Medicaid Rates and Mental Health Services

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Abstract

We examine how Medicaid reimbursement rates affect mental health access and use. Allegheny County delivers behavioral health services to Medicaid recipients through a managed care organization that frequently changes provider and service-specific rates. We find that increasing Medicaid payments for mental health services leads to increased service provision, with an elasticity of approximately 0.16. Therefore, the average 20% rate increase results in a 3.2% supply increase. Payments primarily increase services for existing patients, with a small increase in new patients. The largest increases in supply occur when Medicaid rates approach or exceed Medicare reimbursement rates.

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1 Introduction

Mental health services are often difficult to access. In 2022, fewer than 20% of United States psychiatrists accepted new patients, and the median wait time exceeded two months (Sun et al., 2023). Access challenges are particularly severe for Medicaid patients. While 73% of specialists accept Medicaid, only 43% of psychiatrists do (Bishop et al., 2014). These differences may be due to historically low Medicaid reimbursement, more complex patient needs, or the increased administrative burden for processing Medicaid payments.

We examine how reimbursement rates affect the supply of mental health services for Medicaid patients. We use data from over 1,100 behavioral healthcare service providers and over 90 different procedure codes in Allegheny County over the course of 10 years. Allegheny County contains Pittsburgh and is the second-most populous county in Pennsylvania nearly 1.3 million residents. During this time, the Allegheny County Department of Human Services (ACDHS), in collaboration with a Medicaid managed care organization (MCO), enacted over 800 rate changes for different providers and procedures. These rate changes vary both relative to Medicare rates and within a service code.

We use variation in the timing and size of these rate changes to examine how Medicaid rates affect the supply of mental health services. We find that providers and services that received rate increases immediately increase their provision of those mental health services with a supply elasticity of 0.16 (the 95% confidence interval is 0.11 to 0.20). This implies that the median increase in rates of 20% generates a 3.2% increase in service provision. These supply changes persist for several years before fading after four to five years.

The increase in mental health services is mostly driven by existing clients. The elasticity of unique clients to changes in rates is 0.07, which is less responsive than total visits. We also find that the increase in supply is similar for larger and smaller providers.

Our increase in supply is driven by rate changes that set Medicaid rates near or above Medicare rates for the same services. Among rate changes where the final rate is within 90% to above 100% of Medicare rates, our elasticity estimates are twice to five times as high as our overall elasticity. For example, for rate changes where the Medicaid rate moves above the Medicare rate, our elasticity estimate is 0.91 with a 95% confidence interval of 0.50 to 1.31. When the final rate remains substantially below the Medicare rate, the elasticity estimates range from slightly negative to around 0.4.

While reimbursement rates are not randomly assigned, we use multiple methods to assess the validity of our causal identification assumptions. One threat to identification is that rate increases could have targeted providers or services that would have decreased (or increased) quantity in the absence of rate changes. For an institutional perspective, we interviewed colleagues at Allegheny County's Department of Human Services who were involved in the rate-setting process. Discussions rate changes did not mention any dynamic or other critical unobserved variables. Rate decisions were primarily based on state budget availability. An ACDHS contact stated, "When the program budget can support it, [we] invest in the provider network ... through ongoing rate increases." Our data show most rate changes occurred in four out of forty quarters. We control for calendar time and identify the effect of reimbursement rates using variation in which providers and services get rate increases.

Which providers get rate increases depends on provider-reported rate adequacy, service utilization and expense trends. We spoke with individuals involved in Medicaid rates for behavioral health in rural Pennsylvania (outside Allegheny). They provided examples of increasing rates for the bottom 25% of providers but stated they could not increase rates for all due to budget constraints. They also stated that some providers were "more sophisticated on rates" and lamented that "we should not have to rely on providers to ask for a rate and give it to them haphazardly."

Empirical analysis supports the institutional perspective. We analyzed characteristics that predict whether a provider and service received a rate change and the size of these changes. Large providers, services with higher rates, and growing services were more likely to receive a rate change. However, the size of the rate change is similar for large and small providers and for services that are growing and shrinking. In our main results, we control for provider by service code fixed effects and use the size of the rate change as a source of variation. Finally, we directly study whether provider and service codes that would receive rate changes had different trends in units before the rate change. We find no evidence of pre-trends in our main results.

We report our main estimates in logs but are robust to various specifications, including levels and Poisson regressions. We also consider issues with staggered treatment and heterogeneous treatment effects over time. While heterogeneity-robust difference-in-difference estimators cannot currently incorporate continuous treatment, we present our estimates separately for the time periods with the most rate changes. We also show robustness to including treatment cohort by quarter fixed effects.

Our paper adds to the literature on the effects of supply-side health insurance reimbursement rates on health care utilization. A large literature has found disparities in access and quality between Medicaid and other private insurance (e.g. Kwok et al. 2010; McMorrow et al. 2015; Oostrom et al. 2017). These differences may be due relatively lower provider payments for Medicaid or due to other characteristics of this market, including care needs, provider preferences, and patient populations. We contribute to the literature on the effect of reimbursement rates on access for Medicaid patients in three ways.

Our first contribution is the use of thousands of different rate changes which vary within providers and services and were enacted in many different years. Previous research has focused on the ACA's impact on Medicaid rates, which were applied broadly to many services, and found increases in appointment availability (Polsky et al., 2015), self-reported visits (Maclean et al., 2018), self-reported access to care and health (Alexander and Schnell, 2024). These analyses were nationwide and include compelling survey outcomes, but study concurrent rate changes in a narrow time window.

We use hundreds of rate changes that were applied to different services for separate sets of providers across a decade. The rate changes we study vary both relative to Medicare rates and within a service code. The 25th percentile provider and service receives 30% less in Medicaid than Medicare while the 75th percentile provider and service receives 4% more. Reimbursement rates also vary *across* providers within the same service and time period. Therefore, our estimates are based on averaging the results of hundreds of different rate changes for different providers and services.

Second, we observe claims and rates for a Medicaid MCO directly. Before the 1990s, most Medicaid plans were fee-for-service. Prior literature analyzing Medicaid rate changes has relied on contacting individual states to obtain average fee-for-service amounts for a set of services (e.g. Alexander and Schnell (2024), Zuckerman and Goin (2012), Callison and Nguyen (2018), Buchmueller et al. (2015)), Decker (2007)), and used survey measures of outcomes (e.g. Breslau et al. (2020), Buchmueller et al. (2015), Callison and Nguyen (2018), Alexander and Schnell (2024)).[1] In 2024, 74% of Medicaid beneficiaries were enrolled in a managed care plan (Hinton and Raphael, 2024), in which the state pays an MCO per patient or service. By partnering with the Allegheny County Department of Human Services, we provide evidence on the effect of Medicaid rates in a managed care setting and directly observe rates and claims. This allows us to examine effects by provider size or the final rate relative to Medicare.

Our third contribution is to analyze the effect of provider payments in the behavioral health setting. The demand for mental health care has increased in the last few decades, and The Commonwealth Fund estimates that 8,000 more mental health professionals are needed to meet the population needs (Counts, 2023). Breslau et al. (2020) study how survey-reported mental health visits changed in states that did or did not expand Medicaid under the ACA. (Maclean et al., 2018) study the ACA's rate changes and find improvements in health outcomes, but no change in service use. We observe mental health claims directly and find a small, but positive effect of reimbursement rates on the overall supply of visits.

