Medicare on the Back Burner? Provider Labor Supply Responses to ACA-Driven Changes in Patient Payer Mix*

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Abstract

The Affordable Care Act (ACA) has expanded private insurance coverage to millions of moderate-income Americans through premium subsidies. This study investigates the impact of these private expansions on care access and utilization for Medicare patients, using ACA-driven geographic variations in private enrollment shocks. The results show that the ACA private expansion significantly reduces utilization among fee-for-service Medicare beneficiaries: appointments decline by 7.8% (234 fewer annually per physician), physician labor input falls by 2.9%, and total Medicare spending drops by 4.9% ($5,962 annually per physician). These negative spillover effects arose primarily from physicians treating fewer existing Medicare patients and reducing follow-up visits. Guided by a model of physician capacity allocation, we show that the baseline effects and the rich cross-physician heterogeneities are in line with our promosed mechanisms of financial incentives, productivity variation, and patient risk profile. Our findings inform debates on the ACA's pros and cons and underscore challenges stemming from the fragmented health care demand.

Keywords: Affordable Care Act (ACA); Health Insurance Marketplace; Medicare utilization; Physician Supply; Spillover effects

JEL: G22, H51, I13, I18

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1 Introduction

The U.S. health care system features a fragmented demand side, with multiple payers offering significantly different reimbursement rates for the same physician services. For outpatient care, private insurers reimburse physicians at rates 43% higher than Medicare (Lopez et al., 2020), while Medicare rates are 50% greater than Medicaid rates (Zuckerman et al., 2017). These payment disparities are even more pronounced for inpatient services, where commercial rates surpass Medicare by nearly 90% (Lopez et al., 2020). These substantial gaps in payment rates may further exacerbate disparities in health care utilization and health outcomes (Vogel and Ackermann, 1998; Macinko et al., 2007; Bailey and Goodman-Bacon, 2015).

Existing literature has provided evidence on insufficient access to care for the most vulnerable Medicaid population. For example, Cunningham and May (2006), Decker (2012, 2013, 2018), and Dunn et al. (2021) find that physicians are reluctant to accept and treat new Medicaid patients. Examining physician relocation behavior, Fang et al. (2023) find that the ACA Medicaid expansion reduces the number of physicians relocating into areas with high Medicaid gains. Possible explanations include low Medicaid reimbursement rates (Polsky et al., 2015; Huh, 2021; Fang et al., 2023) and greater administrative burdens associated with processing billing claims (Cunningham and O'Malley, 2008; Huh, 2021). Oostrom et al. (2017) document that wait times for Medicaid patients are longer than for privately insured patients.

Insufficient attention has been directed towards studying physician responses to general Medicare beneficiaries,[1] due to the popular notion that Medicare and private beneficiaries enjoy comparable access to care (Boccuti et al., 2013). However, such conclusions warrant careful scrutiny, as they are drawn from non-causal comparisons.[2] Causally identifying the presence of physician discrimination against Medicare patients is particularly important, as it sheds light on the potential misallocation of care resources between Medicare's elderly population, who face greater health risks (e.g., more chronic health conditions and functional limitations), and the younger population with fewer health care needs.

In this study, we examine whether and how physicians treat Medicare patients differently by investigating the impact of the Affordable Care Act's (ACA) private insurance expansion on physicians' supply responses to Medicare beneficiaries. As the ACA became effective in 2014, the number of both Medicaid and private beneficiaries has increased by tens of millions. Concerns arise that such demand shocks from the Medicaid and private-pay markets would crowd out health care

[1] As a few exceptions, some studies document the limited access to care among specific subgroups within the Medicare population, such as those residing in rural areas (Lahr et al., 2021) and dual eligibles (CMS, 2015).

[2] For instance, Boccuti et al. (2013)'s analysis, which compares access to care between Medicare beneficiaries and private enrollees aged 50-64, did not account for potential disparities between these two patient cohorts, such as Medicare seniors' greater health care needs.

services to the existing Medicare population. Utilizing state-level variation in Medicaid expansion, Carey et al. (2020) show that the ACA Medicaid expansion does not impede Medicare patients' access to physicians. To the best of our knowledge, our study is the first to investigate the impact of the ACA's private insurance expansion on physician responses to Medicare patients.

The ACA marketplace subsidy provisions provide an ideal setting for this study. Firstly, although the marketplace subsidies and tax credits apply to moderate-income people with income-to-poverty ratios between 100 percent and 400 percent, there are substantial variations in private enrollment gains across areas due to variations in pre-ACA income distributions. This allows us to exploit the across-area variations in private demand shocks to estimate the spillover effects of private enrollment on physician services for Medicare patients. Moreover, the ACA private insurance expansion generates demand shocks among private patients without altering the demand dynamics among Medicare patients. This unique feature allows us to attribute the impact of private insurance enrollment on the utilization of Medicare services to changes in physicians' treatment of Medicare patients, without being confounded by shifts in demand among Medicare beneficiaries.

To address the potential endogeneity of private enrollment changes, we follow Currie and Gruber (1996), Dillender (2017), and Gallagher et al. (2020), and use the *predicted* number of people who are newly eligible for Medicaid and marketplace subsidies based on the state-level exogenous changes in eligibility thresholds after the ACA and the place-specific income distribution, as instruments for the *actual* enrollment gains. This instrumental variable strategy helps disentangle the demand shocks experienced by physicians from supply-side factors. This approach is akin to the use of shift-share instruments of Bartik (1991), which are weighted averages of common shocks where the weights measure the local exposures to the common shocks.[3]

To obtain causal effects, in addition to using predicted enrollment gains as instrumental variables, we utilize the finest geographic areas identified in our data – Public Use Microdata Areas (PUMA) – as the geographic units, and include city-by-year fixed effects to capture city-level time-varying unobservables, enabling comparisons between similar PUMAs within the same city.[4] Additionally, we include PUMA fixed effects and control for PUMA-level changes in income dynamics. This empirical design allows us to identify the causal effects of both Medicaid and private health insurance enrollment on physicians' Medicare supply, assuming that high- and low-private-shock PUMAs in the same city share parallel time trends in physicians' Medicare supply in the absence of the ACA. We validate the identification assumption by estimating an event study version of the model.

We find that the ACA private insurance expansion reduces the number of Medicare appoint-

[3] Falcettoni (2018) also employs a Bartik-type instrument that relies on changes in procedure-specific reimbursement rates to isolate the demand shocks for physicians.

[4] Our estimates remain robust even after controlling for insurance enrollment in adjacent PUMAs, which supports the view that PUMAs serve as appropriate delineations for physician service markets.

ments by 7.8 percent (equivalent to 234 fewer Medicare visits per year per physician), decreases physician hours worked treating Medicare patients by 2.9 percent, and results in an overall 4.9 percent reduction in Medicare expenditures, equivalent to savings of $5,962 per year per physician. Physicians reduce their care supply to Medicare patients primarily by either reducing the number of Medicare patients they serve or minimizing the number of visits scheduled for the same Medicare patient. Physician discrimination is more pronounced among existing Medicare patients compared to new enrollees, in specialty care than in primary care, and in Health Professional Shortage Areas (HPSAs). Our findings support physicians' preference for private patients over Medicare beneficiaries in a health care sector characterized by demand-side fragmentation. Consistent with Carey et al. (2020), we show that Medicaid expansion does not crowd out Medicare service utilization. Policy implications of our study include the consideration of equitable payment rates across patient groups to ensure fair and uniform treatment, particularly for Medicare seniors with the greatest health care needs.

Our study contributes to a growing body of work on the impacts of the ACA health insurance expansions. See Antonisse et al. (2016, 2017) for a comprehensive overview of studies on the effects of the ACA insurance expansions.[5]

While the main focus of existing studies has been on exploring the impact of the ACA Medicaid expansion, our paper focuses on both Medicaid and private insurance expansions under the ACA. We document that the ACA private insurance expansion unexpectedly crowds out Medicare service utilization.

Moreover, our study contributes to the literature studying the spillover effects of non-Medicare health insurance expansions, predominantly Medicaid expansion, on Medicare beneficiaries. For example, Carey et al. (2020) examine the effect of the ACA Medicaid expansion and find no spillover effects on Medicare health care use. Examining Medicaid expansion prior to the ACA, Bond and White (2013), McInerney et al. (2017), and Glied and Hong (2018) confirm that Medicaid expansion crowds out Medicare service use, while Joynt et al. (2013, 2015) and Neprash et al. (2021) do not detect any spillover effects on Medicare patients. Our finding of no significant effects of the ACA Medicaid expansion on Medicare patients adds to this line of research. More importantly, our study extends this strand of the literature by examining the impact of the ACA private insurance expansion–a health plan more likely to crowd out Medicare service use–on Medicare service use. Our findings help us understand the presence of physician discrimination

[5]In general, these studies examine the ACA's impacts on care utilization (Mulcahy et al., 2016; Miller and Wherry, 2019; Maclean et al., 2019), health outcomes (Sommers, 2017; Miller and Wherry, 2019; Borgschulte and Vogler, 2020), the use of substituting public funds (Dillender, 2015), consumers' financial well-being (Gallagher et al., 2019; Miller and Wherry, 2019; Brevoort et al., 2020), beneficiaries' labor market outcomes (Dillender, 2017; Dillender et al., 2020; Gallagher et al., 2020), along with an emerging line of research on supply-side responses (Falcettoni, 2018; Carey et al., 2020; Neprash et al., 2021; Geddes and Schnell, 2023).

against Medicare patients.

2 A Model of Capacity Allocation and Utilization Choice

In this section, we develop a model of physician capacity allocation to inform our empirical analysis. The model formalizes how physicians allocate limited labor supply across patients with different insurance types when reimbursement rates differ, and how this allocation responds to changes in demand induced by the ACA.[6] The model delivers three sets of predictions: (i) how private insurance expansion affects physician allocation across payer groups, (ii) how this reallocation manifests in observed utilization patterns, and (iii) which providers and services exhibit stronger responses. We take these predictions to the data in Section 6.

2.1 Model Setup

Patient Population. There is one physician facing a pool of potential patients with mass one. Patients differ along two dimensions: health needs, $\beta \in [0, \bar{\beta}]$, and type of insurance, $I \in \{0, 1, 2, 3\}$. Greater health needs of a patient can arise from higher health risks or severity of conditions, but can also be the result of previously unmet needs of an otherwise healthy patient. The types of insurance include no insurance ($I = 0$), Medicaid ($I = 1$), Medicare ($I = 2$), and private insurance ($I = 3$). The reimbursement rate and fraction of population under each type is denoted by r_I and s_I, respectively, where $r_3 > r_2 > r_1 > 0$ and $\sum_{I=0}^{I=3} s_I = 1$. Further, the distribution of health needs, β, is allowed to vary by insurance types, reflecting underlying demographic and socioeconomic heterogeneity and potential selection.

We focus on physician decisions on the extensive and the intensive margins for patients with at least some insurance coverage. For uninsured patients ($I = 0$), we assume they either do not seek care or are not accepted when they do.[7]

Physician Payoff. For each insured patient, the physician chooses whether to accept the patient, $A \in \{0, 1\}$, and, conditional on acceptance, how much care to provide, $q \in \mathbb{R}^+$. The physician's choice-specific payoff is as follows:

(1) The payoff of not accepting the patient ($A = 0$) is $U^0 = C$, where C is the physician's opportunity cost of providing outpatient or office-based care, such as research and leisure.

[6] The model loosely follows Alexander (2020), where a semi-altruistic, capacity-constrained physician faces a population of heterogeneous patients.

[7] These assumptions are consistent with three key features of our empirical setting. First, uninsurance makes up only 17% (2012) to 10% (post-2014) of population ages 0-64. Second, half of uninsured adults do not see a provider over the past 12 months in 2023 (Tolbert et al., 2024). Third, we focus on outpatient and office-based care, where providers are not obligated to accommodate patients regardless of ability to pay.

(2) The payoff of accepting the patient ($A = 1$) is $U^1 = \alpha h(q;\beta) + (1-\alpha)\pi(q;I)$, where the weight α captures the extent of physician altruism,[8] and

(2a) $h(q;\beta) = \beta q - \frac{1}{2\theta}q^2$ is the patient's health benefits, which implies a patient-optimal utilization of $q^{PO}(\beta) = \theta\beta$, increasing with health needs and physician productivity.

(2b) $\pi(q;I) = r_I q$ is the physician's financial incentive, assumed to be independent of β. That is, the extent of provider-induced demand of a given physician does not vary by patient health needs, and r_I has been risk- and cost-adjusted.

2.2 Optimal Physician Decisions in the Baseline

Tradeoff in Acceptance Decisions *for Patients with a Given Insurance Type*. Within the submarket of patients covered by a given type of insurance, I, the physician's problem is:

$$\max_{A,q} U^A(q;\beta,I) = \max\left\{C, U^1(q^*(\beta,I);\beta,I)\right\},$$

where the optimal utilization conditional on $A = 1$ is $q^*(\beta,I) = \theta\left(\beta + \frac{1-\alpha}{\alpha}r_I\right)$, which deviates from the patient-optimal $q^{PO}(\beta)$ more if the physician is more productive, less altruistic, or receives higher reimbursement rates. The physician's optimal payoff from acceptance is then

$$U^1(q^*(\beta,I);\beta,I) = \frac{\alpha\theta}{2}\left(\beta + \frac{1-\alpha}{\alpha}r_I\right)^2.$$

The physician's acceptance decision trades off a constant opportunity cost, C, and a U-shaped quadratic payoff, U^1, giving rise to the following optimal policy:

Proposition 1 (Optimal Cutoff Rule). Under regularity conditions and absent of capacity constraints, there exists a unique acceptance threshold for patients with each type of insurance I, $\beta_I^* \in [0,\bar{\beta}]$, such that

(1) the physician accepts a patient iff $\beta \geq \beta_I^*$;

(2) β_I^* decreases with physician productivity (θ) and reimbursement rates (r_I), and increases with physician altruism (α) and opportunity cost (C).

Proof. See Appendix A.

Figure 1 illustrates the optimal cutoff rule. The horizontal axis represents patient health needs, ranging from $\beta = 0$ to $\bar{\beta}$. The horizontal line marks the value of declining a patient, $U^0 = C$; the

[8] We use "altruism" as a proxy term to refer to any factors that may mute the physician's financial incentives.

quadratic curve depicts the value of accepting a patient *and* choosing the optimal level of utilization for the physician, $U^1(q^*(\beta, I); \beta, I)$. The upper envelope of the two is highlighted in thick solid lines, with a kink at $\beta^* I$, the optimal cutoff. Patients with $\beta \geq \beta^* I$ are accepted, while the rest are declined.

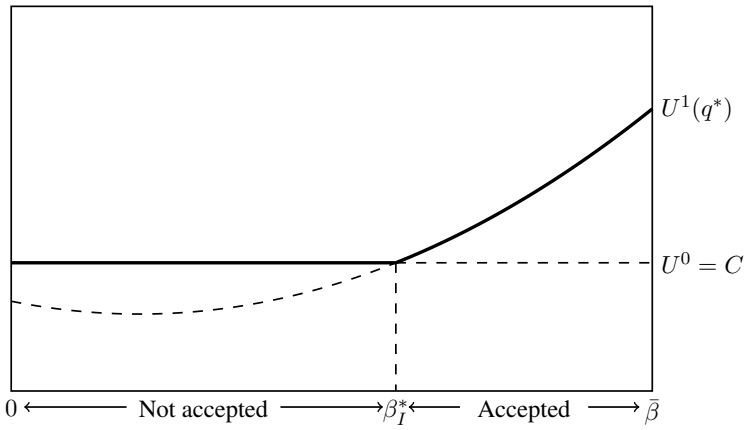


Figure 1: Optimal cutoff rule without capacity constraint (single insurance market)

2.3 Capacity Allocation Across Markets: Pre- and Post-ACA

The Marginal Condition. Following the above optimal cutoff rule, the physician decides which patients to accept within each submarket of patients covered by a given type of insurance. A physician subject to capacity constraints will then balance acceptance decisions across markets. Importantly, the marginal patient from each submarket must generate the same value for the physician, otherwise the physician can always re-allocate the slot for a net gain.

The Two-Market Example. To illustrate how the marginal condition guides capacity allocation across groups of patients, consider a physician facing only Medicare ($I = 2$) and privately-insured ($I = 3$) patients for now. The right half of Figure 2 shows the physician's tradeoff in the Medicare market; the left half shows that in the private insurance market, with its horizontal axis reversed, i.e. β decreases when moving to the right end of the axis. Note that, conditional on β, the payoff from a privately insured patient, $U^1(q^*; \beta, I = 3)$, is higher than that from a Medicare patient, $U^1(q^*; \beta, I = 2)$, due to differences in reimbursement rates, $r_3 > r_2$.

Absent a binding capacity constraint, the physician would accept Medicare patients with $\beta \geq \beta^* I = 2$ and privately insured patients with $\beta \geq \beta^* I = 3$. With a binding capacity constraint, however, these acceptance cutoffs will be increased to $\tilde{\beta}_{I=2}$ and $\tilde{\beta}_{I=3}$, such that

(1) $U^1(q^*; \tilde{\beta}_{I=2}, I = 2) = U^1(q^*; \tilde{\beta}_{I=3}, I = 3)$, i.e., the marginal patient in either market generates the same payoff for the physician; and

(2) $\int_{\tilde{\beta}_{I=2}}^{\bar{\beta}} f_{I=2}(\beta)\mathrm{d}\beta + \int_{\tilde{\beta}_{I=3}}^{\bar{\beta}} f_{I=3}(\beta)\mathrm{d}\beta = \gamma$, where f_I is the distribution of β within the population covered by insurance I and γ is the physician's capacity.

