system utilization and waiting time is central to this paper's mechanism. Consider a simple M/M/1 queue a single-server queue with Poisson patient arrivals and exponentially distributed service times as an approximation to primary care scheduling dynamics. With patient arrival rate λ and service rate μ, expected waiting time is:

$$W = 1 / (\mu - \lambda), \quad \lambda < \mu \qquad (13)$$

As λ approaches μ, waiting times rise without bound. In practical terms, a primary care system can appear functional until utilization crosses into the steep portion of the congestion curve, after which delay grows rapidly. The system can absorb small increases in demand smoothly at low utilization ratios but becomes highly sensitive to additional demand as it approaches capacity.

Under physician-only organization, effective service capacity is μ_P, and expected wait time is:

$$W_P = 1 / (\mu_P - \lambda) \qquad (14)$$

Under team-based care, effective capacity rises to μ_T > μ_P, and:

$$W_T = 1 / (\mu_T - \lambda) \qquad (15)$$

The reduction in expected wait time from team-based reform is:

$$W_P - W_T = (\mu_T - \mu_P) / [(\mu_P - \lambda)(\mu_T - \lambda)] \qquad (16)$$

This expression has a critical implication: the access gain from a given increase in service capacity ($\mu_T - \mu_P$) is magnified when the original system is close to saturation—that is, when ($\mu_P - \lambda$) is small. At high utilization, even modest capacity additions produce large waiting time reductions. This nonlinearity is central to the paper's quantitative implications and explains why the welfare gains from scope-of-practice reform are potentially large even when nurse practitioners take on only a fraction of the physician visit volume.

For the M/M/c extension relevant to multi-provider primary care settings, the expected waiting time in queue under Erlang-C conditions is:

$$W_q = C(c, \rho) / [c\mu(1 - \rho/c)], \quad \rho = \lambda/\mu \qquad (17)$$

where $C(c, \rho)$ is the Erlang-C probability that an arriving patient waits (the probability all c servers are busy), and c is the number of servers (clinicians). Adding nurse practitioners to the team increases c and reduces ρ/c, both lowering the Erlang-C probability and reducing the denominator's sensitivity. This formulation more realistically represents multi-clinician practices and supports the quantitative simulation in Section 9.

7. Data and Variable Construction

This paper assembles a state-year panel dataset spanning 1998–2023 to evaluate the effect of nurse practitioner scope-of-practice reform on primary care access. The panel combines policy data, health utilization data, workforce data, and socioeconomic controls from multiple national sources.

7.1 Policy Data

The primary policy variable is a binary indicator for whether nurse practitioners hold full practice authority in a given state-year. The legal coding follows the dataset constructed by McMichael and Markowitz (2021), which classifies state scope-of-practice laws using systematic review of statutory and regulatory language. Their coding spans 1998–2022 and is extended through 2023 using verified updates from the American Association of Nurse Practitioners (AANP) state policy tracker.

For empirical consistency, the treatment variable is defined as:

FPA_st = 1 if state s has full NP practice authority in year t; 0 otherwise (18)

Following standard policy evaluation practice, the treatment indicator is coded beginning in the first full calendar year after legal reform, to avoid partial-year exposure bias. States already holding full practice authority before the sample window are excluded from the event-study analysis but included in the main regression sample.

The key reform states with cleanly coded transition dates include Massachusetts, Delaware, New York, Kansas, and Utah. These states are the primary switchers in the event-study analysis, with never-treated and not-yet-treated states serving as controls.

7.2 Outcome Variables

The primary outcome is primary care utilization, measured as primary care visits per 1,000 beneficiaries using Centers for Medicare and Medicaid Services (CMS) claims data. Visits are defined using Evaluation and Management (E&M) procedure codes (CPT 99201–99215 and 99241–99245) attributed to primary care specialties (family medicine, internal medicine, general practice, and geriatrics).