The paper continues as follows. In Section 2 we introduce background and context on

[1] An exception is Cabral et al. (2025), who use Medicaid claims in the Medicaid Analytic eXtract to analyze responses to rate changes for individuals dually eligible for Medicare and Medicaid.

behavioral health services in Allegheny County and in Section 3 we present our Medicaid data and empirical strategy. In Section 4 we present our main results and heterogeneity analysis. In Section 5 we provide conclusions and policy implications.

2 Allegheny County Department of Human Services

The Allegheny County Department of Human Services (ACDHS) provides a variety of services, including mental and physical health care, to the nearly 1.3 million residents of Pittsburgh and its surrounding areas. ACDHS is the primary contractor for Medicaid-provided behavioral health services in the county, including outpatient treatment (such as individual and group therapy) and inpatient treatment (such as mental health-related hospitalizations).

Of the approximately 250,000 residents of Allegheny County enrolled in Medicaid, 20% use behavioral health services. These 50,000 enrollees are served by a network of more than 1,500 providers. In Allegheny County, the state Medicaid program is administered in a "carve-out" model, meaning that behavioral health services are managed separately from physical health services. ACDHS contracts with a managed care organization, Community Care Behavioral Health (CCBH), to ensure accessibility and quality of behavioral health services.

Each year, the MCO asks all its providers to submit requests for rate increases by March 1st. In practice, these requests include detailed information on the service codes for which providers need rate increases and reasoning for increases (e.g., cost of living, lack of rate increases for the service in past years, additional training or requirements for service provisions, increased workforce payments). After compiling these requests, the MCO transfers them for review to ACDHS, while providing their own recommendations on which services to increase rates for. The MCO often prioritizes different "levels of care" each year; for instance, outpatient and inpatient rate increases are staggered between years.

Although annual provider rate requests are the most common reason for rates increases, there is also an informal rate-setting process outside of the March 1st deadline if providers recognize a need post-deadline. Additionally, if the MCO identifies excess funds mid-to-late-year, they can distribute these funds through additional end-of-year rate increases.

Before rate increases are decided, the statewide capitation rates for Medicaid services are set. Capitation rates are fixed amounts per member enrolled in Medicaid that are allowed to be paid to managed care organizations. In practice, the state considers a variety of factors, including service utilization rates, enrollment rates, and stability of the currently enrolled Medicaid population to set capitation rates. Calculations of capitation rates are made with data from the two most recent fiscal periods (which are from July 1-June 30). For example, the state will set 2024 capitation rates using data from the 2021-2022 fiscal year. The MCO can negotiate these capitation rates with the state once every three years but otherwise must accept the rate given to them.

Capitation rates, dependent on a variety of statewide factors, establish the main pool of funds used to pay providers on a fee-for-service basis. This pool is also used to determine any rate changes. For example, the state capitation rate set by Pennsylvania for 2024 was \$3,944 per Medicaid enrollee. This rate, multiplied by the number of enrollees, establishes the funds from which providers can receive rate increases for 2024. While other sources of funding might contribute to this pool (e.g., reinvestment funds or excess funds from previous years), capitation rates make up the largest portion of the pool.

Due to inputs from the state, the MCO, and ACDHS, rate increases for mental health services are difficult for providers to predict. After submission on March 1, rate increases that are accepted by the MCO and ACDHS are implemented mid-year and are permanent. Additionally, while rate increases are provided as a way to increase or maintain supply of a service, they are not always used for intended purposes. While revenue goes to the provider, various constraints may prevent a supply increase of the intended services: for example, staffing issues, facility capacity, fixed costs such as rent and equipment depreciation, and other constraints may prevent funds from increasing the supply of services.

3 Data and Empirical Strategy

3.1 Medicaid Claims for Behavioral Health

Our data include the universe of mental health claims for Medicaid patients in Allegheny County from 2010-2019. These data come from Community Care Behavioral Health (CCBH), the Behavioral Health Managed Care Organization for the state of Pennsylvania's Medicaid HealthChoices program. For each claim, we observe the provider, which may be an individual physician or a hospital group. We also observe the procedure or service code, which follows the Current Procedure Terminology (CPT) coding system. We refer to each unique code as a service. For each provider, service, and month, we observe the base rate, any modifications of the base rate due to negotiations, and the number of unique patients served.

We begin with 203,230 provider-service-quarter observations. For each provider and service observed, the panel is balanced over time. Quarters with no observations are assigned zero units and the most recent prior rate. We drop provider-service combinations where the rate is always missing, service codes that were phased out during our sample period, one outlier service code with a huge rate drop, and service codes that were used less than 10 times in total. This leaves 191,240 provider-service-quarter observations. Appendix table B.1, panel A, presents summary statistics at the provider-service-quarter level. The mean number of units provided in a quarter is 50 units, and the standard deviation is 478. The median provider-service quarter has zero units. The average rate for a service is \$84 and the median is \$60. The rates vary from \$8 for group counseling for substance abuse to \$2,500 for inpatient residential services.

Appendix table B.1, panel B displays summary statistics at the provider-service level. One in five (18%) of all provider-services experience a rate change over our 10-year time period. On average, these are larger provider-services, so this represents over half of the total units. The largest providers include the University of Pittsburgh Medical Center's Western Psychiatric Hospital (14% of units), Mercy Behavioral Health (12% of units), and

Glade Run Lutheran Services (5% of units).

The median dollar change in rates is $11.60 and the median percent change is 15%. Of all services provided, 1% are inpatient service codes, and 31% are individual therapy, and 19% are group or family therapy. The remaining service codes are usually for specific, uncommon service codes that are infrequently billed. Of all units provided, 7% are inpatient service codes, 50% are individual therapy, and 33% are group or family therapy. The remaining 10% are mostly codes for non-inpatient hospital care or intake services.

3.2 Determinants of Rate Changes

The validity of our empirical strategy relies on the assumption that providers and service codes would have experienced parallel trends in the absence of rate changes. That is, providers and services with and without rate changes, or with larger or smaller changes, would have had similar trends in units supplied. This assumption could be incorrect if providers that grow receive greater rate changes. Alternatively, providers could request rate changes when the supply of a service is declining.

We find that the size of rate changes is likely unrelated to future supply changes for both institutional and quantitative reasons.

Most providers make requests for rate increases every year, regardless of supply levels. Our conversations with providers illustrate that rate increases are approved based on a variety of factors, including capitation rates and whether there are excess funds. Figure 1 plots the number of inpatient and outpatient rate changes approved each quarter from the first quarter of 2010 to the last quarter of 2019. Almost all rate changes are approved in odd years at the end of the year (2011Q4, 2013Q3, 2015Q4, and 2016Q4).

Within a timing cohort, a subset of providers received rate increases. As an example of our rate changes, consider the code for individual psychotherapy (90837-HP). In 2010, the majority of providers received $86 for this service, but 30% of the providers received $96.5. A subset of providers received rate increases on seven different dates: at the end of the sample in 2019, 83% of providers received the higher rate of \$96.5. A similar pattern occurred for the service code 99232 for Hospital Care for Evaluation. At the beginning of the sample, 56% of providers received the higher rate of \$57.75 compared to \$46.2. There were nine dates with rate changes. At the end of the sample, 85% of the providers received the higher rate.

Table 1 displays summary statistics on rate changes by service codes and characteristics of providers and services. Overall, 18% of providers and services received a rate change during 2010-2019. Although only a few providers offered inpatient services, 44% of these provider-service code combinations experienced a rate change. Individual therapy was more likely to receive rate changes, while few providers received rate changes for family and group therapy.