Illustration Assuming Uniform Distribution of β. For expositional convenience and without loss of generality, Figure 2 depicts the resulting cutoffs when β is uniformly distributed in both markets and $s_2 = s_3$.[9] The physician's capacity allocation problem is equivalent to finding a cutoff value for the *payoff*, such that the total mass of patients generating at least as much payoff equals the physician's capacity.[10]

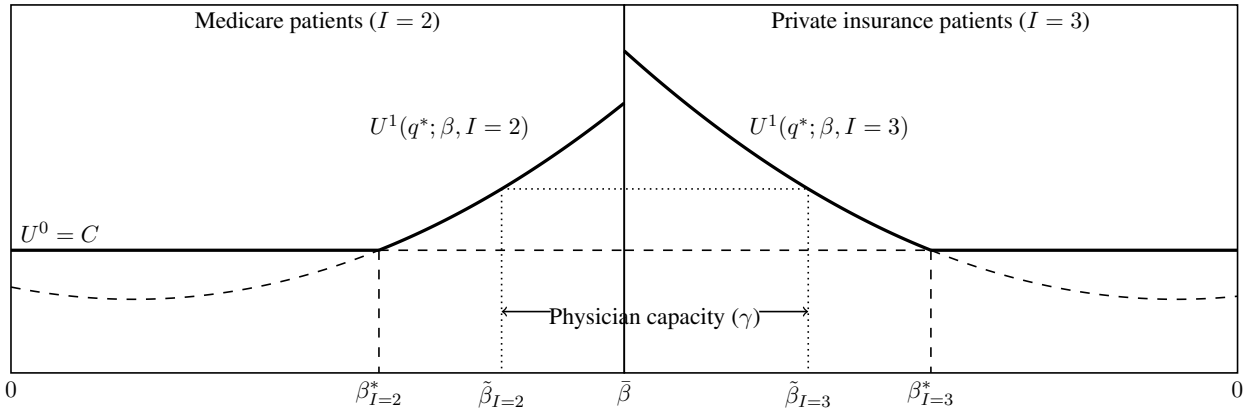


Figure 2: Capacity allocation across two insurance markets (the marginal condition)

The Effects of ACA. The expansion of the privately insured market after the ACA increases the corresponding population mass, s_3, as shown on the right of Figure 3, where the density-weighted horizontal axis stretches from $\bar{\beta}$ to 0^{post}, instead of 0^{pre}.

After new population mass enters the $I = 3$ market, the shape of $U^1(q^*; \beta, I = 3)$ also changes as long as *some* of the newly insured patients have high enough health needs β. This condition is likely satisfied because the previously uninsured patients could have accumulated unmet health needs. Note that the payoff for a *given* β remains unchanged: for example, the payoff from accepting a patient with $\bar{\beta}$ is the same under the original function (dotted line) and the new function (solid-then-dashed line); similarly, the cutoff β for accepting a patient in the absence of capacity constraint is also the same ($\beta^{*\text{post}}_{I=3} = \beta^{*\text{pre}}_{I=3}$).[11]

Under the new $U^1(q^*; \beta, I = 3)$, the physician again finds a cutoff value for the marginal payoff, which is now higher than the pre-ACA level due to more higher-value patients from the private

[9] That is, the horizontal axes should be interpreted as the density-weighted range of β.

[10] A special case where only $I = 3$ patients are accepted is possible. We discuss the conditions and the irrelevance of this case to our research question in A.

[11] These two values are shown at different points along the β-axis due to weighting and changes in the location of 0.

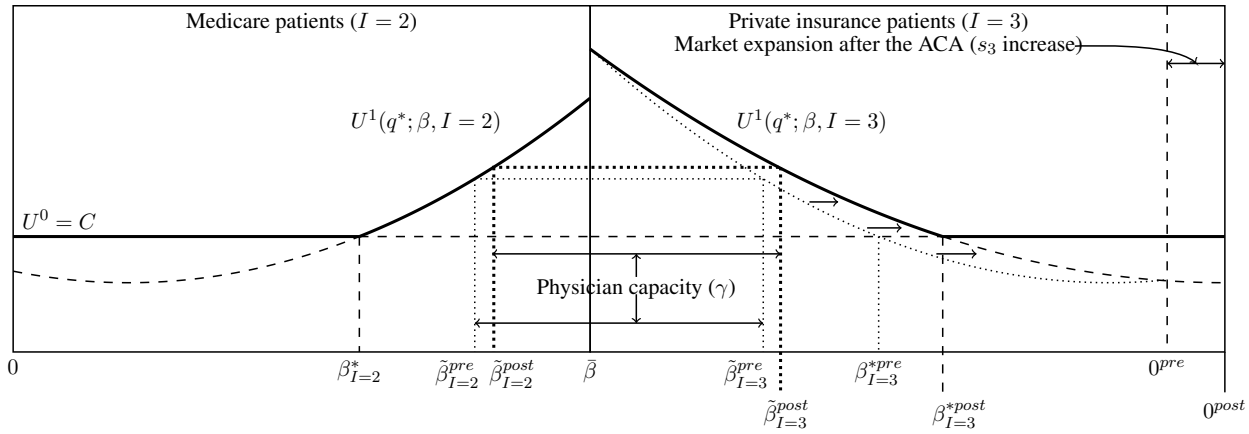


Figure 3: Capacity allocation across two insurance markets, before and after the ACA

Notes: the β-axes are weighted by distribution of β in the population in each market. With the post-ACA expansion of the private insurance market ($I = 3$), its β-axis now ranges from $\bar{\beta}$ to 0^{post}, reflecting a larger mass (s_3). Due to the scale change, the pre- and post-ACA cutoff values (β^* and $\tilde{\beta_{I=3}}$) are not directly comparable.

insurance market. With the same capacity, γ, this implies an increase in the acceptance cutoff for Medicare patients, from $\tilde{\beta}^{\text{pre}}_{I=2}$ to the higher $\tilde{\beta}^{\text{post}}_{I=2}$, resulting in the crowding-out of Medicare patients. The freed up capacity is then shifted to privately insured patients, as reflected in the move from $\tilde{\beta}^{\text{pre}}_{I=3}$ to $\tilde{\beta}^{\text{post}}_{I=3}$ in Figure 3.[12]

Medicaid Expansion. The mechanisms described above also apply to the expansion of Medicaid . But the effects on Medicare can be less visible for at least two reasons: (1) the lower Medicaid payoff ($U^1(q^*; \beta, I = 1)$) makes the corner solution case (Medicaid patients not accepted in the baseline) more likely; (2) those gaining new access to Medicaid could have relatively low health needs among the $I = 1$ population due to higher income thus their entry does not meaningfully shift U^1.

2.4 Testable Implications

Although parsimonious, our model of capacity allocation across insurance markets and optimal utilization captures the salient impacts of post-ACA expansion in private insurance and Medicaid. It also sheds light on heterogeneous responses across providers. We summarize the testable implications as follows:

Main Results: The Crowding-Out of Medicare Patients.

[12] Again, that $\tilde{\beta}^{\text{post}}_{I=3}$ is located to the right of $\tilde{\beta}^{\text{pre}}_{I=3}$ in the figure is merely the result of an expanded β-axis. In fact, $\tilde{\beta}^{\text{post}}_{I=3} > \tilde{\beta}^{\text{pre}}_{I=3}$, consistent with the increase in the payoff of the marginal patient.

(1) Extensive margin (private insurance): the post-ACA expansion of the private insurance market (s_3), coupled with the likelihood of new enrollees having greater health needs (β), will tilt physician capacity toward the privately insured and crowd out Medicare patients.

(2) Extensive margin (Medicaid): the post-ACA Medicaid expansion (s_1) has the potential to similarly crowd out Medicare, but the effects can be more muted due to low payoff (U^1) and lower health needs of the newly enrolled (β).

(3) Intensive margin (q conditional on acceptance): no effect for *individual* q^*, but the *average* q among the accepted patients of a given physician will increase due to the higher thresholds of acceptance ($\tilde{\beta}_I$).

Heterogeneous Responses. Our model sheds light on the dimensions along which heterogeneous physician responses can arise. Most notably:

Capacity constraints: the tighter the capacity constraint, or the less competitive the supply-side market, the more selective physicians can be. We expect such physicians (solo practitioners, those in provider shortage areas, or simply those already providing high volumes of Medicare services) to see more crowding out of Medicare patients post-ACA. In fact, the extremely capacity-constrained physicians would not even cater to the Medicare market, as discussed above.

Physician productivity and reimbursement rates: higher physician productivity (θ) and more generous reimbursement rates (r_I) both increase the payoff from accepting a patient, and lower the acceptance threshold (β^*). When the private insurance market expands, a lower $\beta^*_{I=3}$ in the baseline implies more new enrollees have a β above the threshold. Thus, we expect higher-productivity providers (such as specialists relative to primary care providers, doctors relative to nurse practitioners and physician assistants) and better-paid services (such as non-primary care ones) to respond more strongly to the private expansion.

Patient characteristics: as shown in Figure 3, the acceptance cutoff for patient health needs ($\beta_{I=2}$) increases after the ACA. We expect the lower-β Medicare patients to get crowded out. As a result, the accepted case mix will have great health needs, including more advanced patient age and greater health risks. Note, however, that to the extent health risks and low socioeconomic status (such as dual-eligible status) are correlated, the effect can be ambiguous, as the reimbursement rates of such patients can be lower, dampening the incentive to accept them.

Physician altruism and opportunity cost: as shown in Proposition 1, the altruism (α)–or less pronounced financial incentives–and opportunity cost (C) of a physician increases the acceptance threshold (β^*) in the baseline, limiting the extent of crowding out after the ACA. Thus, we expect to observe more crowding out of Medicare patients from physicians with lower altruism or opportunity cost, such as those working in more competitive markets.

Taken together, the model provides a unified framework for interpreting how ACA-induced demand shocks translate into changes in physician behavior. In the empirical analysis, we test these predictions by examining (i) whether private enrollment crowds out Medicare utilization, (ii) whether this operates through changes in patient volume and visit intensity, and (iii) whether responses are concentrated among capacity-constrained providers and higher-margin services.

3 Background: The ACA Insurance Expansion

3.1 The ACA Insurance Expansion Provision

The Affordable Care Act (ACA) insurance expansion provisions, which became effective in January 2014, aimed to expand insurance coverage to the low- and moderate-income uninsured in the United States. The ACA's insurance expansion provisions include Medicaid expansion, Marketplace subsidies, the individual mandate, and the employer mandate.

The Medicaid Expansion Provision requires participating states to extend Medicaid eligibility to all adults under age 65 with incomes below 138 percent of the federal poverty level (FPL). [13] In Medicaid expansion states, the ACA has significantly increased Medicaid income eligibility thresholds relative to non-expansion states, from 26 percent in 2013 to 128 percent in 2014 and gradually to 139 percent since 2016 for non-disabled adults without children, and from 110 percent in 2013 to 140 percent in 2016 for parents with dependent children (Fang et al., 2023).

Secondly, the Marketplace subsidies and individual mandate provide "Carrot and Stick" incentives for the uninsured to purchase private health insurance. Under the ACA's individual mandate, most Americans are required to obtain and maintain health insurance by May 1, 2014, or pay a monthly fee as a penalty. Marketplace subsidies, on the other hand, provide subsidies and tax credits to individuals who do not qualify for Medicaid and have income between 100% and 400% of the federal poverty level (FPL) to purchase plans through the Health Insurance Marketplace. As a result, uninsured adults aged below 65 with family incomes between 100% and 400% of FPL are eligible for subsidies to buy private insurance through the Marketplace exchange.

Finally, the ACA has also enacted an employer mandate, which requires employers with 50 or more full-time equivalent (FTE) employees to offer health insurance to at least 95 percent of

[13] Some states opted to expand Medicaid through private options. As of January 1, 2015, Arkansas, Indiana, Iowa, Michigan, Montana, New Hampshire, and Pennsylvania had been granted Section 1115 waivers to expand their Medicaid programs. Among them, Arkansas, Iowa, and New Hampshire expanded Medicaid through the private option, allowing people who qualify for Medicaid to purchase private health insurance plans on the federal and state marketplaces. The remaining four states stuck to the traditional Medicaid expansion. Notably, New Hampshire switched to a Medicaid managed care system in January 2019. In states expanding Medicaid through the private option, about 10 percent of the original Medicaid beneficiaries who were medically frail remained in the traditional Medicaid coverage plan, which increased the attractiveness of the Medicaid pool to private insurers, but decreased the profitability of treating traditional Medicaid patients.

full-time employees and their dependents under age 26.

The ACA insurance expansion has led to a substantial increase in Medicaid and private enrollment. Compared with enrollment in 2013, Medicaid enrollment increased by 4.6 million in 2014, by an additional 4.6 million in 2015, and by a further 1.7 million in 2016 (Fang et al., 2023). The number of individuals purchasing insurance on their own has increased sharply since 2014. In comparison with 2013, 2014 and 2015 saw an additional 5.6 million individuals enrolled in directly purchased plans. Enrollment remained stable in 2016 and 2017 (Fang et al., 2023).

3.2 The Spatial Variation in ACA Enrollment Change

Previous studies have provided ample evidence showing that the ACA has significantly increased insurance enrollment in Medicaid and private marketplace plans at the national and state levels (e.g., Carey et al., 2020). Figure 4 shows that these enrollment gains exhibit meaningful and substantial variations across Public Use Microdata Areas (PUMAs)[14], so it is reasonable to expect that Medicare beneficiaries in high-shock areas are at higher risk of being crowded out of medical care.

Figure 4 displays the number of Medicaid and private plan beneficiaries in an average PUMA over the 2010-2018 period by quartiles of ACA enrollment gains. Enrollment gain is calculated as the difference in insurance enrollment between 2013 and 2016, representing the cumulative effects of the ACA insurance expansion. PUMAs are divided into quartiles based on Medicaid and private enrollment gains, and the average enrollment from 2008 to 2016 is plotted for each quartile group.

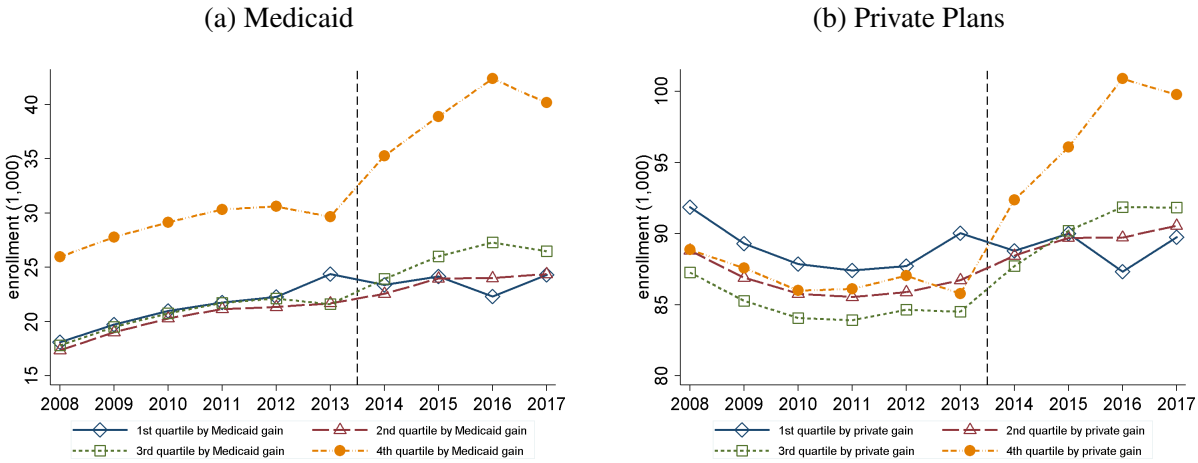
Panel (a) of Figure 4 shows substantial variation in Medicaid gains across PUMAs: the top 25% PUMAs (marked by solid circles) have gained 16,000 Medicaid enrollees after the ACA, while the number of new Medicaid enrollees is only 5,000 in the top 25%-50% PUMAs, suggesting a 6,000 gap of Medicaid enrollment gains between the two groups of PUMAs. Similarly, Panel (b) of Figure 4 demonstrates a 13,000 and 5,000 private enrollment gain after the ACA in the top 25% and 25%-50% PUMAs, respectively. The 8,000 gap in private enrollment gains is substantial for a PUMA with about 130,000 to 200,000 residents.

4 Data

Dependent Variables—The outcome variables on physicians' care provision to Medicare patients come from the 2012-2019 Medicare Part B FFS Physician Utilization and Payment data, which document outpatient care use by 100 percent Medicare patients enrolled in the fee-for-service

[14] PUMAs are the smallest identifiable geographic units in the American Community Survey. Refer to section 4 for more details.