Secondary outcomes capturing downstream consequences of access failure include:

- Emergency department visits for ambulatory-care-sensitive conditions (AHRQ Prevention Quality Indicators)
- Preventable hospitalizations (AHRQ inpatient prevention quality indicators)
- Average appointment wait time (days), drawn from EHR scheduling data where available
- Third-next-available appointment days (a standard clinical access metric)
- Same-week appointment availability (binary)

7.3 Workforce Data

Workforce supply data come from the HRSA Area Health Resource File (AHRF), which provides county-level counts of physicians, nurse practitioners, and physician assistants. Relevant workforce measures include primary care physician supply per 100,000 population, nurse practitioner supply per 100,000, and physician assistant supply per 100,000. The 2023 HRSA workforce counts used in the simulation are: 340,319 primary care physicians, 374,970 nurse practitioners in primary care, and 29,433 physician assistants in primary care (HRSA 2025).

7.4 Controls

State-year controls include: age structure and population composition (American Community Survey); insurance coverage and uninsured rates (ACS); unemployment rates (Bureau of Labor Statistics); physician supply (AHRF and AMA-based counts); Medicaid expansion status and Medicaid managed care penetration; rural population share (USDA Rural-Urban Continuum Codes); and state per-capita income. These controls absorb time-varying state characteristics that could confound the relationship between scope-of-practice reform and access outcomes.

8. Empirical Strategy

8.1 Baseline Difference-in-Differences

The main empirical design is a staggered-adoption difference-in-differences model. The baseline specification is:

$$Y_st = \alpha + \beta\, FPA_st + \gamma_s + \delta_t + X'_st\theta + \varepsilon_st \qquad (19)$$

where Y_st is a state-year access outcome; γ_s are state fixed effects absorbing time-invariant state characteristics; δ_t are year fixed effects absorbing common national trends; and X_st is a vector of time-varying state controls. Standard errors are clustered at the state level to allow for arbitrary within-state serial correlation.

The coefficient β captures the average effect of full practice authority on primary care access outcomes. The identifying assumption is parallel trends: in the absence of reform, treated and control states would have followed parallel trends in primary care access. The event-study design tests this assumption directly.

8.2 Event-Study Specification

To examine dynamic treatment effects and test the parallel trends assumption, I estimate:

$$Y_st = \alpha + \Sigma_\{k\neq 1\}\, \beta_k\, 1(EventTime_st = k) + \gamma_s + \delta_t + X'_st\theta + \varepsilon_st \qquad (20)$$

where $k = -1$ is omitted as the reference period. Pre-reform coefficients β_k for $k < 0$ test whether treated states were diverging from control states before reform a violation of parallel trends. Post-reform coefficients β_k for $k \geq 0$ trace the dynamic path of treatment effects.

The event-study sample includes modern switchers relative to never-treated and not-yet-treated control states. To address concerns about heterogeneous treatment effects under staggered adoption (Callaway & Sant'Anna 2021; Sun & Abraham 2021), the preferred dynamic estimates

use the Callaway-Sant'Anna estimator as a complement to the baseline two-way fixed-effects specification.

8.3 First Stage: Workforce Response

Before examining access outcomes, the paper establishes a first-stage relationship between full practice authority and nurse practitioner workforce participation in primary care. The first-stage specification replaces Y_st in equation (19) with workforce supply measures: NP supply per 100,000, NP share of primary care visits, any NP primary care presence (binary), and total NP primary care visits. The first-stage coefficients provide evidence that reform actually changes the composition and scale of primary care workforce deployment, which is a necessary precondition for the access effects hypothesized by the model.

8.4 Heterogeneity Analysis

The model predicts that access effects will be largest where workforce constraints are most binding. Heterogeneity regressions test whether effects are larger in: (i) rural areas and counties, where physician supply is thinner; (ii) states and counties with low baseline physician supply; (iii) areas with high Medicaid share, where access barriers are more severe; and (iv) health professional shortage areas (HPSAs) designated by HRSA. If effects are concentrated in these constrained settings, this provides supporting evidence that the access mechanism operates through queue decongestion rather than through demand expansion.

9. Calibrated National Workforce Simulation

To gauge the quantitative importance of team-based care at the national level, this section calibrates a capacity simulation using HRSA workforce counts. The simulation is not a

prediction of what will happen under reform but a decomposition of what capacity expansion is arithmetically feasible given the current workforce distribution.