Providers with above median initial rates were more likely to receive rate changes than those with lower rates (27% versus 10%, respectively), and the smallest providers were less likely to receive rate changes. However, the size of the rate increase, both in levels and percentages, was not related to provider sizes.

We also directly test whether providers and services that were growing or declining received different rate changes. In panel (b), we compute the change in units from the prior year for each provider, service, and quarter. Observations that had increased in units over the past year were more likely to experience a rate change. Among observations that had increased 25-49%, 1.4% had a rate change, compared to 0.99% for those who had decreased 26-50%. However, the size of the rate change was consistent for observations that were growing or shrinking. In each case, the mean rate change was between \$15 and \$20. In many cases, the prior year unit change is not defined because it is the first year of our data, or the prior year units were zero. These observations were an order of magnitude less likely to receive a rate change and contribute little to our identifying variation.

Finally, our main event study graphs suggest no evidence of pre-trends leading up to rate increases. One exception is the slight negative pre-trend in Figure 3 panel (a) which studies visits per client. In this case, our estimates would be biased downwards, since providers who received rate increases might have been decreasing the number of visits per client before the rate change (and increased visits per client afterwards).

3.3 Empirical Strategy

To estimate the effects of rate increases on the supply of mental health services, we use a difference in difference framework. We compare outcomes for provider and services that did experience a rate change with those that did not experience a rate change, or experienced a rate change later in the study period. Our event is the first price change within a provider and service. We estimate the following event study equation:

$$y_{ist} = \beta_0 + \sum_{j \neq 1} \beta_j (\mathit{\Delta}_{i,s} \times D_{i,s,t-j}) + \delta_t + \alpha_{i,s} + \epsilon_{ist} \tag{1}$$

where y_{ist} is the outcome of interest for provider i, service s, and quarter t. On the right-hand side, $D_{i,s,t-j}$ is an indicator variable for event time j, meaning that the first price change for provider i and service s took place j periods before this observation's calendar time. $\mathit{\Delta}_{i,s}$ represents the size of the price change for that provider and service, either in levels or logs. δ_t and $\alpha_{i,s}$ represent quarter fixed effects and provider-service fixed effects, respectively. ϵ_{it} represents the idiosyncratic error term.

The coefficient of interest is β_j which varies by relative time and is normalized to zero in the year prior to treatment. We estimate the full set of β_j coefficients, but in most specifications, we plot the coefficients $-7 \leq j \leq 7$ to focus the time period where we have the most observations.

In our regression tables, we report average effects for a provider and service by estimating the difference-in-difference specification below.

$$y_{ist} = \beta_0 + \beta_{post} (\mathit{\Delta}_{i,s} \times Post_{i,s,t-j}) + \delta_t + \alpha_{i,s} + \epsilon_{ist} \tag{2}$$

In this equation, the relative years are replaced by an indicator “Post” for quarters after the rate change. In this specification, we restrict the sample to the quarters -7 to 7 to focus on the short-term effect.

4 Effect of Rate Changes on Mental Health Services

4.1 Quantity of Services

We present the event study estimates in Figure 2 which illustrates the effects of rate changes on the quantity of services supplied. We plot the coefficient on relative year, interacted with the natural log of the rate change plus one. All coefficients are relative to the coefficient on the quarter before the rate change. The outcome is the natural log of the number of units plus one. The number of units has a flat trend in the quarters before the rate change and then increases immediately after the rate change. We can interpret these coefficients as a supply elasticity that is around 0.15-0.20 (a 15%-20% increase in supply in response to a 100% increase in rate).

The corresponding regression results are shown in Appendix table B.3. Column 1 shows an estimated supply elasticity of 0.16 (95% confidence interval 0.11 to 0.20), which is similar to the result in Figure 2. As an alternative to the log specification, we also present estimates using Poisson regression in Appendix Section A.1 which are similar in timing and magnitude. Appendix Figure A.2 shows similar estimates using levels of units as the outcome.

In the previous estimates, we focus on seven quarters before and after the rate change, since rate changes occur every eight quarters on average. However, if future rate changes are independent from current rate changes, we can interpret coefficients from later quarters as showing the longer-run effects of the first rate changes. Appendix Figure B.4 plots the coefficients on relative quarters -11 to 15. The effect of a rate change on the number of units increases until one year afterwards, remains approximately constant until three years afterwards, and then falls back to zero. This suggests that rate changes may only have temporary effects on health services provision.

4.1.1 Magnitude of Effect

The average rate change in our sample is 20%. Using the elasticity of 0.16, this corresponds to a 3.2% increase in the supply of services for the mean rate change. The service that compromises the largest portion of outpatient rate changes is a 45-minute individual outpatient therapy session. In the last quarter of 2022, 7,877 units of this service were provided in Allegheny County, at a cost of $106.25 per unit. A 20% increase in rate (to $127.38 per unit) would result in a 3.2% increase in services, or about 250 additional units supplied in the next quarter. These additional units are expensive relative to the inframarginal units (which were supplied regardless), as the rate increase applies to *all* units.[2]

It is possible that the additional relatively high cost for the extra supply is warranted because this service is much more valuable than other services in reducing further medical spending or adverse health outcomes. A service's value will also likely depend on whether a service needs to be performed urgently. Longer wait times for mental health visits has been found to increase emergency room visits and mortality (Costantini, 2025).

We find that the elasticity of supply for units of mental health is lower than other papers have found in other settings. For example Cabral et al. (2025) focus on evaluation and management services and find an elasticity of 1.2 for dual Medicaid-Medicare enrollees in response to ACA rate changes. Alexander and Schnell (2024) find that a 13% increase in Medicaid rates leads to a 11 percent reduction in reports of doctors telling adult Medicaid beneficiaries that they are not accepting new patients, an elasticity of 0.8. This could reflect the effects of individual rate changes versus ACA changes or the difficulty in increasing the supply of mental health services. In Section 4.4.1 we show the low elasticity estimates are also because most rate changes remain well below Medicare rates.

[2]The additional cost of $21.25 is applied to 7,877 units and the cost of the marginal units is $127.38 times 250 for a total cost of almost $200,000.

4.2 Robustness to Heterogeneous Treatment Effects Over Time

In our setting, treatment both occurs at different times (staggered) and affects providers to different degrees, depending on the size of the rate change (continuous). Staggered treatment may pose a threat to identification if treatment effects are heterogeneous across cohorts.[3] Standard approaches for dealing with staggered treatment in a difference-in-difference analysis do not consider cases where treatment is continuous (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021). This literature is still evolving; one recommendation is to make reasonable choices in how to aggregate group, time, and treatment dosage effects (Callaway et al., 2024).

We employ two robustness checks to address our continuous and staggered treatment. First, Appendix Figure B.5 presents estimates from only one treatment period at a time, utilizing the four most common quarters with rate changes in our data. Concerns about heterogeneous treatment effects do not apply in cases with only one treatment cohort. Panels A and B are consistent with our main results from the full sample; in most panels, pre-trends are flat, and there is a marked jump in supply post-treatment. The estimated elasticity is larger, around 0.50 instead of 0.16, suggesting that responses are larger to expansive rate changes. In panel C there is a negative pre-trend but an increase in the coefficients after the rate change. Panel D, on the other hand, shows that there is no elasticity to rate changes in quarter 3 of 2016. In terms of timing, the estimates in Appendix Figure B.5 also show supply increases immediately after the rate changes, confirming the general patterns in our main results.