Figure 4: Insurance Enrollment by ACA Enrollment Gains from 2008 to 2017



Notes: The figure illustrates the average enrollment per PUMA categorized by quartiles of Medicaid and private enrollment gains after the implementation of the ACA, depicted in panels (a) and (b), respectively. The ACA Medicaid and private enrollment gains are calculated as the difference between 2016 and 2013 enrollment. The PUMAs are divided into quartiles based on the magnitude of the ACA enrollment gains. Source: American Community Survey 1-year estimates as compiled by IPUMS.

(FFS) program. Health care providers in this data are uniquely identified by their national provider identifier (NPI). Diseases are classified using five-digit Healthcare Common Procedure Coding System (HCPCS) codes. Care provision is defined at the physician–disease–year level. On average, there are 9.6 million physician-disease-specific records each year, including information on service counts, beneficiary counts, provider charges, Medicare-allowed amounts and payments, place of service (facility or non-facility), and other demographic information such as the individual/organization indicator, gender, and practice address (street, city, state, and ZIP code).

To quantify the amount of work physicians provide to Medicare patients, we supplement the Medicare Part B FFS Physician Utilization and Payment data with the National Physician Fee Schedule to obtain the Work Relative Value Units (RVUs) of each service,[15] which are used to calculate the total amount of time input by care providers per year.[16] Work RVUs are effective measures of the time physicians devote to patient care. Zuckerman et al. (2014) show that service time explains the majority of the variation in work RVU, and Fang and Gong (2017) indeed use work RVU to measure the hours worked per physician.

[15]These two databases are linked based on HCPCS codes. We drop 0.009 percent of the services that cannot be matched.

[16]In practice, CMS devises RVUs to measure resource inputs for care provision and to calculate Medicare payments to providers. While the work RVU measures the time and effort spent by clinicians, the PE RVU and the MP RVU capture practice expense and malpractice costs, respectively. The formula for physician payment amount is Payment=[(Work RVU)×(Work GPCI)+(PE RVU)×(PE GPCI)+(MP RVU)×(MP GPCI)]×CF. The Geographic Practice Cost Index (GPCI) adjusts for geographic variation in practice cost, and the Conversion Factor (CF) translates the RVUs into dollar amounts.

To understand what causes changes in physicians' hours worked, we construct four additional treatment quantity measures: the total number of appointments per physician per year, the number of visits per Medicare patient per physician, the number of Medicare patients per physician, and the average work RVUs per visit per physician. To detect the presence of any downstream impacts of reductions in hours worked for service, we also examine medical expenditures, which are measured as Medicare-allowed amounts for physician services, including the Medicare portion and the out-of-pocket (OOP) cost, and are converted to real 2012 dollars using the Consumer Price Index for Medical Services.

Additionally, we merge the main data set with the National Plan and Provider Enumeration System (NPPES) by NPI to obtain provider type and specialization, as recorded in the entity type and the Healthcare Provider Classification Code Set. We drop about 3.82 percent of records as unmatched during this process. First, the entity type allows us to identify individual providers from organizational providers. Second, using the HPCCS classification code in NPPES, we then classify providers as physicians (by specialty), physician assistants, and registered nurses. In particular, physicians are classified into specialties in primary care (internal medicine, family medicine/general practice, obstetrics and gynecology, or pediatrics), and specialists.

Primary care services for Medicare patients may be more susceptible to erosion due to the increased payment rate for treating Medicaid patients under the ACA. Although Carey et al. (2020) find no spillover effect from the ACA Medicaid expansion on Medicare service provision, we nevertheless follow them and identify primary care services to facilitate a comparison of our results to theirs. Following Carey et al. (2020), we define a service as "primary care" if it received increased reimbursement in Medicaid in 2013 and 2014. The affected Medicare codes are HCPCS codes 99201-99499, 90460, 90461, 90471, 90472, and 90473. Among primary care services, we further identify the services that are delivered to new Medicare patients, with the remaining services classified as delivered to existing patients. In particular, primary care services with HCPCS codes 99201-99205 are identified as primary care services for new patients. We use this classification to test whether any ACA spillover effects are concentrated among new patients.

Independent Variables—Our main independent variables come from the IPUMS American Community Survey (ACS), which provides detailed information for each respondent on health insurance, location, income, and other socio-demographic characteristics. Following Fang et al. (2023), we pick the smallest identifiable geographic unit used in the ACS – the Public Use Microdata Area (PUMA)– as the geographic unit throughout the analysis in this paper. Although constructed for tabulation purposes, PUMAs are meaningful local markets for health care demand. First, the PUMA delineation follows the principle that the census tracts or counties within the same PUMA are geographically contiguous and share similar demographics, economic conditions, and topography. Second, PUMA boundaries are nested within state boundaries and are aligned as

closely as possible with metropolitan area boundaries. Third, PUMAs are delineated based on population or healthcare demand, so that each PUMA contains a population between 100,000 and 200,000 persons.[17] We calculate insurance enrollment in private plans, Medicaid, and Medicare for 2,035 PUMAs over the 2012-2019 period. To test the robustness of the estimates, we also construct time-varying demographic and economic covariates for each PUMA, including the unemployment rate, the percentages of the population (such as in the labor force, female, White, Hispanic, under 35, 65 or older, high school dropouts, high school graduates, some college or higher), and total income in 2013 dollars. The PUMA-year dataset is linked with the Medicare Part B FFS Physician Utilization and Payment data based on PUMA and year. About 15.45 percent of observations of physician service provision are dropped in places without insurance information.

Sample Selection— We have 4,842,012 provider-year observations, with 904,105 providers and 2,336 PUMAs. We construct a balanced provider panel, yielding 1,753,432 observations with 219,179 physicians, and 2,883,360 observations with 360,045 physician assistants and nurses.

4.1 Data Summary

Table 1 presents summary statistics for the average insurance enrollment and other socio-demographic characteristics per PUMA, as well as physicians' annual labor supply to Medicare patients. Panel A of Table 1 compares changes in insurance enrollment between PUMAs with below-median and above-median enrollment gains before and after the implementation of the ACA. Regarding total enrollment gains after the ACA, the ACA led to an increase of approximately 4 to 6 percentage points in the number of insured individuals across PUMAs with both low and high enrollment gains. However, there is substantial variation between PUMAs with low and high Medicaid gains. High-Medicaid-gain PUMAs experienced an increase of 8,000 Medicaid enrollees (a 5-percentage-point increase), while low-gain PUMAs had a gain of 3,000 Medicaid enrollees (a 2-percentage-point increase). Moreover, private enrollment gains were slightly larger in low-Medicaid-gain PUMAs, indicating a negative correlation between Medicaid gains and private gains. Regarding Medicare gains, the changes were similar across low- and high-Medicaid-gain PUMAs.

Similarly, there was substantial variation in private plan enrollment gains between low- and high-private-gain PUMAs. Following the ACA, high-private-gain PUMAs experienced an increase of 8,400 private plan enrollees (a 2-percentage-point increase), significantly higher than the addi-

[17] A PUMA can be 1) a county PUMA where the county meets the minimum threshold of 100,000 persons but contains no more than 200,000 persons. In the state of Ohio, for example, 13 out of 88 counties form a county PUMA; 2) a counties PUMA where two or more contiguous counties, if each is not populous enough to be counted as a PUMA on its own, may be aggregated to create a counties PUMA (e.g., three counties–Athens, Gallia, and Meigs together form a counties PUMA); 3) a city-part PUMA that comprises a part of a city. For example, the central and northeast Columbus in Ohio each form a city-part PUMA; 4) a city PUMA where several adjacent cities or city parts are combined to form a PUMA.

Table 1: Summary Statistics

	By Private Gain	Pre-ACA	Post-ACA	Diff	Diff-in-Diff	By Medicaid Gain	Pre-ACA	Post-ACA	Diff	Diff-in-Diff
Panel A. PUMA-level Insurance Enrollment										
population	Below Median	126,381	129,003	2,622***	2,070**	Below Median	131,020	135,668	4,648***	-1,974*
	Above Median	141,953	146,645	2,674***		Above Median	137,933	140,607	2,674***	
Insured	Below Median	112,635	120,580	7,944***	4,876***	Below Median	109,856	119,545	9,689***	1,565*
	Above Median	114,863	127,684	12,821***		Above Median	117,912	129,166	11,254***	
Private	Below Median	90,200	93,667	3,467***	4,256***	Below Median	83,312	90,165	6,852***	-2,456***
	Above Median	82,350	90,074	7,724***		Above Median	89,164	93,561	4,397***	
Medicaid	Below Median	19,957	23,791	3,834***	517	Below Median	22,836	24,844	2,008***	4,294***
	Above Median	28,380	32,731	4,351***		Above Median	25,815	32,117	6,301***	
Medicare	Below Median	20,574	22,718	2,144***	381	Below Median	21,133	23,510	2,377***	-75
	Above Median	22,060	24,585	2,525***		Above Median	21,554	23,856	2,302***	
Panel B. PUMA-level demographics										
Income Per Capita	Below Median	30,462	32,676	2,213***	-374	Below Median	26,915	28,782	1,867***	317
	Above Median	24,124	25,963	1,839***		Above Median	27,507	29,690	2,183***	
Unemployed	Below Median	0.083	0.056	-0.027***	-0.006***	Below Median	0.086	0.057	-0.029***	-0.003**
	Above Median	0.097	0.064	-0.033***		Above Median	0.095	0.063	-0.032***	
Female	Below Median	0.509	0.508	-0.001	0.001*	Below Median	0.509	0.509	-0.000	-0.000
	Above Median	0.507	0.507	0.000		Above Median	0.506	0.506	-0.000	
White	Below Median	0.809	0.801	-0.008*	0.001	Below Median	0.764	0.758	-0.006	-0.003
	Above Median	0.723	0.715	-0.007		Above Median	0.766	0.756	-0.010*	
Hispanic	Below Median	0.097	0.103	0.006**	0.002	Below Median	0.17	0.178	0.008	-0.002
	Above Median	0.246	0.254	0.008		Above Median	0.178	0.184	0.006	
Age $>$ 65	Below Median	0.144	0.158	0.014***	-0.001	Below Median	0.14	0.154	0.013***	0.000
	Above Median	0.134	0.147	0.013***		Above Median	0.137	0.151	0.014***	
Age $<$ 35	Below Median	0.455	0.448	-0.007***	-0.002	Below Median	0.47	0.462	-0.008***	0.001
	Above Median	0.483	0.474	-0.009***		Above Median	0.469	0.461	-0.007***	
High School Dropouts	Below Median	0.09	0.086	-0.004***	-0.002*	Below Median	0.101	0.096	-0.005***	-0.001
	Above Median	0.11	0.104	-0.006***		Above Median	0.100	0.094	-0.006***	
High School Graduates	Below Median	0.215	0.213	-0.002	0.004	Below Median	0.215	0.215	0.000	-0.001
	Above Median	0.217	0.219	0.002		Above Median	0.218	0.217	-0.001	
Some College and Above	Below Median	0.475	0.489	0.014***	0.001	Below Median	0.442	0.456	0.014***	0.001
	Above Median	0.414	0.429	0.015***		Above Median	0.445	0.46	0.015***	
Panel C. Physician-level Annual Labor Supply										
Visits	Below Median	2,668	2,997	329***	146***	Below Median	3,587	4,099	511***	-220***
	Above Median	3,545	4,020	474***		Above Median	2,624	2,915	291***	
Work RVUs	Below Median	1,780	1,729	-52***	-44***	Below Median	2,102	2,018	-84***	20***
	Above Median	2,171	2,076	-96***		Above Median	1,849	1,785	-64***	
Costs	Below Median	112,396	110,812	-1,583***	-3,190***	Below Median	136,980	133,435	-3,545***	741
	Above Median	138,634	133,861	-4,773***		Above Median	113,991	111,187	-2,804***	
Patients	Below Median	1,119	1,126	7*	-31***	Below Median	1,383	1,367	-17***	17***
	Above Median	1,368	1,344	-24***		Above Median	1,103	1,103	0	
Visit per Patient	Below Median	2.114	2.275	0.16***	0.029	Below Median	2.225	2.425	0.20***	-0.050***
	Above Median	2.202	2.392	0.19***		Above Median	2.091	2.242	0.15***	
Work RVUs per Visit	Below Median	1.275	1.271	-0.004	0.004	Below Median	1.240	1.240	0.00	-0.005
	Above Median	1.282	1.282	-0.00		Above Median	1.318	1.313	-0.005*	

Notes: This table reports summary statistics at the PUMA-year level (Panels A and B) and physician-year level (Panel C). Private gain and Medicaid gain refer to changes in private and Medicaid insurance enrollment after the ACA, and are measured as the difference between 2016 and 2013 enrollment. PUMAs are grouped into above- and below-median gain categories based on private and Medicaid gains, respectively. Pre-ACA refers to the period before the ACA implementation (up to 2013), and Post-ACA refers to the period following implementation (2014 onward). Diff is the within-group difference in means between Post-ACA and Pre-ACA periods. Diff-in-Diff reports the difference in pre-post changes between above-median and below-median groups. All monetary values are inflation-adjusted to 2012 dollars. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

tional 1,400 private enrollees (a 0.2-percentage-point increase) in low-gain PUMAs. The changes in Medicare enrollment were similar in PUMAs with low and high private gains.

Panel C of Table 1 shows the quantity of physician treatment to Medicare patients across low- and high-enrollment-gain PUMAs before and after the ACA. The enrollment gain is the difference in enrollment between 2016 and 2013. PUMAs are divided into two groups of equal size according to the enrollment gain. There are no discernible differences in Medicare care provision (e.g., the total number of physician appointments, total work RVUs per physician, total Medicare expenditures, the total number of Medicare patients, the number of appointments scheduled for each

Medicare patient, and work RVUs per visit) between low- and high-enrollment-gain PUMAs.

5 Empirical Strategy

5.1 Difference-in-Differences Model

To quantify the effect of the ACA insurance expansion on physician care provision to Medicare patients, we estimate the following model linking the care provision to Medicare patients by provider i in PUMA p and year t (denoted by Y_{ipt}) to the demand from Medicaid- and private-pay markets in PUMA p, measured by Medicaid and private enrollment, EnrollCaid_{pt} and EnrollPriv_{pt}.

$$\ln \mathrm{Y}_{ipt} = \delta \text{EnrollCaid}_{pt} + \gamma \text{EnrollPriv}_{pt} + \theta_i + \theta_{c,t} + \epsilon_{it}. \tag{1}$$

The care provision to Medicare patients, Y_{ipt}, is measured by multiple variables, including the volume of Medicare appointments, the work-related RVUs, and medical expenditures. We take natural logarithms of the outcome variables so that the estimated parameters can be interpreted as percent changes. We use the inverse hyperbolic sine function to transform outcome variables that may take the value of zero.[18] EnrollCaid_{pt} and EnrollPriv_{pt} respectively represent the Medicaid and private enrollment (in units of 10,000) in PUMA p in year t.[19] Parameters δ and γ capture the respective impacts of the Medicaid and private insurance enrollment on provider care provision to Medicare patients, which can be interpreted as the percent change in Medicare service supply in response to an increase of 10,000 private or Medicaid beneficiaries in an area with about 130,000 to 200,000 people. The regressions are weighted by each provider's pre-ACA volume of Medicare visits. The standard errors are clustered at the city-by-year level, which allows additional complex correlations within a city at a particular year.

To obtain causal estimates of δ and γ, the readily available instrumental variables are the raw changes in insurance enrollment before and after the ACA, which could nevertheless be subject to the omitted variable problem. The insurance enrollment gain after the ACA may be correlated with unobservable local socio-demographic conditions that, in turn, affect provider supply. For example, a disadvantaged area may simultaneously experience declines in insurance enrollment and physician supply.

We thus employ two strategies to address the above challenges in the identification of δ and γ. Firstly, we include a rich set of fixed effects to account for possible correlations and heterogeneity in the error term, which include the provider specific fixed effect θ_i, and city-by-year fixed effects

[18] In our data, we obtain similar estimates using either logarithmic transformation or IHS transformation.

[19] For a PUMA with a total population between 130,000 and 200,000, a 10,000 enrollment gain is of moderate magnitude. We also rescale enrollment gains to thousands, and the results remain robust.

$\theta_{c,t}$, so that our comparison is made between the high- and low-shock PUMAs in the same city.[20] Secondly, to address the concern that PUMA-level unobservables are correlated with both ACA health insurance enrollment gains and provider supply, we follow Fang et al. (2023) and use the simulated eligibility method to construct instrumental variables for the ACA insurance enrollment gains. We predict the changes in the number of people newly eligible for Medicaid and private insurance, based on the time-unvarying PUMA-level income distribution and other demographics before the ACA, and the exogenous variations in the income eligibility for Medicaid and Marketplace subsidies under the ACA reform. We estimate a two-stage least-squares (2SLS) regression model where the first stage specification is a difference-in-differences model with continuous treatment:

$$\begin{aligned} \text{EnrollCaid}_{pt} &= \pi_{11}\text{PredChnCaid}_p \times \text{PostACA}_t + \pi_{12}\text{PredChnPriv}_p \times \text{PostACA}_t \\ &\quad + \theta_p + \theta_{ct} + e_{pt}, \end{aligned} \tag{2}$$

$$\begin{aligned} \text{EnrollPriv}_{pt} &= \pi_{21}\text{PredChnCaid}_p \times \text{PostACA}_t + \pi_{22}\text{PredChnPriv}_p \times \text{PostACA}_t \\ &\quad + \theta_p + \theta_{ct} + \vartheta_{pt}. \end{aligned} \tag{3}$$

PredChnCaid_p and PredChnPriv_p denote, respectively, the predicted number of newly eligible people for Medicaid and marketplace subsidies, which are calculated based on simulating eligibility and thus depend on whether a state adopted the Medicaid expansion, the magnitude of any increase in the Medicaid income eligibility threshold, and the pre-ACA PUMA-level income distribution. π_{11} and π_{22} can be interpreted as the take-up rates of Medicaid and individual marketplace subsidies under the ACA, which should be significant and positive for valid instruments.