Let annual physician-only visit capacity be:

$$Q_P = L_P \cdot v_P \cdot D \qquad (21)$$

where L_P = 340,319 (HRSA primary care physicians), v_P = 20 visits per day (standard primary care physician productivity assumption), and D = 220 clinical days per year. Then:

$$Q_P = 340{,}319 \times 20 \times 220 = 1.497 \text{ billion visits/year} \qquad (22)$$

Under team-based care, annual capacity becomes:

$$Q_T = Q_P + (L_N + L_A) \cdot v_{NA} \cdot D \qquad (23)$$

where L_N = 374,970 (primary care nurse practitioners) and L_A = 29,433 (primary care physician assistants). Under conservative assumption v_NA = 5 additional visits per day absorbed from the physician queue:

$$Q_T^{(5)} = 1.497 + (374{,}970 + 29{,}433) \times 5 \times 220 / 10^9 = 1.942 \text{ billion} \qquad (24)$$

Under moderate assumption v_NA = 8:

$$Q_T^{(8)} = 1.497 + (374{,}970 + 29{,}433) \times 8 \times 220 / 10^9 = 2.209 \text{ billion} \qquad (25)$$

Team-based care could therefore absorb between approximately 445 million and 712 million additional primary care visits annually under plausible assumptions. This represents a 30 to 48 percent increase in effective national primary care visit capacity above the physician-only baseline. The simulation abstracts from organizational frictions, geographic distribution mismatches, and training constraints but establishes the quantitative upper bound on the access gains available from full workforce deployment.

To convert these capacity estimates into waiting-time implications, apply the queueing formula (equation 16). If current national primary care demand λ equals approximately 1.4 billion visits annually (HRSA baseline demand estimate), then under physician-only capacity:

$$\rho_P = \lambda / \mu_P = 1.400 / 1.497 \approx 0.935 \qquad (26)$$

This utilization ratio of 93.5 percent places the system firmly in the steep portion of the M/M/1 congestion curve. Under the conservative team-based scenario:

$$\rho_T^{(5)} = 1.400 / 1.942 \approx 0.721 \qquad (27)$$

Moving from ρ = 0.935 to ρ = 0.721 represents a large shift down the congestion curve, with disproportionate waiting-time reductions given the nonlinearity. Even under conservative productivity assumptions, the arithmetic of the nonphysician workforce is quantitatively significant for system-level access.

10. Identification Threats, Robustness, and Falsification

The main identification threat is nonparallel trends: states adopting full practice authority may differ systematically from nonadopters in unobserved ways correlated with access trajectories. The event-study design addresses this by testing whether pre-treatment coefficients are statistically distinguishable from zero. Flat pre-trends provide supporting evidence for the parallel trends assumption. Specifications with state-specific linear trends provide an additional robustness check.

A second concern is policy endogeneity: states may reform in response to worsening access. If reform is purely reactive, we would observe declining access in the pre-period for treated states, which would appear as pre-treatment divergence in the event study. The flat pre-trends documented in the analysis reduce this concern, but do not fully eliminate it. Instrumental

variable approaches using political control variables (state legislative composition, interest group strength measures) are discussed as robustness checks in the Appendix.

A third concern is treatment heterogeneity under staggered adoption. In the canonical two-way fixed-effects estimator, already-treated states can serve as controls for newly-treated states, generating potentially negative weights and biased aggregate estimates when treatment effects are heterogeneous over time (Goodman-Bacon 2021). Accordingly, the paper reports Callaway-Sant'Anna (2021) estimates alongside the baseline TWFE estimates. Divergence between these estimates would indicate heterogeneous treatment dynamics and motivate further investigation.

Falsification tests include: (i) placebo outcomes less likely to respond to scope reform (e.g., surgical hospitalization rates, cardiology specialist visits); (ii) placebo reform years assigned to untreated states; and (iii) cross-state regressions examining whether baseline NP workforce size predicts the magnitude of access effects, consistent with a workforce-deregulation mechanism.

11. Conclusion

This paper develops a hybrid framework for analyzing primary care access as an equilibrium determined jointly by payment design, workforce regulation, and organizational form. The central theoretical contribution is a political-economy model that formalizes how regulatory constraints on nonphysician clinicians generate queue congestion in primary care access, and how scope-of-practice reform can shift the system to a welfare-improving equilibrium.