Secondly, Appendix Figure B.6 replicates our main results, but includes treatment cohort by quarter fixed effects. This controls for differences between treatment cohorts over time and identifies treatment effects using only variation in the *size* of rate changes within treatment cohorts. With these controls, the effect sizes are larger, and the elasticity is about 0.4, rather than 0.16 in our main estimates. There is a negative pre-trend, indicating that

[3] Cohorts refer to all provider-service codes that experience rate changes in the same quarter.

providers who were experiencing decreases in supply received larger rate increases. This would bias our main elasticity estimate downwards in the absence of the timing variation. However, the general pattern mimics that of our main results.

4.3 Mechanisms: Unique Clients

Outpatient services could increase after a rate change because providers accept additional clients or because they increase the number of services to existing clients. In Figure 3, panel a, we plot the natural log of the number of units per client. Observations with no visits or clients are given a value of zero. We find an immediate increase in visits per client that persist for two years after the rate change. In Appendix table B.3, column (2), we find that the elasticity of visits per client is 0.09.

In Figure 3, panel b, we plot the number of *unique* clients served by a provider using our event study equation. The patterns mimic those of patterns for outpatient rate changes overall; namely, there is an increase in the number of unique clients served that remains for 7 quarters. However, while services overall increased in quarter one after a price change, the effect on clients served takes three to four quarters occur. These results suggest that providers may initially expand capacity by adding appointments and services for existing clients, while expanding to new clientele requires a longer period.

The size of the increase in unique clients is smaller than the increase in total units. In Appendix table B.3, column (3), we show that the elasticity of unique clients to rate changes is 0.07, compared to the elasticity of total visits of 0.16.

The average provider and service has 50 units and 9.5 unique patients. With an elasticity of total visits of 0.16, the average provider and service that experienced a 20% rate increase would have 1.6 more units (20% x 0.16 x 50 units). This roughly comes from 0.7 visits by new patients (20% x 0.07 elasticity of new patients x 9.5 patients x 5 visits per new patient) and 0.9 visits by existing patients (20% x 0.09 elasticity of visits per patient x 9.5 patients x 5 visits per patient).

4.4 Heterogeneity

4.4.1 Descriptive of Rates Relative to Medicare

Most providers serve not only Medicaid patients but also Medicare and privately-insured patients. Their decision to see Medicaid patients may depend on the rates for Medicare or privately-insured patients. We analyze how relative rates affect the provider supply response.

We obtain annual Medicare rates from 2010-2019 from the Centers for Medicare and Medicaid Services Physician Fee Schedule. We use the facility fee rate for Pennsylvania outside of Philadelphia. In appendix table B.2, we show the most common service codes in our data, along with their descriptions, and Medicaid and Medicare rates in 2019. Behavioral health counseling (15 minutes) is billed at a Medicaid rate of \$24; however, Medicare does not allow billing at these increments and does not pay for this rate. The second most common service is 90853-HE, a group therapy session. Medicaid pays \$8.90 to \$10, while Medicare pays \$25.04. Similarly, a one-hour individual therapy appointment is paid \$72 to \$106.15 in Medicaid, but \$126.28 under Medicare.

In some cases, Medicaid rates are higher than Medicare rates. Service code 90834-HP (individual therapy 45-50 minutes) is reimbursed at \$86-\$89 in Medicaid but \$84.13 in Medicare. ”HP” refers to a doctoral level provider; ”HE” refers to a mental health program. The ”HP” modifier is reimbursed more in Medicaid than the ”HE” modifier, but for Medicare billing 90834-HP and 90834-HE receive a consistent \$84.90.

Appendix figure B.3 displays the full distribution of Medicaid rates relative to Medicare rates in 2019. Each Medicaid rate is normalized as a percentage of the Medicare rate for that service. As shown in panel (a), the median Medicaid service pays 80% of Medicare rate, but there is substantial variation. Panel (b) is weighted by the number of units provided in the first quarter of 2019. In total 28% of all provider-service codes pay *more* for Medicaid than Medicare, but only 10% of all units are paid more in Medicaid than Medicare.

4.4.2 Heterogeneity by Rate Relative to Medicare

We might expect larger supply responses if the Medicaid rate comes close to or passes the Medicare rate for that service. Figure 4 shows how the elasticity of mental health supply changes as a function of the Medicaid rate compared to Medicare. We estimate equation 2 separately by the post-change Medicaid rate relative to Medicare. In each of the first six bins, the rate before the change was below Medicare rates. The last bin includes providers and services for whom the rate was already higher than Medicare. All providers and services with no rate changes are included in each of these specifications as the control group.

Figure 4 shows that the elasticity of mental health supply is larger for rate changes that are 90-95% of Medicare, 95-100% of Medicare or over 100% of Medicare rates. The elasticity for rates that are below 90% relative to Medicare is smaller, as is the elasticity for rate already above Medicare. Of all rate changes, 72% are in the first three bins (¡90% of Medicare), 22% are in the second three bins (90%- over 100% of Medicare, and 7% have a rate already higher than Medicare.

Appendix Figure B.7 shows the dynamic event study patterns for the subgroup with final Medicaid rate within 10% of Medicare rates. All providers and services with no rate changes served as a control group in both specifications. As in Figure 4, we observe a larger elasticity when the final rate is near Medicare rates.

This evidence fits with providers considering Medicare patients to be substitutes for Medicaid patients. If rates for Medicaid patients remain substantially below Medicare rates, both before and after a rate change, Medicare patients will always be more profitable and accordingly we see little change in supply. This situation applies to the majority of rate changes where the final rate remains substantially below the Medicare rate. Overall, our elasticity estimates may be low because only a quarter of rate changes move the Medicaid reimbursement close to or above Medicare rates.

4.4.3 Heterogeneity by Provider Size

The approximately 1,100 behavioral healthcare providers within Allegheny County vary from large hospitals to individual practitioners. In order to understand differences in elasticities, we bucket providers into five groups based on the total units they supplied in an average quarter before their first rate change. For providers with no rate change, we use the average units across all quarters.

We estimate equation 2 separately by quintile of provider size. Appendix figure B.8 shows that the elasticity of rate changes is similar for small and larger providers. While administrative capacity, fixed costs, and staffing capabilities all vary by provider size, both small and large providers increase supply in response to rate increases.

5 Conclusion

We derive supply elasticities for providers of Medicaid behavioral health services in Allegheny County. We use detailed data on all 50,000 recipients of Medicaid behavioral healthcare services in the county, 1,100 behavioral health care providers, and all rate changes for the 10 years between 2010 and 2019.

We find that the supply elasticity for mental health services is around 0.16. We find evidence that providers mostly increase units for existing clients rather than attract new clients. Our supply elasticities are similar for smaller and larger providers.

Our estimated elasticities are much larger for rate changes that bring Medicaid rates in line with Medicare rates. Our data represent one of the first efforts to use service-code and provider level rate changes and estimate elasticities relative to Medicare reimbursement rates. We find substantial variation in rates, both within a service code and relative to Medicare rates. We also document variation in the supply response by the size of Medicaid rates relative to Medicare rates.

Almost all Medicaid rates in our context are consistently below Medicare rates, both before and after rate changes. This limits the financial attractiveness of serving Medicaid patients relative to Medicare patients and contributes to our low overall elasticity estimates.