With two endogenous variables and two instruments, the parameters of interest, δ and γ, are exactly identified and can be interpreted as the average treatment effects of Medicaid and private demand shocks on the supply of medical care to Medicare patients, under the assumptions that providers practicing in high- and low-predicted-gain PUMAs within the same city show parallel time trends in care provision to Medicare patients absent the ACA, and that the instrumental variables are relevant and exclusive.

[20] A city refers to three types of geographic groupings: metropolitan cities, micropolitan cities, and non-city (rural) areas within each state. To construct these groupings, we use a PUMA-to-city crosswalk provided by the Missouri Census Data Center's geocorr tool, which assigns each PUMA to a specific metropolitan or micropolitan area, or to a residual non-city area within the state. When a PUMA spans multiple areas, we assign it to the area containing the largest share of its population. In total, this classification includes all metropolitan and micropolitan cities, along with 48 non-city (rural) areas—one for each state in our sample, excluding the District of Columbia.

5.2 Event Study Model

To test for pre-ACA trends and examine treatment effect dynamics, we estimate the following event study model with continuous treatment:

$$\begin{aligned}\ln \mathrm{Y}_{ipt} = \text{PredChnCaid}_p \times \left[\delta_{-2}\mathrm{I}\left(t-2014=-2\right) + \sum_{s=1}^{5}\delta_s \mathrm{I}\left(t-2014=s\right)\right] \\ + \text{PredChnPriv}_p \times \left[\gamma_{-2}\mathrm{I}\left(t-2014=-2\right) + \sum_{s=1}^{5}\gamma_s \mathrm{I}\left(t-2014=s\right)\right] \\ + \theta_i + \theta_{c,t} + \epsilon_{it}.\end{aligned} \tag{4}$$

Here, δ_s and γ_s show how outcome variables evolve in high-shock PUMAs relative to low-shock PUMAs, using 2013–the year immediately preceding ACA implementation in 2014–as the reference year. If δ_{-2} and γ_{-2} are close to zero and statistically insignificant, this provides support for the parallel trends assumption that high-shock and low-shock PUMAs in the same city experienced similar pre-trends in outcomes. Any estimated divergence in outcomes between the two groups of PUMAs during the post period, captured by δ_s and γ_s for $s = 1, ..., 5$, can then be attributed to the policy change and interpreted as the intent-to-treat effects of the ACA insurance expansion on care provision to Medicare patients.

5.3 Simulating the ACA Impact

Based on the causal estimates of δ and γ, we then use a back-of-the-envelope method to derive the impacts of the ACA insurance expansion on the supply of medical care to Medicare patients. δ and γ denote the causal effect of every additional 10,000 Medicaid or private enrollees on care provision to Medicare patients. Our first step is to calculate the insurance enrollment change due to the ACA insurance expansion for an average PUMA. We multiply the average predicted Medicaid and private enrollment gains by the estimated take-up rates, π_{11} and π_{22}, respectively, to approximate the ACA-induced enrollment gains. Next, we multiply these ACA-induced enrollment gains by the corresponding estimated parameters of interest, δ or γ, to obtain the impacts of the ACA Medicaid expansion and Marketplace plan subsidies on medical care for Medicare patients.

6 Results

6.1 The Effect of Predicted Enrollment on Actual Enrollment

In this study, we utilize predicted enrollment gains resulting from ACA-induced changes in income eligibility limits as exogenous shocks to actual insurance enrollment. To demonstrate the validity of the instrumental variables, Figures 5(a) and 5(b) display the temporal effects of predicted Medicaid and private enrollment on actual Medicaid and private enrollment, respectively.

The positive and statistically significant post-ACA estimates in Figure 5 indicate that predicted enrollment gains are relevant instruments for actual enrollment. Medicaid sign-up rates among the eligible low-income population rose initially, peaked in 2016, and then declined, suggesting setbacks in enrollment. In contrast, participation in Marketplace plans steadily increased throughout the sample period, reflecting the growing popularity of these plans. Table 2 reports difference-in-differences estimates, showing that approximately 21% of newly eligible low-income individuals enrolled in Medicaid between 2014 and 2018. By comparison, 53.2% of otherwise uninsured individuals eligible for Marketplace plans enrolled during the same period. The first-stage F-statistics reported in Table 2 range from 30 to 40, supporting the strength and relevance of the predicted enrollment instruments. To shed light on the exogeneity of the instruments, we note that pre-ACA estimates in Figure 5 are close to zero and statistically insignificant, suggesting that predicted enrollment gains do not forecast insurance enrollment prior to the ACA.

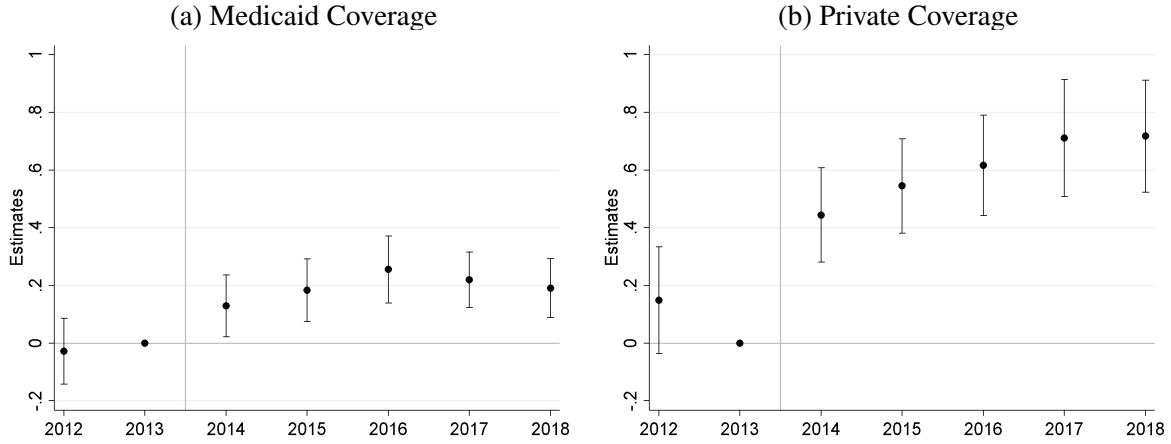


Figure 5: First-Stage Event Study Estimates

Notes: Figure (a) presents event study estimates of the effect of predicted Medicaid gains on actual Medicaid enrollment, based on equation (4) with actual Medicaid enrollment as the dependent variable. Figure (b) shows analogous estimates of the effect of predicted private gains on actual private enrollment. All estimates are reported with 95% confidence intervals.

Source: American Community Survey 1-year estimates (IPUMS).

Table 2: First-Stage Estimates: The Effect of Predicted Enrollment on Actual Enrollment

Dependent Variables	Private Enrollment		Medicaid Enrollment	
PredChnPriv×postACA	0.532***	0.543***	0.192***	0.200***
	(0.0577)	(0.0571)	(0.0440)	(0.0438)
PredChnCaid×postACA	-0.026	-0.018	0.210***	0.216***
	(0.0446)	(0.0451)	(0.0332)	(0.0333)
Medicare Enrollment		0.240***		0.176***
		(0.0463)		(0.0354)
F-stat	44.78	40.26	35.32	30.18
Observations	1,977,892	1,977,892	1,977,892	1,977,892
R-squared	0.986	0.986	0.970	0.970

Notes: This table presents the first-stage effects of predicted changes in private and Medicaid enrollment on the actual private and Medicaid enrollment, respectively. Both predicted and actual insurance enrollments are measured in units of 10,000 enrollees. Estimation equations for private and Medicaid enrollment are shown in equations (2) and (3), respectively. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: American Community Survey 1-year estimates (IPUMS).

6.2 The Effect of Insurance Enrollment on Physician Care Provision to Medicare Patients

6.2.1 Main Results

We first report estimation results for the effects of private and Medicaid enrollment on physician service provision to Medicare patients. Given that Carey et al. (2020) find no evidence that Medicaid expansion crowds out Medicare service use, we place particular emphasis on examining the potential crowding-out effects driven by private enrollment. We focus on physician provision of FFS outpatient services, measured annually at the physician level by Medicare visits, total Medicare expenditures, and labor input, proxied by work relative value units (RVUs).

Table 3 presents difference-in-differences estimates for each of these three dimensions of physician care provision. Columns (1), (4), and (7) report the baseline estimates from equation (1). To assess the robustness of our specification, we also estimate two alternative models. Columns (2), (5), and (8) show results from excluding Medicaid enrollment from the baseline model, while columns (3), (6), and (9) report estimates that include a control for Medicare enrollment, which serves as a proxy for Medicare demand dynamics. We take the baseline estimates as our main results. Consistent with the model's prediction on capacity reallocation in Section 2.3, we find that private enrollment crowds out physician care for Medicare patients. Specifically, if a physician practices in a PUMA that experienced an increase of 10,000 privately insured individuals post-ACA, the physician would reduce Medicare appointments by 22.7% (685 visits annually or

approximately 1.88 per day), reduce annual labor hours for Medicare patients by 8.4%, and generate a 14.2% decline in Medicare expenditures—equivalent to $17,417 per physician per year. In line with Carey et al. (2020), the estimated effects of Medicaid enrollment are small and statistically insignificant, suggesting that increases in Medicaid coverage do not displace Medicare service provision. Moreover, the results from the alternative specifications confirm that the estimated crowd-out effect of private enrollment remains stable regardless of whether Medicaid or Medicare enrollment is included as a control. This pattern is in line with the model's prediction that private demand shocks shift physician capacity toward higher-reimbursement patients.

The baseline estimates reflect the marginal effect of an additional 10,000 private enrollees on Medicare service provision at the physician level. To approximate the total effect of the ACA-induced private insurance expansion, we conduct a back-of-the-envelope calculation. In our sample, the average PUMA gained 3,423 additional privately insured beneficiaries due to the ACA.[21] Scaling our baseline estimates by this gain implies that the ACA Marketplace expansion led to a 7.8% reduction in Medicare appointments (234 visits per physician per year), a 2.9% reduction in labor input, and a 4.9% reduction in Medicare expenditures—equal to $5,962 annually per physician. Given approximately one million practicing physicians in the U.S., this implies Medicare savings of roughly $6 billion per year.

Decomposing Physician Labor Supply.— To provide more direct evidence of the crowd-out effect, we decompose physicians' labor supply into three components: the number of Medicare patients seen, the frequency of visits per patient, and the time spent per visit. Table 4 presents the corresponding estimates. Following an increase in private insurance enrollment, physicians reduce both the number of Medicare patients and the number of visits per patient, but increase the time spent per visit. This pattern is consistent with the model's implication that physicians reallocate their fixed capacity across patients, adjusting along both extensive and intensive margins.

Specifically, in response to an additional 10,000 private beneficiaries, the average physician treats 10% fewer Medicare patients—approximately 126 fewer per year—schedules 14% fewer visits per Medicare patient, and increases time per visit by 4.5%, or roughly 2.7 additional minutes for a one-hour appointment. Scaling these effects by one third to reflect the average ACA-induced private enrollment gain, we estimate that the ACA Marketplace expansion led to approximately 3.5% of Medicare patients losing access to care per physician.

Figure 6 complements the regression results by presenting event study estimates. The pre-ACA coefficients are near zero and statistically insignificant, supporting the common trends assumption. Post-ACA patterns broadly mirror the difference-in-differences findings, with one notable nuance:

[21] To estimate ACA-induced private enrollment gains, we first compute the average predicted increases in private and Medicaid enrollment for PUMAs in Medicaid expansion states (7,041 and 12,409, respectively). We then apply the first-stage coefficient from column (1) of Table 2 to simulate realized ACA-driven private enrollment gains.

Table 3: The Effects of Insurance Enrollment on Physician Care Provision to FFS Medicare Patients

Dependent Variables	Annual Medicare Visits			Annual WorkRVU			Annual Total Cost		
In logs	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Private Enrollment	-0.258***	-0.228***	-0.256***	-0.088***	-0.107***	-0.087***	-0.153***	-0.162***	-0.152***
	(0.0832)	(0.0584)	(0.0831)	(0.0315)	(0.0223)	(0.0312)	(0.0544)	(0.0390)	(0.0541)
Medicaid Enrollment	0.058		0.077	-0.037		-0.028	-0.016		-0.004
	(0.0956)		(0.0964)	(0.0372)		(0.0373)	(0.0594)		(0.0598)
Medicare Enrollment			0.116***			0.054***			0.076***
			(0.0275)			(0.0092)			(0.0157)
Pre-ACA Mean	3,013				1,941	1,941	$122,766	$122,766	$122,766
percent change	-0.227						-0.142		
Absolute Change	-685						-$17,417		
Physicians	282,556								
Observations	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892

Notes: Insurance enrollment denotes the number of enrollees in units of 10,000 in a PUMA. The outcome variables measure the physician supply to Medicare patients per year. The instrumental variable estimates are obtained from conducting the 2SLS estimation procedure as specified in equations (1)-(3). Percent Change is calculated using the formula: $e^{estimates} - 1$. We multiply the percent change by the pre-ACA average of the outcome variable to obtain the absolute change for an increase of 10,000 non-Medicare beneficiaries. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

the increase in time per visit appears particularly pronounced in later years, suggesting that physicians may be reallocating time toward more complex remaining patients or compensating for fewer visits with longer appointments. Consistent with prior analyses, Medicaid enrollment shows no meaningful effect across these outcomes.

6.2.2 Identification Assumption and Robustness Checks

Common Trend Assumption.—To assess the validity of the parallel trends assumption, Figure 7 reports event study estimates of the effects of predicted enrollment changes on physician care provision to Medicare patients, based on equation (4). The pre-ACA estimates are statistically insignificant and close to zero, indicating no discernible differential trends in Medicare service provision between higher- and lower-gain PUMAs prior to the ACA. This pattern holds across all three measures of physician labor supply, further supporting the common trends assumption. In the post-ACA period, the negative spillover effects of private enrollment on Medicare care provision appear to grow stronger over time. In contrast, we find no systematic effect of Medicaid enrollment on Medicare service use, consistent with findings in Carey et al. (2020), who attribute this null effect to Medicaid's lower reimbursement rates and more burdensome claims processes.