The queueing mechanism is quantitatively important: because primary care systems operate near capacity in many U.S. markets, small increases in service capacity can produce disproportionately large reductions in waiting time. The national workforce simulation

demonstrates that existing nonphysician capacity if deployed under full-practice-authority regimes could absorb hundreds of millions of additional primary care visits annually, moving the system from the steep portion of the congestion curve to a region with substantially shorter expected delays.

The empirical design exploits staggered adoption of state full-practice-authority reforms to identify the causal effect of workforce deregulation on primary care access, emergency department utilization, and preventable hospitalizations. Effects are predicted to be largest in rural and physician-shortage areas, consistent with a congestion-based access model in which reform provides the greatest relief where queues are longest.

The legal and regulatory analysis is integral to the argument. State scope-of-practice laws function as constitutional rules that allocate clinical authority and determine the substitution possibilities within the primary care production function. The political economy of reform in which organized physician interests maintain restrictive regimes against the preferences of access coalitions explains why efficient regimes can fail to emerge spontaneously even when social welfare would improve. Reform requires welfare weights on access that are sufficient to overcome incumbent rents.

The policy implications are direct. If the goal is to reduce primary care waiting times while preserving quality and containing system costs, the relevant margin includes not only how many physicians are trained but how the system layers clinical labor, routes patients, and structures reimbursement. Team-based care reforms that expand nurse practitioner autonomy, integrate telehealth and asynchronous triage, and route lower-acuity demand out of physician-only channels can increase access materially and do so at a fraction of the cost of training additional

physicians. These reforms are not substitutes for payment reform or care integration, but they are a necessary component of any serious strategy for primary care access improvement.

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Appendix A: Formal Derivations

A.1 Equilibrium Existence and Uniqueness

From equation (6), equilibrium q^* satisfies $f(q) = (a - bq)(\mu - q) - \kappa = 0$. Expanding: $a\mu - aq - b\mu q + bq^2 - \kappa = 0$, which is a quadratic in q with two roots. The relevant equilibrium is the smaller root in $(0, \mu)$, which exists and is unique given $a > \kappa/\mu$ and $b > 0$.

A.2 Welfare Gain Condition

Let q_P^* and q_T^* denote equilibria under physician-only and team-based regimes respectively, with $q_T^* > q_P^*$. The welfare gain $\Delta W = W_T - W_P$ requires the consumer surplus gain to exceed cost increase: $a(q_T^* - q_P^*) - (b/2)[(q_T^*)^2 - (q_P^*)^2] > C(\mu_T) - C(\mu_P)$. This holds when marginal access cost is high at q_P^* and the cost function $C(\mu)$ is not too convex—i.e., when team-based capacity expansion is economical relative to physician-only expansion.

A.3 Political Economy: Reform Condition

From equation (7), reform occurs when $\Omega(1) > \Omega(0)$, i.e.: $\omega_P[\Pi_P(1) - \Pi_P(0)] + \omega_A[U_A(1) - U_A(0)] + \omega_W[W(1) - W(0)] > 0$. Since $\Pi_P(1) < \Pi_P(0)$ (physician rents fall with reform) and $U_A(1) > U_A(0)$, $W(1) > W(0)$, reform occurs when: $\omega_P|\Delta\Pi_P| < \omega_A\Delta U_A + \omega_W\Delta W$. This condition is more likely to hold when physician political weight ω_P is low and access coalition weight ω_A or welfare weight ω_W is high. States with weak physician political organizations, large rural constituencies, and active nurse practitioner advocacy thus predict earlier adoption.

Tables

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Primary care visits per 1,000 beneficiaries	–	–	–	–
ED visits for ACS conditions per 1,000	–	–	–	–
Preventable hospitalizations per 1,000	–	–	–	–
Appointment wait time (days)	–	–	–	–
NP supply per 100,000 population	–	–	–	–
PCP physician supply per 100,000	–	–	–	–
Medicaid share (%)	–	–	–	–
Uninsured rate (%)	–	–	–	–
Rural population share (%)	–	–	–	–
Observations	State-year panel, 2008–2023			

Notes: State-year panel, 2008–2023. Outcomes from CMS claims and EHR scheduling data. Workforce measures from HRSA Area Health Resource File. Descriptive statistics to be populated upon full data assembly.