Our work suggests that, for Medicaid behavioral healthcare services, rate increases below Medicare rates have limited effects on provider supply, while increases near Medicare rates have much larger effects. For behavioral healthcare, overall elasticities are not high enough to address capacity constraints at the level of a typical rate increase. ACDHS has latitude to assign a portion of total Medicaid funds to health care investments, which could be another pathway for increasing capacity. Our findings indicate that policymakers may need to consider alternative approaches, such as targeted rate increases relative to Medicare rates or direct capacity investments, to meaningfully expand access to behavioral healthcare services for Medicaid recipients.

References

Alexander, D. and M. Schnell (2024, July). The impacts of physician payments on patient access, use, and health. *American Economic Journal: Applied Economics 16*(3), 142–77.

Bishop, T. F., M. J. Press, S. Keyhani, and H. A. Pincus (2014, 02). Acceptance of Insurance by Psychiatrists and the Implications for Access to Mental Health Care. *JAMA Psychiatry 71*(2).

Breslau, J., B. Han, J. Lai, and H. Yu (2020, 07). Impact of the ACA Medicaid Expansion on Utilization of Mental Health Care. *Medical Care 58*, 757–762.

Buchmueller, T. C., S. Orzol, and L. D. Shore-Sheppard (2015). The effect of medicaid payment rates on access to dental care among children. *American Journal of Health Economics 1*(2), 194–223.

Cabral, M., C. Carey, and S. Miller (2025). The Impact of Provider Payments on Health Care Utilization of Low-Income Individuals: Evidence from Medicare and Medicaid. *American Economic Journal: Economic Policy 117*(1).

Callaway, B., A. Goodman-Bacon, and P. H. C. Sant'Anna (2024). Event studies with a continuous treatment. *AEA Papers and Proceedings 114*(May), 601–05. Themed Issue: Treatment Effect 1.

Callaway, B. and P. H. Sant'Anna (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics 225*(2), 200–230. Themed Issue: Treatment Effect 1.

Callison, K. and B. T. Nguyen (2018). The effect of medicaid physician fee increases on health care access, utilization, and expenditures. *Health Services Research 53*, 690–710.

Costantini, S. (2025). How Do Mental Health Treatment Delays Impact Long Term Mortality? *American Economic Review, forthcoming*.

Counts, N. (2023). Understanding the u.s. behavioral health workforce shortage. *The Commonwealth Fund*.

Decker, S. L. (2007). Medicaid physician fees and the quality of medical care of medicaid patients in the usa. *Review of Economics of the Household 5*(1), 95–112.

Hinton, E. and J. Raphael (2024). 10 things to know about medicaid managed care. https://www.kff.org/medicaid/issue-brief/10-things-to-know-about-medicaid-managed-care.

Kwok, J., S. M. Langevin, A. Argiris, J. R. Grandis, W. E. Gooding, and E. Taioli (2010). The impact of health insurance status on the survival of patients with head and neck cancer. *Cancer: Interdisciplinary International Journal of the American Cancer Society 116*(2), 476–485.

Maclean, J. C., C. McClellan, M. F. Pesko, and D. Polsky (2018). Reimbursement Rates for Primary Care Services: Evidence of Spillover Effects to Behavioral Health. *NBER Working Paper No. 24805*.

McMorrow, S., S. K. Long, and A. Fogel (2015). Primary care providers ordered fewer preventive services for women with medicaid than for women with private coverage. *Health Affairs 34*(6), 1001–1009.

Oostrom, T., L. Einav, and A. Finkelstein (2017). Outpatient office wait times and quality of care for medicaid patients. *Health Affairs 36*(5), 826–832.

Polsky, D., M. Richards, S. Basseyn, D. Wissoker, G. M. Kenney, S. Zuckerman, and K. V. Rhodes (2015). Appointment availability after increases in medicaid payments for primary care. *New England Journal of Medicine 372*(6), 537–545.

Sun, C.-F., C. U. Correll, R. L. Trestman, Y. Lin, H. Xie, M. S. Hankey, R. P. Uymatiao, R. T. Patel, V. L. Metsutnan, E. C. McDaid, A. Saha, C. Kuo, P. Lewis, S. H. Bhatt, L. E. Lipphard, and A. S. Kablinger (2023). Low availability, long wait times, and high geographic disparity of psychiatric outpatient care in the us. *General Hospital Psychiatry 84*, 12–17.

Sun, L. and S. Abraham (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics 225*(2), 175–199. Themed Issue: Treatment Effect 1.

Zuckerman, S. and D. Goin (2012). How Much Will Medicaid Physician Fees for Primary Care Rise in 2013? Evidence from a 2012 Survey of Medicaid Physician Fees. *Washington, DC: Kaiser Commission on Medicaid and the Uninsured*.

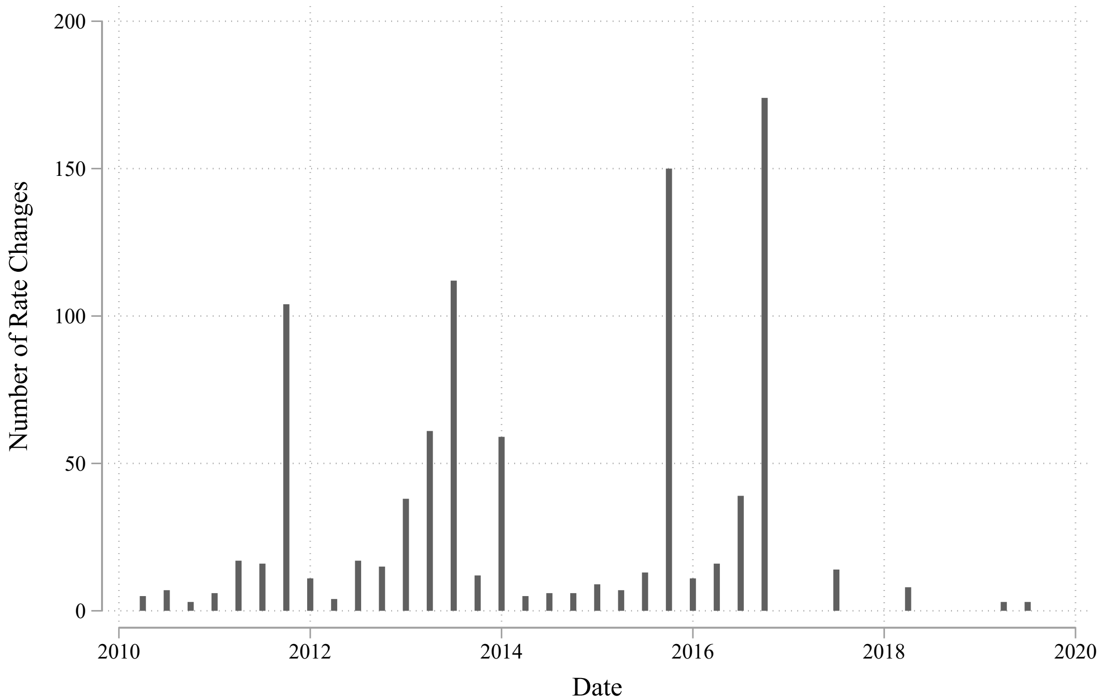
Figures and Tables

Table 1: Rate Changes by Provider and Service Characteristics

	N	Share with Rate Change	Mean Initial Rate	Rate Change ($)	Rate Change (%)
A. Provider-Service Level					
All	4,693	.18	106.52	17.15	20
Inpatient	59	.44	616.2	60.06	11
Individual Therapy	1,478	.27	76.57	14.16	19
Family & Group Therapy	913	.04	11.56	10.52	50
Largest Providers	1,035	.19	133.98	17.12	16
4th Quintile	957	.20	95.75	19.86	25
3rd Quintile	1,006	.21	95.47	13.99	17
2nd Quintile	965	.20	104.89	18.57	23
Smallest Providers	730	.12	98.54	15.69	23
Rate, Above Median	2,242	.27	134.29	19.89	17
Rate, Below Median	2,451	.10	38.11	10.41	28
B. Provider-Service-Quarter Level					
All	191,240	.0045	106.52	17.15	20
Prior Year Change in Units					
Less than -50%	17,556	.0108	105.68	15.49	20
-50% to -26%	4,867	.0099	128.00	19.63	21
-25% to -1%	4,453	.0139	124.94	15.27	17
0% to 24%	5,633	.014	126.08	17.92	22
25% to 49%	2,469	.0142	132.10	16.38	17
Greater than 50%	9,650	.0172	111.63	16.08	16