One potential concern with the event study is the short pre-ACA window in the FFS Medicare utilization data. To address this concern, we follow the approach of Bailey and Goodman-Bacon

Table 4: The Effects of Insurance Enrollment on Physician Care Provision to FFS Medicare Patients: Decomposing by Patient Volume and Treatment Intensity

Dependent Variables	Number of Medicare Patients			Visits per Medicare Patient			Work RVU per Medicare Visit		
In logs	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Private Enrollment	-0.107***	-0.127***	-0.106***	-0.152**	-0.102**	-0.151**	0.044***	0.037***	0.044***
	(0.0391)	(0.0265)	(0.0386)	(0.0595)	(0.0426)	(0.0596)	(0.0168)	(0.0131)	(0.0168)
Medicaid Enrollment	-0.038		-0.028	0.097		0.105	-0.014		-0.017
	(0.0474)		(0.0475)	(0.0654)		(0.0656)	(0.0183)		(0.0183)
Medicare Enrollment			0.064***			0.052**			-0.016***
			(0.0106)			(0.0214)			(0.0060)
Pre-ACA Mean	1,243			2.16			1.28		
percent change	-0.101			-0.14			0.045		
Absolute Change	-126			-0.30			0.06		
Physicians	282,556								
Observations	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892	1,977,892

Notes: Insurance enrollment denotes the number of enrollees in units of 10,000 in a PUMA. The outcome variables measure the physician supply to Medicare patients per year. The instrumental variable estimates are obtained from conducting the 2SLS estimation procedure as specified in equations (1)-(3). Percent Change is calculated using the formula: $e^{estimates} - 1$. We multiply the percent change by the pre-ACA average of the outcome variable to obtain the absolute change for an increase of 10,000 non-Medicare beneficiaries. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

(2015) and Goodman-Bacon (2018) and test whether our instruments predict trends in socioeconomic characteristics during the extended pre-ACA period (2008–2013). The specification is as follows:

$$\begin{aligned} \mathrm{X}_{pt} = {} & \delta_{11}\mathrm{PredChnCaid}_p + \delta_{12}\mathrm{PredChnCaid}_p \times (t - 2014) + \delta_{21}\mathrm{PredChnPriv}_p \\ & + \delta_{22}\mathrm{PredChnPriv}_p \times (t - 2014) + \theta_p + \theta_{ct} + e_{pt}. \end{aligned} \tag{5}$$

where X_{pt} denotes socioeconomic outcomes in PUMA p and year t, including income per capita, unemployment rate, educational attainment, and demographic characteristics. We test for balance both in pre-ACA levels ($H_0 : \delta_{11} = 0, \delta_{21} = 0$) and in linear pre-ACA trends ($H_0 : \delta_{12} = 0, \delta_{22} = 0$). We expect predicted insurance enrollment to be correlated with levels of socioeconomic variables prior to the ACA, as lower-income areas were likely to experience larger gains in coverage due to higher pre-ACA uninsured rates. However, for the predicted enrollment changes to be considered exogenous, they should not be associated with differential trends in observable characteristics before the ACA. As shown in Table 5, PUMAs with larger predicted enrollment gains do tend to have worse baseline socioeconomic conditions (e.g., lower income, higher unemployment, larger minority shares, and lower educational attainment). However, we find no evidence of divergence in trends for these variables before the ACA; all coefficients on the interaction terms are statistically insignificant. These findings support our identifying assumption that PUMAs with

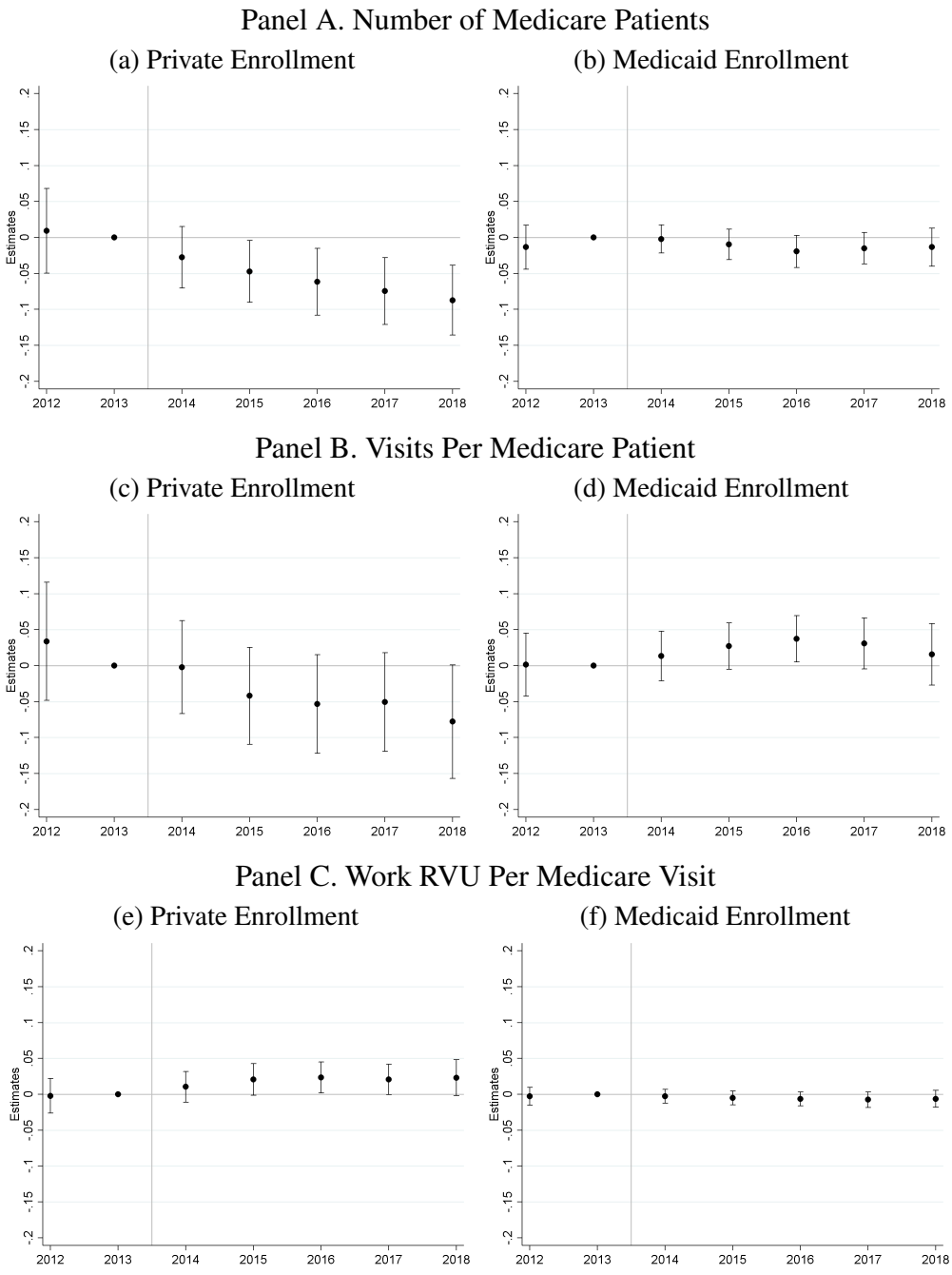


Figure 6: Event Study Estimates: Decomposing by Patient Volume and Treatment Intensity

Notes: The figures illustrate the event study estimates of the impact of predicted Medicaid and private enrollment on components of physician supply to Medicare patients, which include the total number of unique Medicare patients treated per year, the number of visits per Medicare patient, and the work RVU or hours worked per Medicare visit. The estimation is based on the event study model of equation (4).

Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

differing levels of predicted enrollment gains followed parallel trends in observable socioeconomic characteristics prior to the ACA, strengthening our confidence that, absent the ACA, these areas

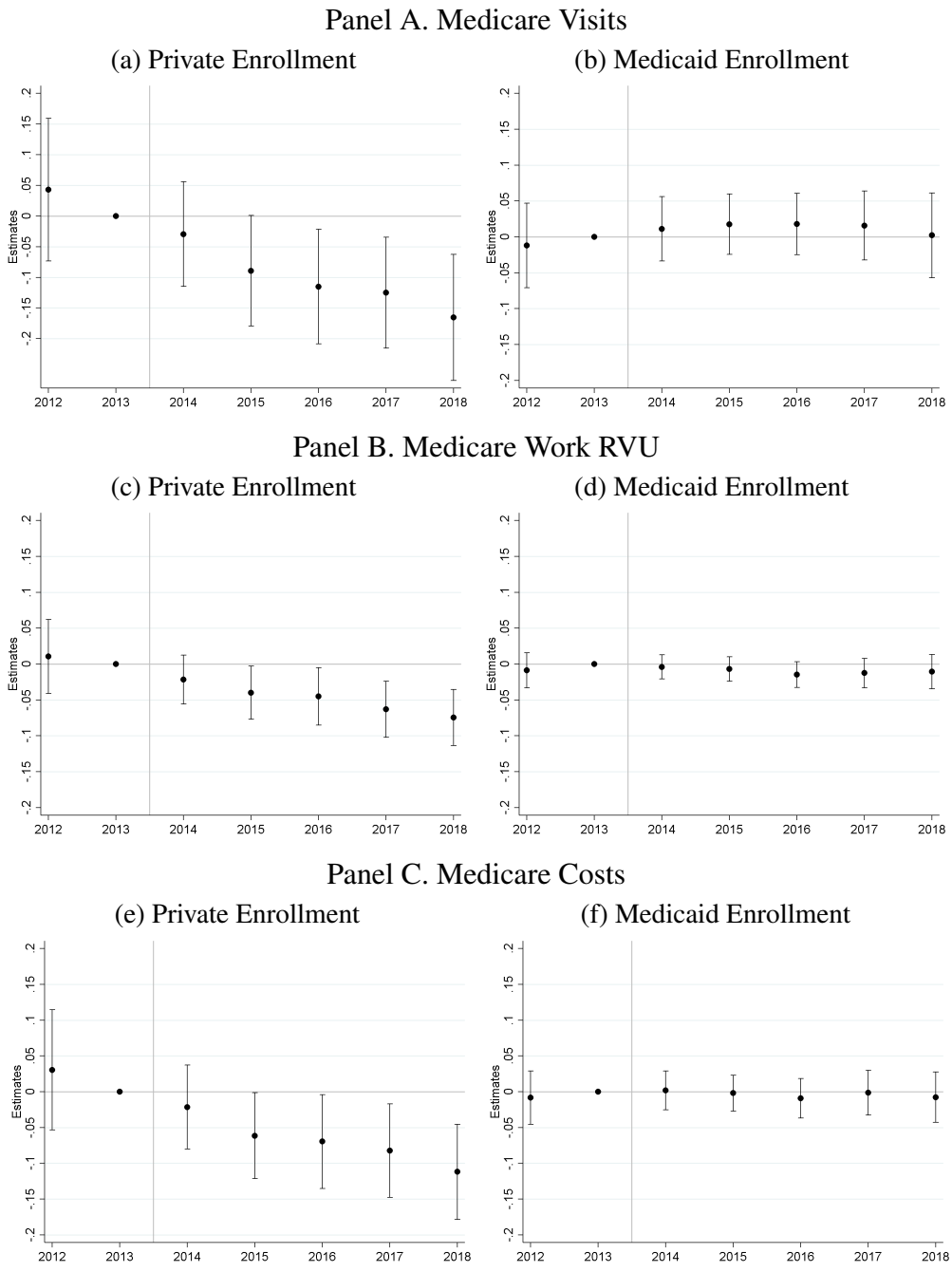


Figure 7: Reduced Form Event-study Estimates: Physician Medicare Supply

Notes: The figures illustrate the event study estimates and the 95 percent confidence intervals for the impacts of predicted Medicaid and private enrollment on physician supply to Medicare patients, which include the total annual number of Medicare visits, total hours worked, and total cost associated with these appointments. The estimation is based on the event study model of equation (4).

Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

would have exhibited similar trends in physician care provision.

More Robustness Checks.—Table 6 reports six robustness checks for each measure of physician

Table 5: The Effect of Predicted Enrollment on the Levels and Trends of PUMA Characteristics During 2008-2013

	PredChnPriv		PredChnPriv×(t-2014)		PredChnCaid		PredChnCaid×(t-2014)		
Dependent Variables	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Observations
income per capita ($1000)	-14.903***	(1.2415)	0.131	(0.3293)	-4.064***	(0.6118)	0.075	(0.1620)	11,880
Unemployed (%)	2.303***	(0.3623)	-0.078	(0.0947)	2.238***	(0.3868)	-0.008	(0.1031)	11,880
Female(%)	-0.804***	(0.1156)	-0.004	(0.0292)	0.174	(0.1309)	0.018	(0.0349)	11,880
White(%)	-13.649***	(2.8586)	0.120	(0.7301)	-9.823***	(1.9604)	-0.001	(0.5016)	11,880
Hispanic(%)	24.271***	(2.1008)	-0.002	(0.5405)	1.716**	(0.6978)	0.012	(0.1785)	11,880
High School Dropout(%)	3.805***	(0.3888)	-0.034	(0.1028)	0.692***	(0.2445)	0.005	(0.0643)	11,880
High School Graduate(%)	4.593***	(0.5249)	-0.033	(0.1365)	0.311	(0.3903)	0.015	(0.0992)	11,880
College and Above(%)	-15.715***	(1.3307)	0.050	(0.3481)	-0.742	(0.7677)	-0.021	(0.1994)	11,880
Age>65 (%)	-2.699***	(0.4223)	-0.040	(0.1079)	-0.867***	(0.2015)	-0.004	(0.0514)	11,880
Age<35(%)	5.588***	(0.4860)	-0.006	(0.1248)	3.462***	(0.4579)	-0.006	(0.1175)	11,880

Notes: This table follows the methods of Bailey and Goodman-Bacon (2015) and Goodman-Bacon (2018) and estimates the effects of the ACA insurance expansion on the levels and trends of various socioeconomic variables during the pre-period of 2008-2013 based on the estimation of equation (5). Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

labor supply. Column (1) replicates the baseline results reported in Table 3. In column (2), we drop states that adopted Medicaid waivers and expanded Medicaid prior to 2014. Column (3) accounts for the staggered rollout of Medicaid expansion by interacting predicted enrollment changes with state-specific expansion year indicators. In column (4), we restrict the sample to Medicaid expansion states and examine the effect of private enrollment on physician care provision to Medicare patients. In column (5), we address potential omitted variable bias by augmenting the baseline difference-in-difference specification with PUMA-level, time-varying demographic and socioeconomic controls, including age distribution, education, race, average income, and unemployment rate. Column (6) estimates the baseline model without applying weights (i.e., the number of pre-ACA visits per physician). Finally, column (7) tests the sensitivity of the results to the unit of insurance enrollment by scaling the enrollment variable from increments of 10,000 to 1,000. Across all specifications, the results in Table 6 confirm that our baseline estimates are robust.

6.2.3 Mechanism

In this section, we examine the underlying mechanism driving the observed crowd-out effects, and specifically test whether they reflect physician capacity constraints that limit the ability to accommodate both Medicare and privately insured patients.

Evidence from Table 4 provides initial support for this mechanism. The decline in both the number of Medicare patients and visit frequency suggests that physicians face trade-offs in allocating limited time across patient groups. This pattern highlights the implication of the capacity constraint in the model, where an increase in private demand raises the acceptance threshold for

Table 6: More Robustness Checks

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Dependent Variable: Annual Medicare Visits							
Private Enrollment	-0.258***	-0.199***	-0.239***	-0.159	-0.243***	-0.203***	-0.026***
	(0.0832)	(0.0698)	(0.0780)	(0.1142)	(0.0757)	(0.0626)	(0.0083)
Medicaid Enrollment	0.058	0.041	0.020		0.013	0.075	0.006
	(0.0956)	(0.1094)	(0.0889)		(0.0741)	(0.0966)	(0.0096)
Panel B. Dependent Variable: Annual WorkRVU							
Private Enrollment	-0.088***	-0.069**	-0.078**	-0.065**	-0.075**	-0.152***	-0.009***
	(0.0315)	(0.0279)	(0.0305)	(0.0311)	(0.0294)	(0.0499)	(0.0031)
Medicaid Enrollment	-0.037	-0.106***	-0.056		-0.034	0.037	-0.004
	(0.0372)	(0.0388)	(0.0359)		(0.0276)	(0.0806)	(0.0037)
Panel C. Dependent Variable: Annual Total Cost							
Private Enrollment	-0.153***	-0.110**	-0.137***	-0.082	-0.137***	-0.187***	-0.015***
	(0.0544)	(0.0433)	(0.0516)	(0.0718)	(0.0493)	(0.0580)	(0.0054)
Medicaid Enrollment	-0.016	-0.091	-0.047		-0.030	0.062	-0.002
	(0.0594)	(0.0618)	(0.0553)		(0.0443)	(0.0903)	(0.0059)
PUMA-level Controls	N	N	N	N	Y	N	N
Weights	Y	Y	Y	Y	Y	N	N
Enrollment Units	10,000	10,000	10,000	10,000	10,000	10,000	1,000
Early Medicaid Expanders	Include	Exclude	Include	Include	Include	Include	Include
Stagger Expansion Timing	N	N	Y	N	N	N	N
Medicaid Expanders	Include	Include	Include	Exclude	Include	Include	Include
Observations	1,977,892	1,689,926	1,977,892	768,593	1,977,892	1,977,892	1,977,892

Notes: This table presents robustness checks for the estimated effects of insurance enrollment on physician care provision to Medicare patients across three outcome measures. Column (1) replicates the baseline results from Table 3. Column (2) excludes states that expanded Medicaid prior to 2014 via waiver programs. Column (3) accounts for the staggered timing of Medicaid expansion by interacting predicted enrollment with state-specific expansion year dummies. Column (4) restricts the sample to Medicaid expansion states. Column (5) adds time-varying PUMA-level controls, including demographic and socioeconomic variables (age, education, race, income, and unemployment rate). Column (6) omits pre-ACA visit-based weights. Column (7) rescales insurance enrollment from units of 10,000 to 1,000. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

Medicare patients. The concurrent increase in time per visit implies that, with fewer Medicare patients, physicians may devote more attention to those who remain—a pattern consistent with constrained total time but flexible within-visit allocation. These findings support the interpretation that physicians are reallocating fixed labor in response to increased private demand. While the increase in time per visit could reflect a concern for maintaining care quality, we interpret this cautiously as only suggestive of altruistic behavior.

Table 7 offers further evidence consistent with the capacity constraint explanation, showing that crowd-out effects are more pronounced among physicians practicing in capacity-constrained

settings—those with higher Medicare patient volumes, those located in primary care Health Professional Shortage Areas (HPSAs), or those operating as sole proprietors without institutional support. To test these hypotheses formally, we estimate the following OLS model:

$$\begin{aligned}\ln \mathrm{Y}_{ipt} = {} & \delta_v \mathrm{PredChnCaid}_p \times \mathrm{postACA}_t + \rho_1 \mathrm{PredChnCaid}_p \times \mathrm{postACA} \times \mathrm{HighMedicare} \\ & + \gamma_v \mathrm{PredChnPriv}_p \times \mathrm{postACA}t + \rho_2 \mathrm{PredChnPriv}_p \times \mathrm{postACA}t \times \mathrm{HighMedicare} \\ & + \theta_i + \theta_{c,t} + \epsilon_{it}. \end{aligned} \tag{6}$$

where Y_{ipt} represents physician i's Medicare service provision in PUMA p and year t, measured by the number of Medicare appointments, work RVUs, or total Medicare expenditures. $\mathrm{PredChn}_p$ captures the predicted changes in private and Medicaid enrollment in each PUMA driven by ACA-induced shifts in income-eligibility thresholds. HighMedicare is a binary indicator equal to one for physicians with above-median pre-ACA Medicare visit volume. Our coefficients of interest, ρ, are expected to be negative if physicians with higher baseline Medicare loads experience greater crowd-out. Panel A of Table 7 reports estimates of ρ for each physician supply measure. Across all three outcomes, physicians with high Medicare volume experience significantly larger crowd-out effects. For every 10,000 additional private enrollees, these physicians reduce Medicare visits by an additional 14.8 log points compared to their lower-volume counterparts. The corresponding declines in Medicare-related work hours and expenditures are 7.6 and 11.5 log points, respectively.