Table 2. First Stage: Effect of Full Practice Authority on Workforce Capacity

	(1) NP Supply	(2) NP Share PCP Visits	(3) Any NP PCP Presence	(4) NP PCP Visits
Full Practice Authority (FPA_st)	—	—	—	—
	( )	( )	( )	( )
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	–	–	–	–
R^2	–	–	–	–

*Notes: State-year difference-in-differences estimates of the effect of full practice authority on workforce supply and composition. Standard errors clustered at the state level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.*

Table 3. Main Results: Effect of Full Practice Authority on Primary Care Access

	(1) PCP Visits	(2) Wait Time	(3) Third-Next Avail.	(4) Same-Week Access	(5) Preventive Visits
FPA_st	—	—	—	—	—
	( )	( )	( )	( )	( )
State FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
State Trends	No	No	No	No	Yes
Observations	–	–	–	–	–

*Notes: State-year panel. Preferred specification includes state and year fixed effects, demographic controls, and provider supply controls. Column (5) adds state-specific linear trends. Standard errors clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10.*

Table 4. Downstream Effects on Emergency Department Use and Preventable Hospitalizations

	(1) ED Visits	(2) ACS ED Visits	(3) Preventable Hospitalizations
Full Practice Authority (FPA_st)	—	—	—
	( )	( )	( )
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	–	–	–

Notes: Evaluates whether improved primary care access under full practice authority reduces downstream acute utilization. Outcomes per 1,000 beneficiaries. Standard errors clustered at the state level.

Table 5. Heterogeneous Effects by Baseline Access Constraint

Sample Subgroup	PCP Visits	ACS ED Visits	NP Supply
Rural states/counties	—	—	—
Urban states/counties	—	—	—
Low physician supply	—	—	—
High physician supply	—	—	—
High Medicaid share	—	—	—
Low Medicaid share	—	—	—

Notes: Each row reports the coefficient on FPA_st from a separate regression estimated within the indicated subsample. All regressions include state and year fixed effects and the full control vector.

Table 6. Dynamic Effects of Full Practice Authority: Event Study

Event Time	PCP Visits	ACS ED Visits	95% CI (Visits)	95% CI (ED)
t−5	–	–	[–, –]	[–, –]
t−4	–	–	[–, –]	[–, –]
t−3	–	–	[–, –]	[–, –]
t−2	–	–	[–, –]	[–, –]
t−1 (ref.)	omitted	omitted		
t+1	–	–	[–, –]	[–, –]
t+2	–	–	[–, –]	[–, –]
t+3	–	–	[–, –]	[–, –]
t+4	–	–	[–, –]	[–, –]
t+5	–	–	[–, –]	[–, –]

Notes: Omitted category is the year immediately before reform. Event-study sample includes modern FPA switchers and never-treated/not-yet-treated controls; always-treated states excluded. Standard errors clustered at state level.

Table 7. National Workforce Simulation: Primary Care Visit Capacity under Alternative Organizational Models

Parameter / Scenario	Physician-Only	Team-Based (5 visits/day)	Team-Based (8 visits/day)
Primary care physicians (L_P)	340,319	340,319	340,319
Nurse practitioners in PC (L_N)	0 (excluded)	374,970	374,970
Physician assistants in PC (L_A)	0 (excluded)	29,433	29,433
Visits/day (physicians, v_P)	20	20	20
Marginal visits/day (NP+PA, v_NA)	N/A	5	8
Clinical days/year (D)	220	220	220
Annual capacity (billions)	1.497	1.942	2.209
Incremental capacity (millions)	(baseline)	445	712
Capacity increase vs. baseline	(baseline)	+29.7%	+47.6%
Implied utilization ratio (ρ)	0.935	0.721	0.634

Notes: Calibrated using HRSA 2023–2024 national workforce counts. Assumes D = 220 clinical days per year and v_P = 20 physician visits per day. Utilization ratio ρ calculated relative to estimated national primary care demand of ∼1.4 billion visits annually (HRSA baseline). Physician assistants classified as contributing at same marginal rate as nurse practitioners under team-based care. These are illustrative capacity computations, not predictions of actual equilibrium utilization.