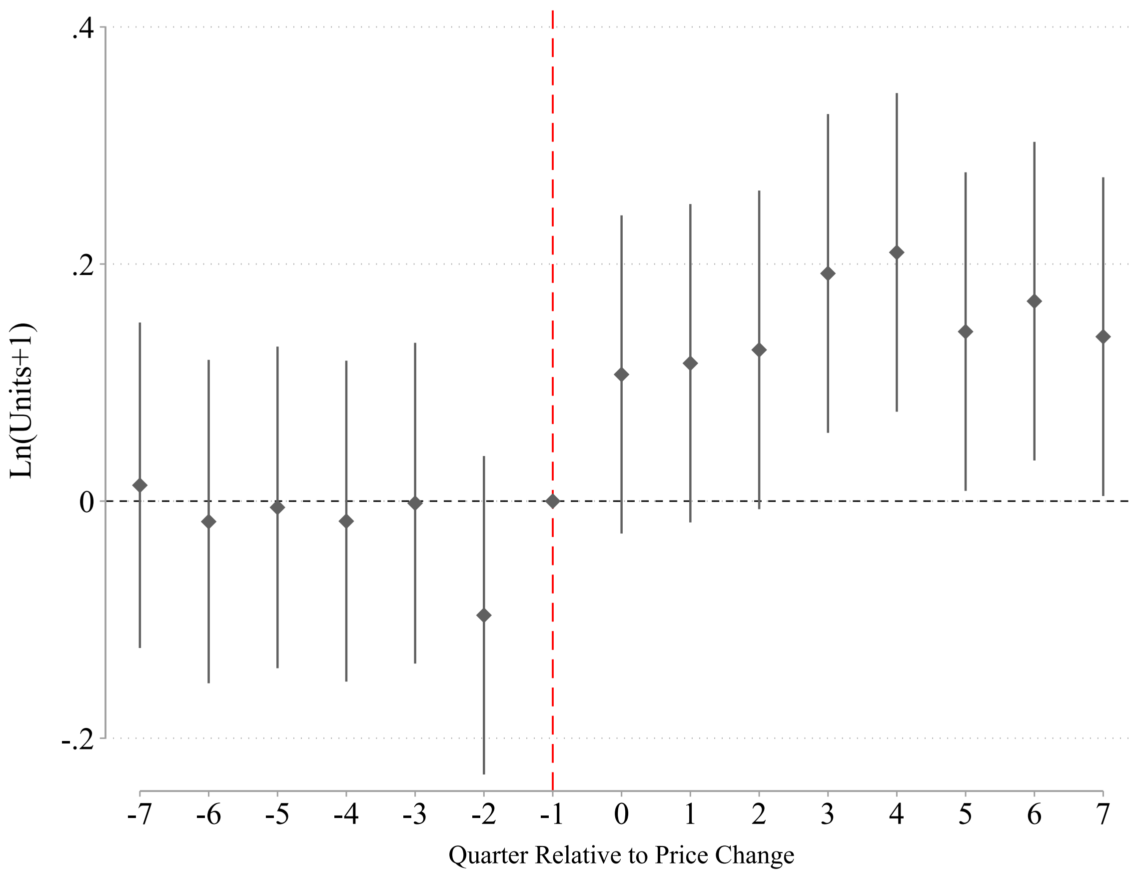
Note: Table presents the frequency and size of rate changes for different service codes and subsets of the data. Behavioral Health Counseling (15 min) refers to codes H0004-HB, H0004-HN, and H0004-HR. These are combined since they all have similar rates and no changes. Psychiatric diagnostic evaluation refers to code 90791-HP. Individual Psychotherapy 45-50 min refers to codes 90834-HP and Individual Psychotherapy 60 min refers to 90837-HP. Hospital Care/Day for Evaluation refers to code 99232. Mean initial rate and the rate change are given in dollars.

Figure 1: Timing of Rate Changes



Note: Figure presents the number of rate changes each quarter. For example, in the last quarter of 2011, there were 104 provider by service code observations that changed their rates.

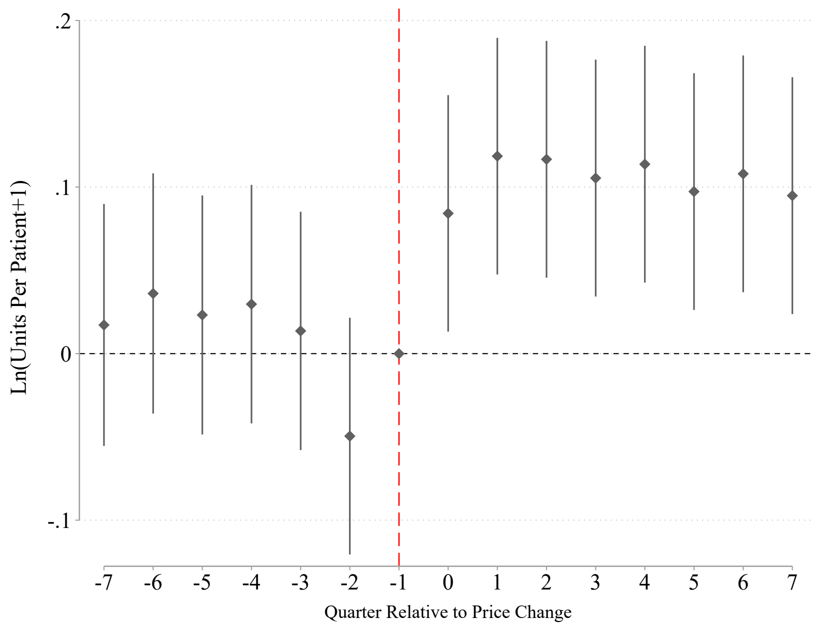
Figure 2: Impact of Rate Changes on Units