We further examine differential crowd-out effects based on local capacity constraints by classifying physicians according to whether they practice in primary care HPSA counties.[22] Physicians in HPSA counties are more likely to operate at capacity and may be less able to absorb increased demand. Panel B of Table 7 presents results from a specification analogous to equation (6), replacing the HighMedicare dummy with the HPSA indicator. As expected, the triple interaction coefficients—between predicted private enrollment gains, the HPSA indicator, and the post-ACA period—are consistently negative and statistically significant across all primary care supply measures. In contrast, we find no differential response to Medicaid enrollment across HPSA and non-HPSA counties. Panel C of Table 7 examines heterogeneity by practice type, comparing sole proprietors with group physicians. Sole proprietors, who operate with fewer resources and more rigid schedules, exhibit significantly stronger crowd-out effects in response to rising private enrollment. This pattern is consistent with the capacity constraint mechanism, as independent physicians face greater limitations in adjusting to increased demand. In contrast, group physicians show weaker or insignificant effects, likely due to greater operational flexibility. Taken together, these results suggest that ACA-induced private insurance expansion had a more pronounced effect on access to care for Medicare beneficiaries in already capacity-constrained areas, consistent with the model's

[22] We use 2023 HPSA designations from the U.S. Health Resources and Services Administration. A county is classified as an HPSA if it was partially or fully designated as such after 2010.

prediction that crowd-out is stronger when capacity constraints bind more tightly.

Table 7: Mechanism Analysis: Capacity Constraints

Dependent Variables In logs	Annual Medicare Visits (1)	Annual WorkRVU (2)	Annual Total Cost (3)
Panel A. By Medicare Patient Volume			
PredChnPriv ×postACA	0.156***	0.090***	0.136***
	(0.0373)	(0.0149)	(0.0252)
PredChnCaid×postACA	0.105***	0.034***	0.084***
	(0.0206)	(0.0085)	(0.0131)
PredChnPriv×postACA×HighMedicare	-0.148***	-0.076***	-0.115***
	(0.0127)	(0.0056)	(0.0086)
PredChnCaid×postACA×HighMedicare	-0.045***	-0.020***	-0.044***
	(0.0074)	(0.0037)	(0.0049)
Observations	1,977,892	1,977,892	1,977,892
Panel B. By Primary Care HPSA (Dependent Variables for Primary Care Services)			
PredChnPriv×postACA	-0.054***	-0.051***	-0.052***
	(0.0091)	(0.0084)	(0.0084)
PredChnCaid×postACA	-0.003	-0.004	-0.002
	(0.0050)	(0.0051)	(0.0052)
PredChnPriv×postACA×HPSA	-0.016**	-0.016**	-0.016**
	(0.0075)	(0.0080)	(0.0079)
PredChnCaid×postACA×HPSA	-0.003	0.001	0.000
	(0.0051)	(0.0054)	(0.0054)
Observations	1,629,418	1,629,418	1,629,418
Panel C. By whether physicians are sole proprietors			
PredChnPriv×postACA	-0.103***	-0.046***	-0.075***
	(0.0314)	(0.0131)	(0.0222)
PredChnCaid×postACA	0.014	-0.004	0.000
	(0.0165)	(0.0068)	(0.0105)
PredChnPriv×postACA×Solo	-0.112***	-0.033***	-0.044***
	(0.0278)	(0.0075)	(0.0138)
PredChnCaid×postACA×Solo	0.035***	-0.007*	0.005
	(0.0131)	(0.0042)	(0.0073)
Observations	1,977,892	1,977,892	1,977,892

Notes: This table examines heterogeneity in the crowd-out effect of private insurance enrollment on physician care provision to Medicare patients, focusing on settings with varying capacity constraints. Panel A stratifies physicians by pre-ACA Medicare patient volume, using a binary indicator for those above the median. Panel B uses a Health Professional Shortage Area indicator, equal to one if the physician practices in a primary care HPSA county. Panel C distinguishes between sole proprietors and group-affiliated physicians. Each panel reports triple interaction terms between predicted private enrollment gains, a capacity-constraint indicator, and a post-ACA dummy. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

6.2.4 Heterogeneity Analysis

In this section, we examine heterogeneity in crowd-out effects across service types, patient types, and physician characteristics, providing insights into which services are reduced, which patients are more likely to be displaced, and which providers drive these adjustments.

Columns (1) and (4) of Table 8 stratify Medicare FFS outpatient services into primary care (PCP) and non-PCP services. Columns (2) and (3) further classify PCP services according to whether they are provided to new or established Medicare patients.[23] Columns (5)-(7) group services into Initial Preventive Physical Examinations (IPPE), Annual Wellness Visits (AWV), and other services. Event study estimates for each service type are reported in Appendix Figures B2–B5.

When comparing PCP and non-PCP services, we show that physicians are more likely to reduce the provision of non-PCP services in response to increased private insurance enrollment. For instance, the number of Medicare visits associated with non-PCP services declines by 37.9 log points, compared with a smaller reduction of 11.8 log points for PCP services (see Panel A of Table 8). This finding aligns with the model's prediction that higher-margin services experience stronger reallocation responses when private demand increases. Existing evidence shows that the private-to-Medicare payment gap is substantially larger in specialty care than in primary care. For example, payment ratios range from 1.1–1.2 for family and internal medicine, compared to 1.3 for cardiology and urology, 1.4 for general surgery and oncology, 1.5 for orthopedics, 1.8 for radiology, 2.2 for neurosurgery, 2.5 for emergency and critical care, and up to 3.3 for anesthesia (McMorrow et al., 2021). These disparities incentivize physicians to prioritize higher-margin specialty services, resulting in greater crowd-out from those services.

We also observe that physicians are more likely to reduce care for established Medicare patients rather than for new patients, which suggests that physicians may be selectively shedding patients who are more time-intensive or less profitable, potentially replacing them with new Medicare patients or privately insured patients with better reimbursements. Alternatively, this may reflect an altruistic preference to maintain access for new patients who may have more urgent or unmet needs. Consistent with the altruistic physician hypothesis, we find no significant reduction in the provision of preventive primary care services such as IPPE and AWV (columns (5)–(6)). These services are widely regarded as essential to preventive care and population health. For instance, the IPPE offers a baseline health assessment for new Medicare enrollees, while the AWV provides an annual opportunity to update risk assessments and care plans. Previous studies have emphasized

[23] Following Carey et al. (2020), we define primary care services based on HCPCS codes that received increased reimbursement rates under the ACA's primary care fee policy in 2013 and 2014. The remaining services are classified as non-PCP. To identify services for new patients, we apply the filtering strategy of Carey et al. (2020). We aggregate the HCPCS-physician-year-level data to the physician-year level by service category.

their role in early detection and cost-effective prevention (Beckman et al., 2019). The persistence of these services despite increased private demand suggests that physicians prioritize preventive care for vulnerable populations, consistent with both professional norms and altruistic motives.

Table 8: Heterogeneous Effects by Service Types

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variables	Primary Care			Non-PCP Services	IPPE	AWV	Other Services
In logs	Total	New	Existing		(once per lifetime)	(once per year)	
Panel A: Annual Medicare Visits							
Private Enrollment	-0.118***	-0.084***	-0.114***	-0.379***	0.217	-0.0227	-0.260***
	(0.0240)	(0.0208)	(0.0241)	(0.1129)	(0.160)	(0.0731)	(0.0835)
Medicaid Enrollment	-0.015	-0.028	-0.016	0.090	-0.315	-0.281***	0.0634
	(0.0313)	(0.0261)	(0.0316)	(0.1327)	(0.283)	(0.0692)	(0.0961)
Panel B: Annual WorkRVU							
Private Enrollment	-0.114***	-0.085***	-0.111***	-0.183**	0.0278	-0.0271	-0.0898***
	(0.0235)	(0.0220)	(0.0237)	(0.0737)	(0.140)	(0.0712)	(0.0318)
Medicaid Enrollment	-0.012	-0.021	-0.013	-0.058	-0.137	-0.290***	-0.0281
	(0.0317)	(0.0268)	(0.0323)	(0.1054)	(0.273)	(0.0722)	(0.0371)
Panel C: Annual Total Cost							
Private Enrollment	-0.121***	-0.091***	-0.118***	-0.236***	0.0183	-0.0375	-0.156***
	(0.0247)	(0.0225)	(0.0248)	(0.0830)	(0.146)	(0.0706)	(0.0547)
Medicaid Enrollment	-0.001	-0.010	-0.002	-0.034	-0.199	-0.276***	-0.00620
	(0.0330)	(0.0286)	(0.0336)	(0.0963)	(0.286)	(0.0705)	(0.0597)
Observations	1,629,418	664,188	1,607,382	1,478,736	7,378	107,821	1,977,577

Notes: This table reports estimates of the effects of ACA-induced insurance enrollment on physician provision of Medicare outpatient services, disaggregated by service type. Columns (1) and (4) distinguish between primary care (PCP) and non-PCP services based on HCPCS codes. Columns (2) and (3) further separate PCP services according to whether they were delivered to new or established Medicare patients, following the classification used by Carey et al. (2020). Columns (5)-(7) categorize PCP services into three groups: Initial Preventive Physical Examination (IPPE), Annual Wellness Visit (AWV), and other services. The IPPE is a one-time preventive visit offered in the first 12 months after Medicare enrollment, while the AWV is an annual service focused on preventive care planning. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

Next, we examine heterogeneous effects by patient characteristics. Table 9 reports the effects of ACA-induced changes in private and Medicaid enrollment on the composition of Medicare patients treated by physicians, including outcomes such as the average risk score, average age, percentage aged 75 or older, percentage Black, percentage White, percentage male, and the share of dual-eligible patients. In general, we do not detect evidence that physicians selectively reduced care for higher-risk, older, female, or Black Medicare patients. Specifically, columns (1) through (6) show that the average patient risk score, average age, racial composition, and sex mix remain largely unchanged following the private insurance expansion. These patterns suggest that physicians may reduce Medicare service provision in a relatively random manner, rather than through systematically excluding more vulnerable populations.

One exception appears in column (3), which shows a modest increase—about 0.5 percentage

points—in the share of Medicare patients aged 75 or older. This suggests that the younger segment of the Medicare population may have been slightly more likely to be crowded out. Such a pattern is consistent with a form of physician altruism: when faced with rising private demand and binding capacity constraints, physicians may choose to prioritize older or more medically needy Medicare patients. This interpretation aligns with the observed increase in time spent per visit reported in prior analyses, implying a possible effort to preserve care intensity for those retained.

In contrast, column (7) reveals a more puzzling result: the share of dual-eligible Medicare patients declines following the private insurance expansion. Because dual eligibles often generate higher reimbursements—due to Medicaid covering cost-sharing—one might expect them to be relatively insulated from crowd-out. However, several mechanisms may explain this finding. Dual-eligible patients are typically more complex to manage clinically, requiring more time per visit and greater care coordination. They are also associated with higher administrative burden due to dual billing with both Medicare and Medicaid. Thus, under capacity constraints, physicians may have opted to reduce care for dual eligibles despite higher reimbursement, preferring less complex and less administratively costly cases. This suggests that crowd-out is shaped not solely by financial incentives, but also by how physicians manage time, complexity, and workflow under increasing demand.

Table 9: Heterogeneous Effects by Patient Characteristics

Dependent Variables In logs	(1) Risk Score	(2) Average Age	(3) Age>75	(4) Black	(5) White	(6) Male	(7) Dual Eligible
Private Enrollment	0.002	0.053	0.005*	0.002	-0.005	0.000	-0.010***
	(0.0059)	(0.0823)	(0.0030)	(0.0029)	(0.0033)	(0.0087)	(0.0036)
Medicaid Enrollment	0.015**	0.070	-0.004	-0.004	0.011*	0.017	0.006
	(0.0067)	(0.1023)	(0.0040)	(0.0063)	(0.0057)	(0.0110)	(0.0049)
Observations	1,977,892	1,977,892	1,574,081	928,497	1,684,056	1,945,955	1,805,598

Notes: This table presents the estimated effects of ACA-induced changes in private and Medicaid enrollment on the composition of Medicare patients treated by physicians, using a difference-in-differences framework. The outcome variables include the average risk score, average age, the share of patients aged 75 or older, racial composition (percent Black and percent White), percent male, and the share of dual-eligible patients (those enrolled in both Medicare and Medicaid). Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

Finally, we delve into the question of which types of physicians are more likely to crowd out Medicare patients in response to increased private insurance enrollment. Panel A of Table 10 explores heterogeneity by local physician density, a proxy for market competition. The estimates indicate that physicians practicing in areas with higher physician density are more likely to reduce care provision for Medicare patients following the private coverage expansion. One possible ex-

planation is that in more competitive markets, physicians have stronger incentives to shift their limited capacity toward higher-paying or administratively simpler cases, leading to a reallocation from Medicare patients to better-paying private patients.

Panel B of Table 10 examines heterogeneous effects by physician sex, revealing that male physicians are more likely to reduce labor supply to Medicare patients in response to increased private demand. This finding is consistent with prior evidence of gender differences in physician behavior and preferences. For example, prior studies show that female physicians are more likely to emphasize continuity of care and maintain stronger commitments to vulnerable or complex patients (Tsugawa et al., 2017). Consequently, female physicians may be less willing to reduce care for Medicare patients, particularly those who are older or medically complex. Male physicians, by contrast, may be more responsive to financial incentives (lower "altruism" in the model) and time constraints, leading to greater substitution toward privately insured patients when demand rises. This heterogeneity provides further evidence that the crowd-out response is not uniform across providers and may reflect underlying behavioral or practice-style differences.

Overall, the empirical patterns that we have uncovered from data closely track the model's predictions: physicians reallocate capacity toward higher-paying patients, with adjustments occurring along both patient selection and treatment intensity, and with stronger effects among providers facing tighter constraints or higher marginal returns.

6.3 Alternative Explanations

Finally, we consider alternative explanations that could account for the observed reduction in physician care provision to Medicare patients, including (i) shifts in staffing, in which existing physicians may shift tasks to newly employed physicians, so that at the facility level, there is no such crowdout; and (ii) delegation to mid-level providers, in which physicians shift tasks to physician assistants and nurses.

Task Shifting to New Staff.— Table 11 presents facility-level estimates of the effect of local changes in private and Medicaid insurance enrollment on physician group labor supply, using the SK&A dataset. The results show no statistically significant effect of increased private insurance coverage on whether physician organizations accept Medicare patients or on the number of Medicare patients served. Similarly, we document a lack of significant changes in total working hours—whether measured by weekday hours, weekend hours, or total weekly hours—suggesting that organizations do not respond to increased coverage by expanding physician labor input at the extensive margin.

Instead, we observe a statistically significant decline in the total number of staff employed at the facility level in response to increased private insurance coverage, particularly driven by a reduction

Table 10: Heterogeneous Effects by Physician Characteristics

Dependent Variables In logs	Annual Medicare Visits (1)	Annual WorkRVU (2)	Annual Total Cost (3)
Panel A. By high physician density			
PredChnPriv×postACA	0.002	-0.046**	-0.038
	(0.0428)	(0.0190)	(0.0305)
PredChnCaid×postACA	0.007	-0.048***	-0.024
	(0.0312)	(0.0100)	(0.0205)
PredChnPriv×postACA×HighDensity	-0.086***	-0.004	-0.030**
	(0.0213)	(0.0082)	(0.0136)
PredChnCaid×postACA×HighDensity	0.011	0.022***	0.015
	(0.0144)	(0.0049)	(0.0092)
Panel B. By whether physicians are male			
PredChnPriv×postACA	-0.118***	-0.0147	-0.0398
	(0.0377)	(0.0154)	(0.0250)
PredChnCaid×postACA	0.0410**	0.00244	0.0183
	(0.0189)	(0.00771)	(0.0118)
PredChnPriv×postACA×Male	-0.00949	-0.0470***	-0.0535***
	(0.0243)	(0.00719)	(0.0137)
PredChnCaid×postACA×Male	-0.0271**	-0.00972**	-0.0218***
	(0.0113)	(0.00428)	(0.00751)
Observations	1,977,892	1,977,892	1,977,892

Notes: This table investigates heterogeneous effects of ACA-induced private insurance enrollment on physician care provision to Medicare patients, stratified by physician characteristics. In Panel A, physician density is defined as the number of physicians per 1,000 population in each Public Use Microdata Area, based on pre-ACA data. PUMAs are classified as high-density if the physician density is above the median across all PUMAs in the sample. In Panel B, physician sex is defined using CMS provider-level data, with a binary indicator for male physicians. Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

in the number of physicians. This finding may seem counterintuitive given rising demand, but it is consistent with broader trends in physician labor markets. One plausible explanation is increased horizontal consolidation in the outpatient sector, where physician groups merge or are acquired by larger entities, leading to staffing reductions due to economies of scale or administrative restructuring. Another possibility is that more physicians are transitioning out of outpatient practice and into hospital-based roles (e.g., hospitalists), which would reduce the number of practicing physicians attached to outpatient groups in the SK&A data.