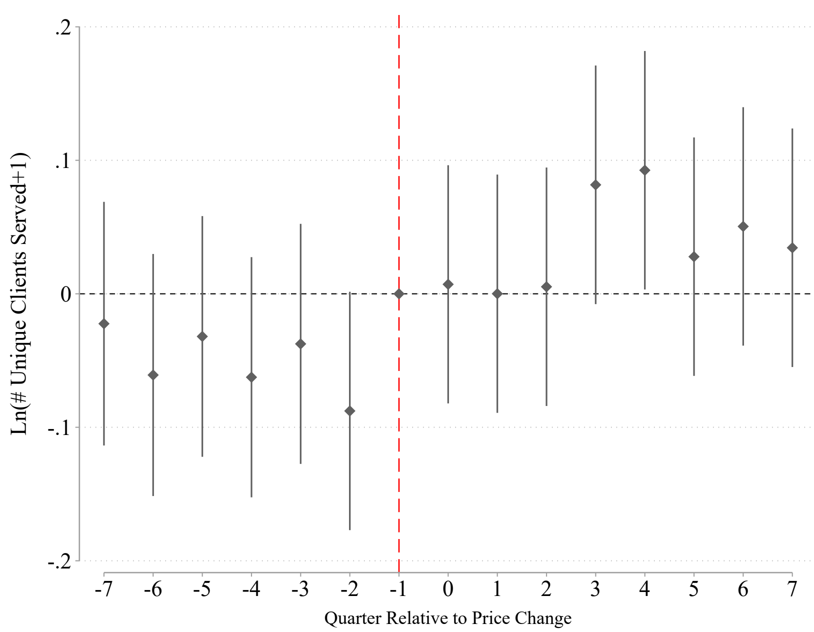
Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. An observation is a provider by service code by quarter. The outcome is the natural log of the number of units plus one. In all specifications, we control for provider by service code fixed effects, quarter fixed effects, and the natural log of the rate change.

Figure 3: Impact on Intensive vs Extensive Margin

(a) Visits per Client

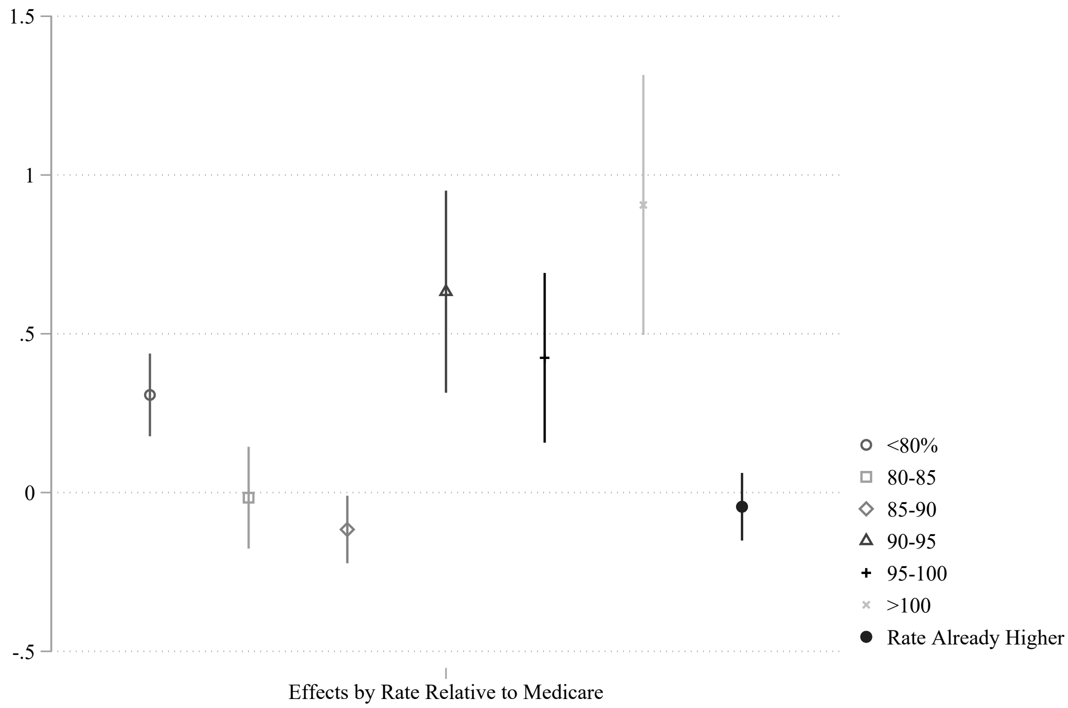


(b) Unique Clients



Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. The outcome is the natural log of the number of visits per patient (panel a), or the natural log of the number of unique clients plus one (panel b). In all specifications, we control for provider by service code fixed effects, quarter fixed effects, and the natural log of the rate change.

Figure 4: Heterogeneity by Rate Relative to Medicare



Note: Figure presents coefficients from the estimation of equation 2 by the relative reimbursement rate. We plot the coefficient β_j on the interaction between after the rate change and the natural log of the rate change plus one. We estimate this equation separately by the Medicaid reimbursement rate relative to Medicare. The first estimate includes all provider-services where the post-change Medicaid rate is less than 80% of Medicare's rate; in the second estimate the post-change Medicaid rate is from 80-85% of Medicare rates. The relative rate is never a round integer so the ranges all exclude the endpoints. In the last estimate, the pre-change Medicaid rate is already above Medicare (these observations are excluded from the other estimates).

A Alternate Specifications

A.1 Poisson

We focus on the log of units as our main outcome. As an alternative to the log specification, we also present estimates using poisson regression, which is well suited for count outcomes. We estimate

$$ln(y_{ist}) = \beta_0 + \sum_{j=-8+}^{8+} \beta_j(\mathit{\Delta}_{i,s} \times D_{i,s,t-j}) + \delta_t + \alpha_{i,s} + \epsilon_{ist} \tag{3}$$

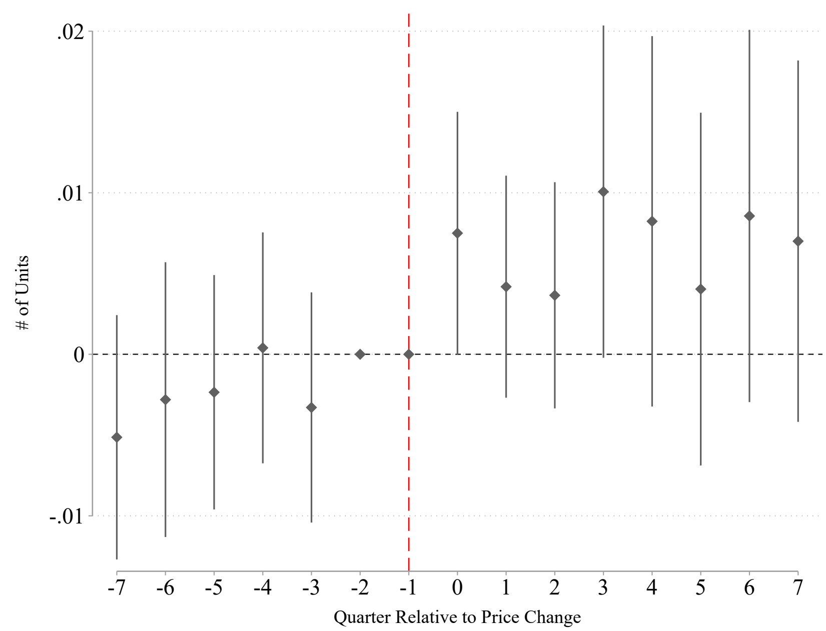
using maximum likelihood estimation. The outcome y_{ist} is number of units for provider i, for service s in quarter t. On the right-hand side, $D_{i,s,t-j}$ is an indicator variable for event time j, meaning that the first price change for provider i and service s took place j periods before this observation's calendar time. $\mathit{\Delta}_{i,s}$ represents the size of the price change for that provider and service, either in levels or logs. δ_t and $\alpha_{i,s}$ represent quarter fixed effects and provider-service fixed effects, respectively. ϵ_{it} represents the idiosyncratic error term. Unlike equation 1, we bin quarters before negative eight and those after quarter 8 separately. We also omit both quarter -2 and quarter -1. These changes improve statistical precision and ensure the poisson estimates converge.