Importantly, we do not see an increase in the number of physician assistants or nurses, nor do we observe any change in the number of other staff. This absence of staff expansion in response to growing insurance coverage provides additional support for the capacity constraint mechanism highlighted earlier. If practices were able or willing to absorb rising demand through task shifting

or hiring, we would expect to see increases in mid-level or support staff. The fact that staffing remains flat or declines reinforces the interpretation that physician time is a relatively fixed resource that organizations reallocate rather than expand in response to external demand shocks.

Table 11: Effects of Private and Medicaid Enrollment on Facility-Level Supply Capacity

VARIABLES	(1) Accept Medicare	(2) Medicare Patient	(3) Weekday Hour	(4) Weekend Hour	(5) Total Week Hour	(6) Total Staff	(7) Physician	(8) PA/Nurse	(9) Other
Private Enrollment	-0.010	-4182.98	1.490	1.403	2.893	-1.240*	-1.237*	-0.101	0.070
	(0.0093)	(3283.07)	(4.426)	(1.128)	(5.242)	(0.706)	(0.706)	(0.124)	(0.114)
Medicaid Enrollment	0.007	4261.35	-2.895	-1.313	-4.209	0.763	0.764	-0.020	-0.125
	(0.0065)	(3216.28)	(4.337)	(0.972)	(5.172)	(0.576)	(0.577)	(0.092)	(0.092)
Observations	1,091,770	1,091,770	1,091,770	1,091,770	1,091,770	1,091,770	1,091,770	1,091,770	1,091,770

Notes: This table estimates the effects of ACA-induced changes in private and Medicaid insurance coverage on facility-level labor supply using SK&A data. The dependent variables include Medicare acceptance status, patient volume, work hours, and facility staffing levels. Insurance enrollment denotes the number of enrollees in units of 10,000 in a PUMA. Columns (6)–(9) report estimates for total staff, physicians, physician assistants and nurses, and other staff. Standard errors in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively. Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

Delegation to Mid-Level Providers.—In response to physician shortages and the implementation of the Patient Protection and Affordable Care Act of 2010, there has been a growing shift toward granting greater autonomy to mid-level providers, such as physician assistants (PAs) and nurse practitioners (NPs), raising the question of whether the observed reduction in physician care provision to Medicare patients reflects substitution toward mid-level providers rather than a true decline in service capacity. If so, we would expect to see a corresponding increase in the care provided by PAs and NPs. To investigate this possibility, Panel A of Table 12 examines the labor supply response of mid-level providers to the expansion of private insurance coverage. Contrary to this hypothesis, we find no statistically significant changes in mid-level provider labor supply in response to the ACA-induced increase in private enrollment.

To further assess this mechanism, Panel B of Table 12 reports heterogeneous effects by state-level scope of practice (SOP) laws. Specifically, we compare responses in states that grant full practice authority to PAs and NPs with those in states that impose more restrictive practice environments. While we document suggestive evidence that mid-level providers in full-SOP states experience a modest increase in total Medicare expenditures, there is no corresponding increase in hours worked or visit volume. This suggests limited evidence of meaningful task delegation, even in regulatory environments that allow it.

Figure 8 presents event study estimates of mid-level provider responses over time. Although supply increases modestly during the early years of the ACA implementation, it begins to decline after 2016. These dynamics help explain why the average treatment effects lack statistical significance and further suggest that mid-level delegation does not account for the reduction in physician care provision to Medicare patients.

Table 12: Effects of Insurance Enrollment on Labor Supply of Physician Assistants and Nurses

Dependent Variables	Annual Medicare Visits		Annual WorkRVU		Annual Total Cost	
In logs	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Baseline Results						
Private Enrollment	0.113	0.117	0.136	0.138	0.066	0.068
	(0.1861)	(0.1840)	(0.0981)	(0.0981)	(0.1090)	(0.1079)
Medicaid Enrollment	-0.141	-0.126	-0.139	-0.134	-0.094	-0.087
	(0.1354)	(0.1347)	(0.1021)	(0.1019)	(0.0994)	(0.0989)
Medicare Enrollment		0.092**		0.031		0.043
		(0.0416)		(0.0317)		(0.0303)
Panel B. Heterogeneity by Full SOP						
PredChnPriv×postACA	0.003	0.007	0.013	0.014	-0.015	-0.014
	(0.0680)	(0.0679)	(0.0278)	(0.0278)	(0.0374)	(0.0372)
PredChnCaid×postACA	-0.009	-0.007	-0.026	-0.025	-0.014	-0.013
	(0.0322)	(0.0319)	(0.0228)	(0.0229)	(0.0239)	(0.0239)
PredChnPriv×postACA×Full SOP	0.077	0.084	0.081	0.084	0.141**	0.144**
	(0.1239)	(0.1222)	(0.0558)	(0.0557)	(0.0712)	(0.0707)
PredChnCaid×postACA× Full SOP	-0.087	-0.085	-0.021	-0.021	-0.029	-0.029
	(0.0647)	(0.0648)	(0.0332)	(0.0335)	(0.0382)	(0.0385)
Medicare Enrollment		0.096**		0.038*		0.044*
		(0.0389)		(0.0226)		(0.0253)
Observations	330,519	330,519	330,519	330,519	330,519	330,519

Notes: Insurance enrollment denotes the number of enrollees in units of 10,000 in a PUMA. The outcome variable in Panel A measures the labor supply of physician assistants and nurses to Medicare patients per year using the 2SLS estimation procedure as specified in equations (1)-(2). We multiply the estimated effect of private enrollment by its pre-ACA average of the outcome variable to obtain the absolute change for an increase of 10,000 non-Medicare beneficiaries. Panel B conducts heterogeneity analysis by whether the state has full scope of practice based on the model represented by equation (6). Standard errors are in parentheses. ***, **, and * indicate coefficients statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively.
Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

7 Conclusion

The ACA has expanded private insurance to millions of otherwise uninsured adults since 2014. Utilizing the PUMA-level variation in private enrollment gains and simulated income eligibility for Marketplace subsidies as instruments, we investigate how ACA-induced private demand shocks affect physicians' supply decisions for Medicare patients. To the best of our knowledge, our study is the first to study the impacts of the ACA's private insurance expansion on physician responses to Medicare patients.

We show that an increase in private enrollees reduces the quantity of care physicians offer to Medicare patients, which is consistent across three measures of physician services for Medicare patients, including total Medicare appointments, total hours worked treating Medicare patients, and

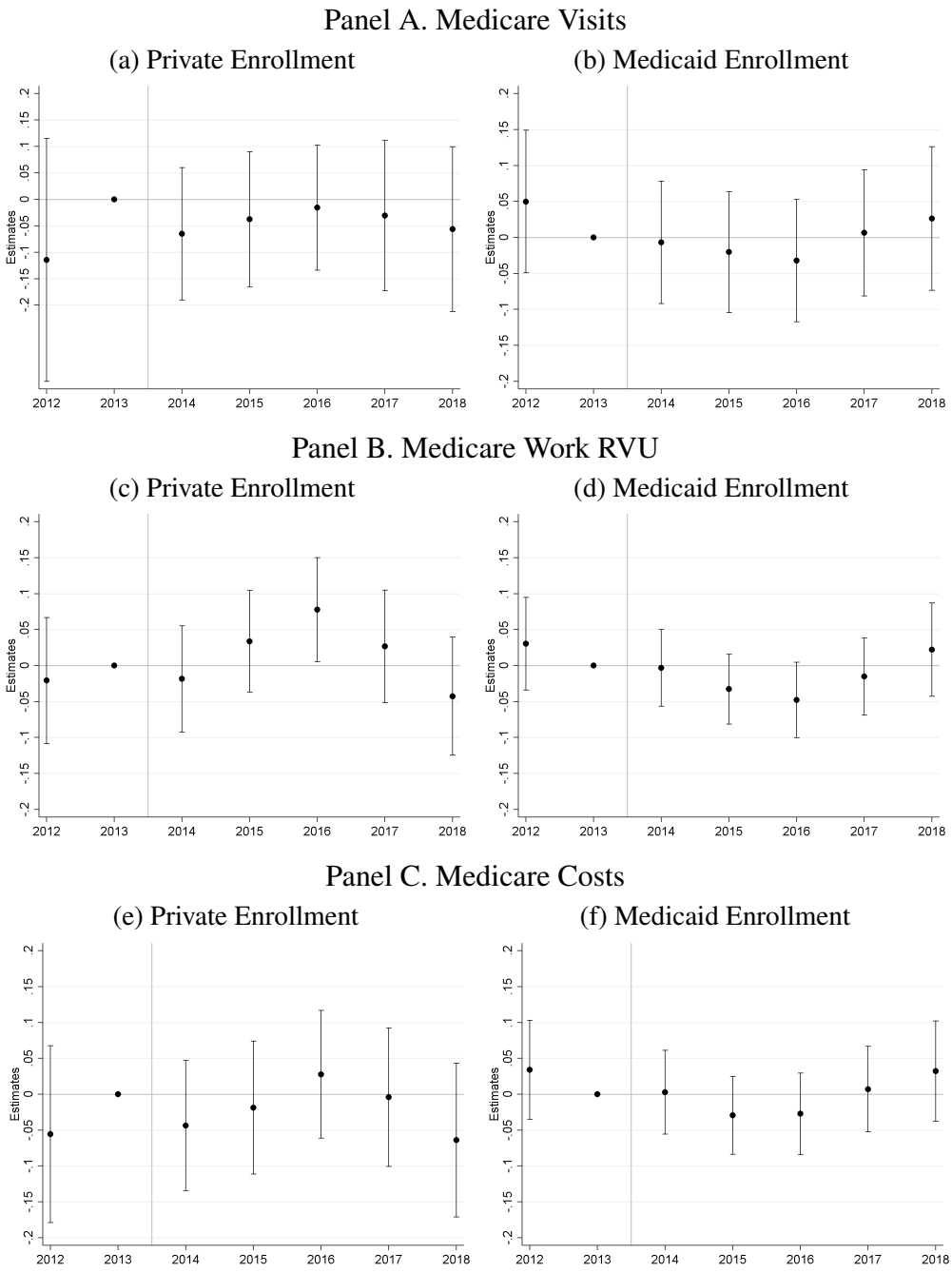


Figure 8: Reduced Form Event-study Estimates: Responses by Physician Assistants and Nurses

Notes: The figures illustrate the event study estimates and the 95 percent confidence intervals for the impacts of predicted Medicaid and private enrollment on mid-level providers' supply response to Medicare patients, which include the total annual number of Medicare visits, total hours worked, and total cost associated with these appointments. The estimation is based on the event study model of equation (4). Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

total Medicare charges. Moreover, the reduction in physician supply to Medicare patients mainly comes from treating fewer Medicare patients and scheduling fewer visits per Medicare patient. The time spent with patients during each visit increases slightly, presumably to compensate for

fewer visits per beneficiary. The finding that private insurance crowds out Medicare enrollees from physicians' patient pool provides strong evidence of physician discrimination against Medicare patients in favor of private enrollees, leading to a misallocation of health care resources between the elderly and the younger population.

Our heterogeneity analysis shows that physician discrimination against Medicare patients is more severe in specialty care than in primary care, in services for existing Medicare beneficiaries than for new Medicare enrollees, and in HPSA areas than in non-shortage areas. Moreover, Medicare discrimination mainly occurs among physicians treating a below-median number of Medicare patients. All these findings are consistent with our conceptual model, in which physicians ration care to beneficiaries according to profit margins. To ensure equal access to health resources for the elderly, policies should be enacted to close the payment gap between private and Medicare rates.

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ACA Insurance Expansion and Access to Care by Medicare Patients Online Appendix

A Capacity Allocation and Utilization Choice Model: Details

In this section, we provide additional details on the model in section 2. Recall that the physician's payoff given acceptance decision ($A \in \{0,1\}$), utilization choice ($q \in \mathbb{R}^+$), and patient characteristics (health needs β and insurance type I) is:

$$U^A(q;\beta,I) = \begin{cases} U^0 = C, & \text{if } A=0 \\ U^1(q;\beta,I) = \alpha h(q;\beta) + (1-\alpha)\pi(q;I) & \text{if } A=1 \end{cases}$$

Proof of Proposition 1. The acceptance decision depends on the comparison between U^0 and the U^1 under the optimal utilization, $q^*(\beta,I)$. Thus two cases are possible:

Case 1: The physician will always find it optimal to accept a patient, regardless of β, if the opportunity cost C is sufficiently low: $C < \tilde{C}$, where

$$\tilde{C} := \min_{0\le\beta\le\bar{\beta}} U^1(q^*(\beta,I);\beta,I) = \frac{\theta(1-\alpha)^2 r_I^2}{2\alpha}$$

Note that the threshold, $\tilde{C}$, is increasing in physician productivity (θ) and reimbursement rates (r_I), and decreasing in altruism (α).

Case 2: For $C \ge \tilde{C}$, the physician only accepts patients whose U^1 is higher than C. Because U^1 is a quadratic function, there are potentially two cutoff values for β, i.e., the two roots that solve $C = U^1$. We denote these two roots as β_- and β_+, with $\beta_- \le \beta_+$. Solving $C = U^1(q^*(\beta,I);\beta,I) = \frac{\alpha\theta}{2}\left(\beta + \frac{1-\alpha}{\alpha} r_I\right)^2$, we get

$$\beta_- = -\sqrt{\frac{2C}{\alpha\theta}} - \frac{1-\alpha}{\alpha} r_I < 0.$$

Thus, β_- is outside the support of β, leaving β_+ the only potentially relevant threshold, where

$$\beta_+ = \sqrt{\frac{2C}{\alpha\theta}} - \frac{1-\alpha}{\alpha} r_I.$$

Under the condition $C \ge \tilde{C}$, $\beta_+ \ge 0$. If, however, $\beta_+ > \bar{\beta}$, then U^1 is always dominated by

C on the support of β. In this case, which arises if C and α are large enough or θ and r_I are small enough, we get the trivial optimal solution of *never* accepting any patient.

The remaining possibility is $0 \leq \beta_+ \leq \bar{\beta}$, in which case β_+ becomes the unique threshold for the optimal acceptance decision. Denote β_+ as β_I^*, we have

$$A = 1 \text{ iff } \beta \in [\beta_I^*, \bar{\beta}].$$

Comparative statics. It is obvious that β_I^* decreases with physician productivity (θ) and reimbursement rates (r_I), and increases with the physician's opportunity cost (C). The case with physician altruism (α) is less obvious, but it can be shown that:

$$\frac{\partial \beta}{\partial \alpha} = \alpha^{-2} r_I - \alpha^{-\frac{3}{2}} \sqrt{\frac{C}{2\theta}} = \alpha^{-2} \frac{1+\alpha}{2} r_I > 0,$$

which indicates that β_I^* also increases with physician altruism. Intuitively, the weaker provider-induced demand by a more altruistic physician lowers the payoff of accepting a patient. A patient will have to have greater health needs (β) to warrant acceptance, thus the higher threshold.

Special case with physicians forgoing the Medicare market. A special case of the capacity allocation problem arises when either the physician's capacity, γ, is sufficiently small or the differences between $U^1(q^*; \beta, I = 3)$ and $U^1(q^*; \beta, I = 2)$ are sufficiently large. The physician can end up accepting only $I = 3$ patients, as depicted in Figure A1. Such physicians are out of the scope of our study, as they mechanically do not have the room for crowding out Medicare patients, nor are they included in our data.

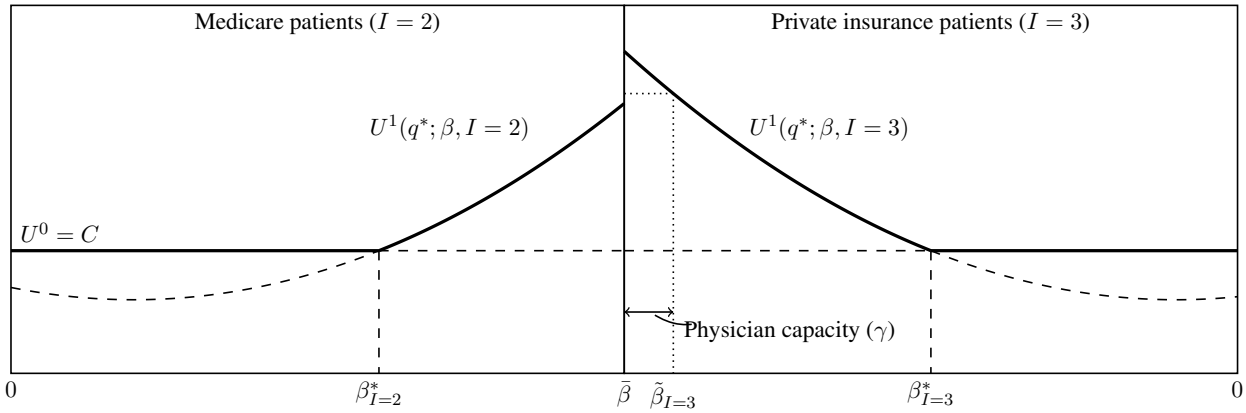


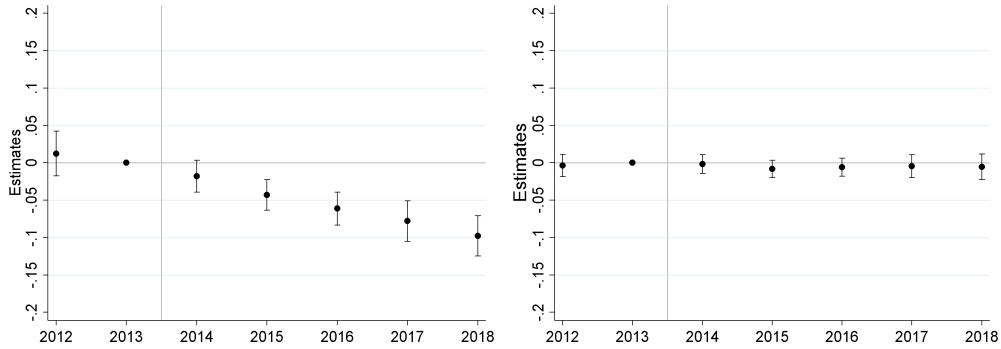
Figure A1: Capacity allocation across two insurance markets (Medicare market forgone)

B Supplemental Tables and Figures

Figure B2: Reduced Form Event-study Estimates for Physician Supply: Primary Care Services

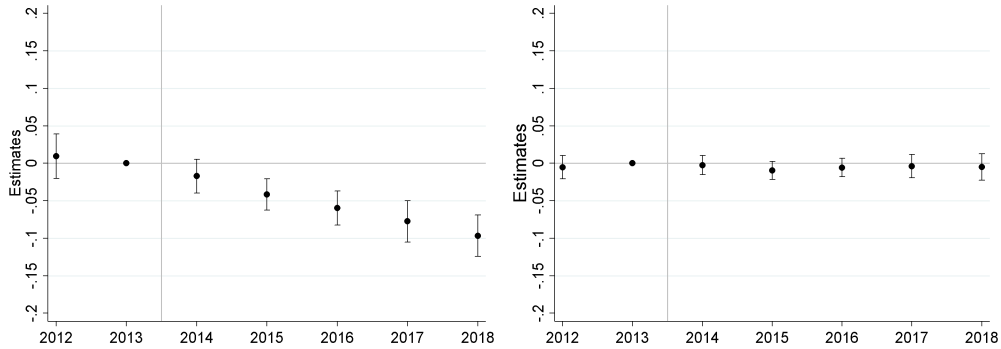
Panel A. Medicare Visits

(a) Private Enrollment (b) Medicaid Enrollment



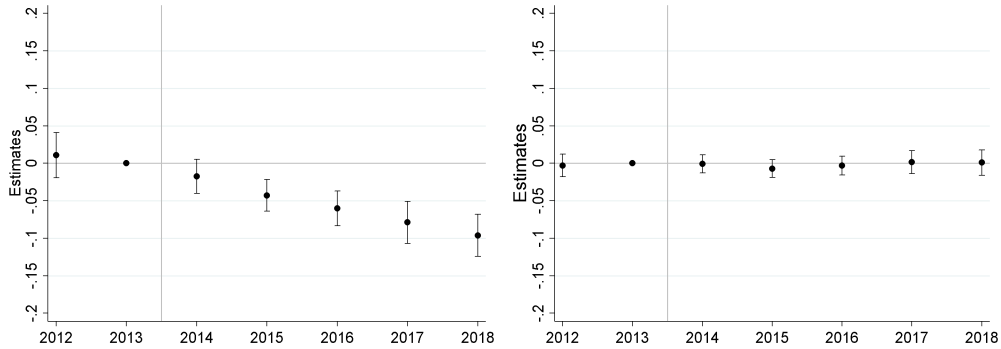
Panel B. Medicare Work RVU

(c) Private Enrollment (d) Medicaid Enrollment



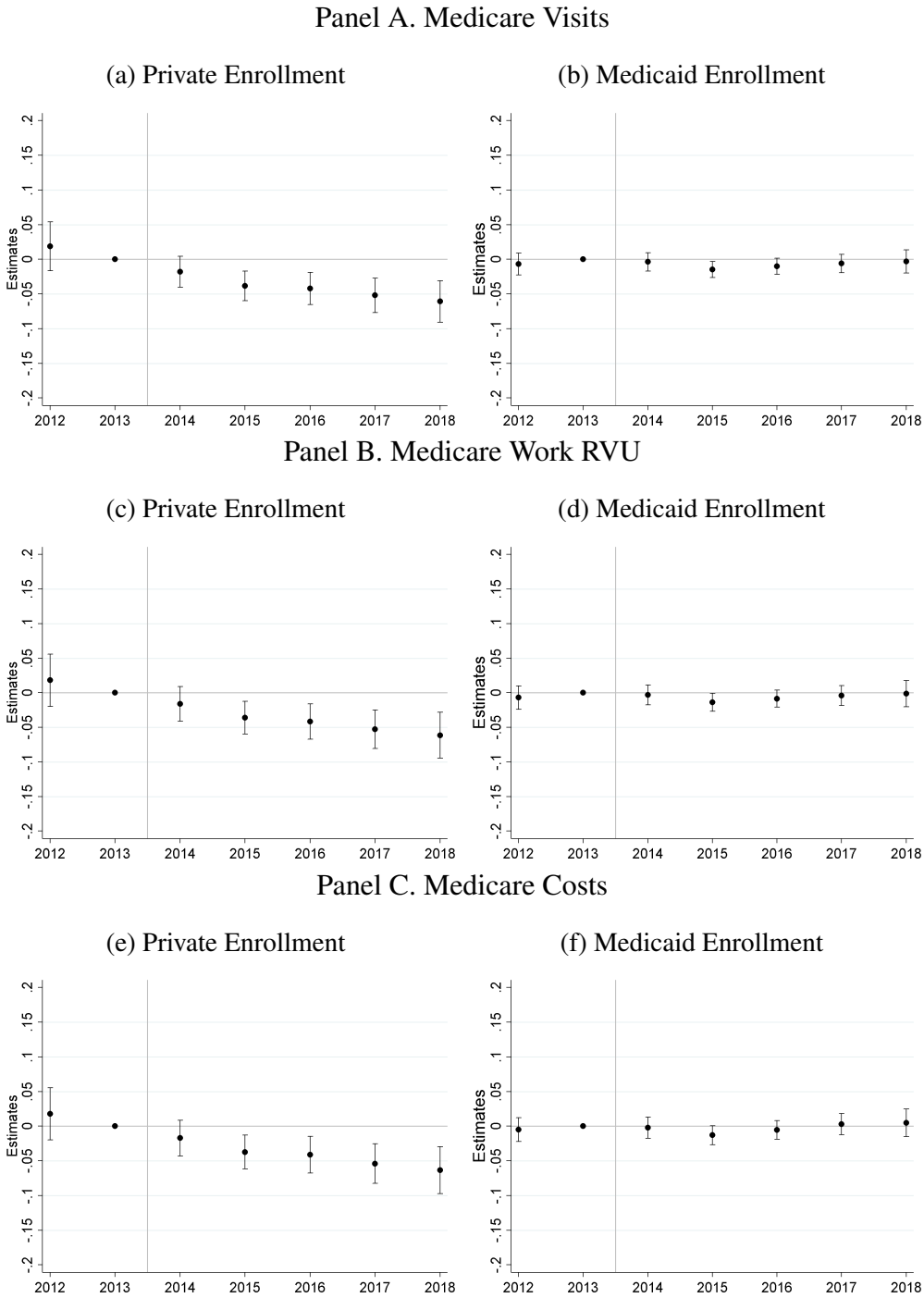
Panel C. Medicare Costs

(e) Private Enrollment (f) Medicaid Enrollment



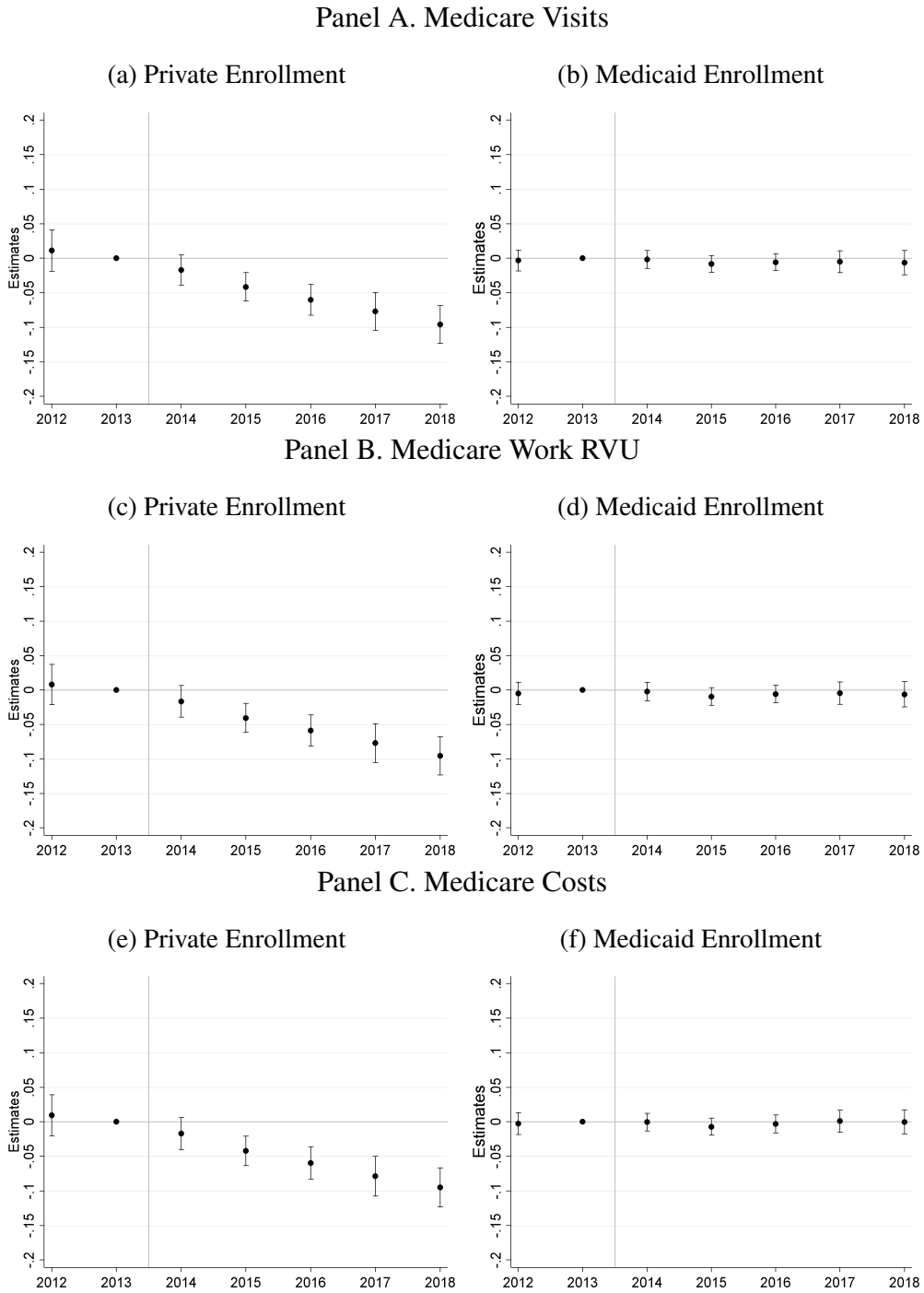
Notes: The figures illustrate the event-study estimates and the 95 percent confidence intervals for the impacts of predicted Medicaid and private enrollment on physician supply to Medicare patients, which include the total annual number of Medicare visits, total hours worked, and total cost associated with these appointments. The estimation is based on the event study model of Eq. (4). Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

Figure B3: Reduced Form Event-study Estimates for Physician Supply: Primary Care Services to New Medicare Patients



Notes: The figures illustrate the event-study estimates and the 95 percent confidence intervals for the impacts of predicted Medicaid and private enrollment on physician supply to Medicare patients, which include the total annual number of Medicare visits, total hours worked, and total cost associated with these appointments. The estimation is based on the event study model of Eq. (4). Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

Figure B4: Reduced Form Event-study Estimates for Physician Supply: Primary Care Services to Existing Medicare Patients

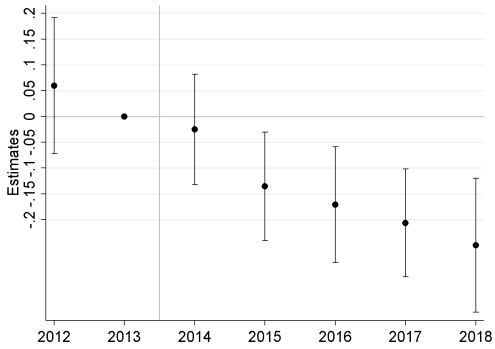


Notes: The figures illustrate the event-study estimates and the 95 percent confidence intervals for the impacts of predicted Medicaid and private enrollment on physician supply to Medicare patients, which include the total annual number of Medicare visits, total hours worked, and total cost associated with these appointments. The estimation is based on the event study model of Eq. (4). Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).

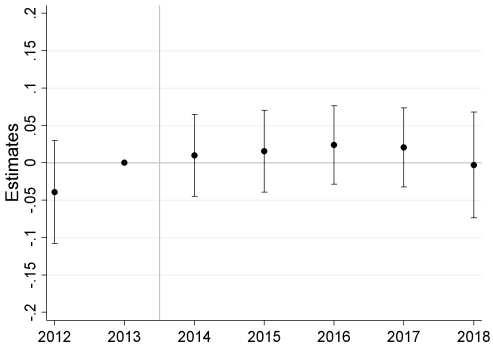
Figure B5: Reduced Form Event-study Estimates for Physician Supply: Other Services

Panel A. Medicare Visits

(a) Private Enrollment

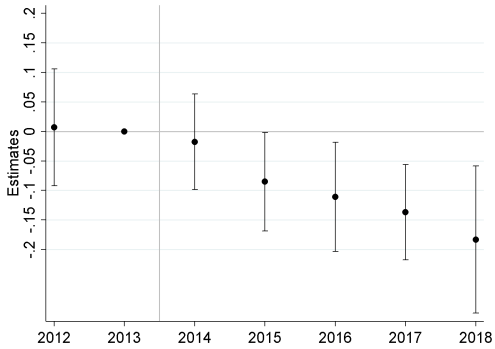


(b) Medicaid Enrollment

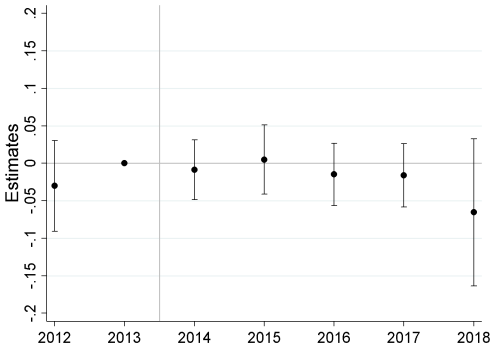


Panel B. Medicare Work RVU

(c) Private Enrollment

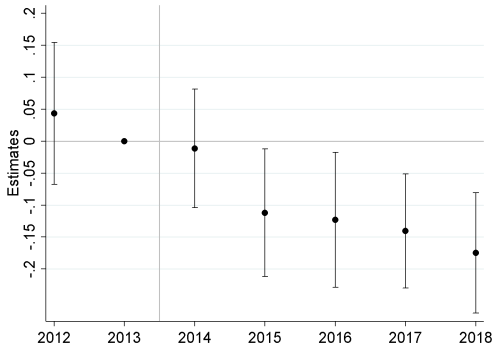


(d) Medicaid Enrollment

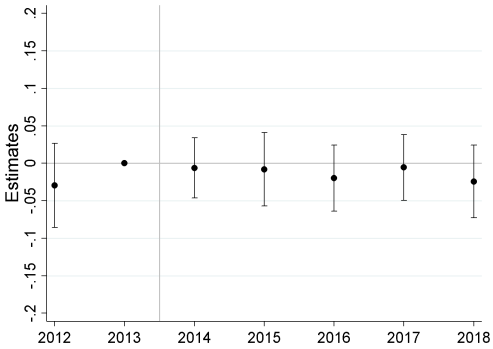


Panel C. Medicare Costs

(e) Private Enrollment



(f) Medicaid Enrollment



Notes: The figures illustrate the event-study estimates and the 95 percent confidence intervals for the impacts of predicted Medicaid and private enrollment on physician supply to Medicare patients, which include the total annual number of Medicare visits, total hours worked, and total cost associated with these appointments. The estimation is based on the event study model of Eq. (4). Source: Medicare Part B FFS Provider Utilization and Payment Data, American Community Survey 1-year estimates (IPUMS).