The coefficients in Appendix Figure A.1, panel (a) show a qualitative pattern similar to the main event study specifications: the pre-trend is flat, and the providers and services with rate changes had a statistically significant increase in the number of units after the rate change. The coefficients after the rate change are about 0.05, suggesting that a \$1 increase in rates results in an $e^{0.05}$ or 5% increase in units. In Figure 2, panel (a), a \$1 increase in rates results in an approximate 1 unit increase, a 2% increase relative to the mean of 50 units. In this case the poisson estimates are similar, though about half as large as the main estimates.

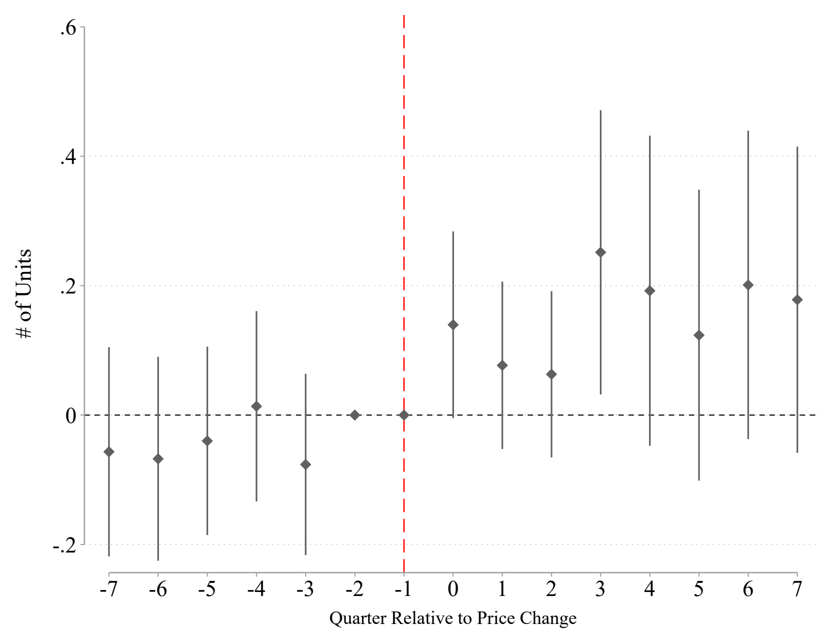
Appendix Figure A.1, panel (b) presents similar estimates except the size of the price change on the right-hand-side is measured in logs. The coefficients are stable and flat before the rate change but increase to about 0.2 after the rate change. This suggests that 100% increase in units corresponds to an $e^{0.2}$ or 22% increase in units. This is similar to the estimates from Figure 2, panel(b) of about 16%. In this specification, the poisson and main estimates are very similar in magnitude.

Figure A.1: Poisson Regression

(a) Effect of Rate Change



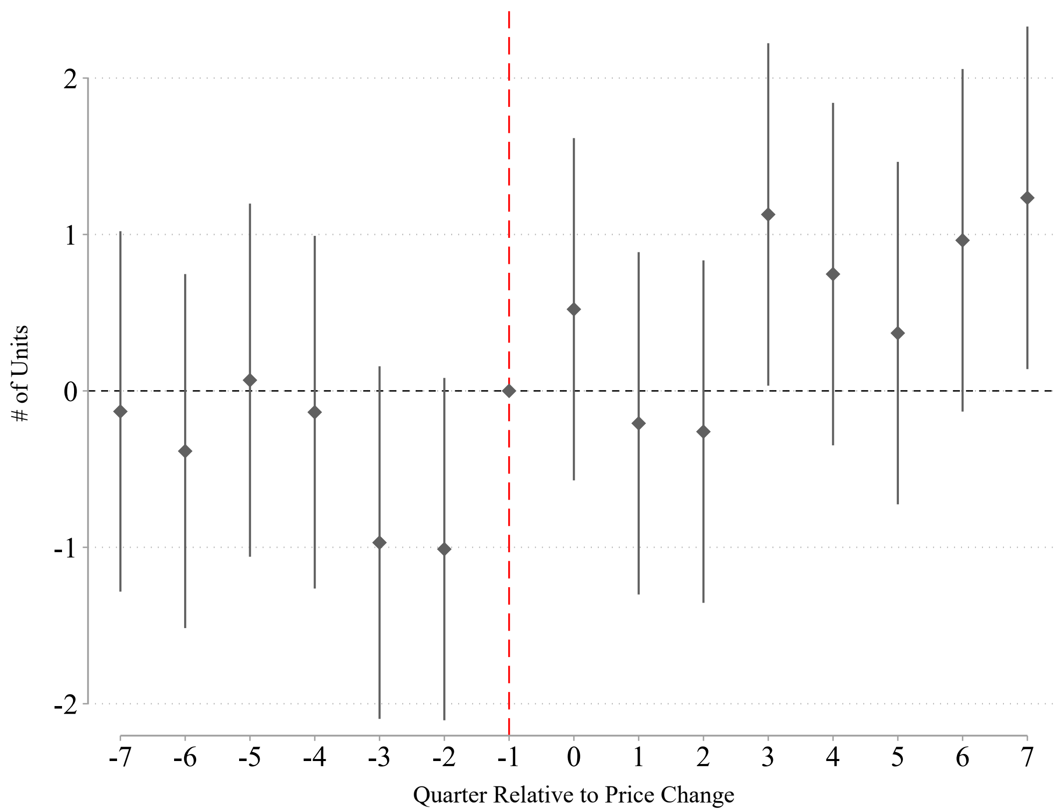
(b) Effect of Ln(Rate Change +1)



Note: Figure presents event study coefficients from the estimation of equation 3. We plot the coefficients β_j on the interaction between event time and the level of the rate change (panel (a)) or the natural log of the rate change plus one (panel (b)). An observation is a provider by service code by quarter. The outcome both cases is the number of units. In all specifications, we control for provider by service code fixed effects, quarter fixed effects, and the level or natural log of the rate change.

A.2 Levels

Figure A.2: Impact of Rate Changes on Units in Levels



Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the rate change plus one. An observation is a provider by service code by quarter. The outcome is the number of units plus one. In all specifications, we control for provider by service code fixed effects, quarter fixed effects, and the level of the rate change.

B Additional Tables and Figures

Table B.1: Summary Statistics

	Count	Mean	Median	SD	Min	Max
A. Provider-Service-Quarter Level						
Units	191,240	49.6	0.00	478.4	0	26,679
Share with Zero Units	191,240	0.73	1.00	0.44	0	1
Rate ($)	191,240	84.3	60.00	101.5	8	2,500
Unique Clients Served	191,240	9.47	0.00	83.2	0	5,581
B. Provider-Service Level						
Share with Rate Change	4,693	0.18	0.00	0.39	0	1
Rate Change ($)	866	17.2	11.6	20.7	1	226
Rate Change (%)	866	20.4	15.0	24.0	3	227
Inpatient	4,693	0.01	0.00	0.11	0	1
Individual Therapy	4,693	0.31	0.00	0.46	0	1
Group & Family Therapy	4,693	0.19	0.00	0.40	0	1

Note: Table presents summary statistics for outcomes at the provider-service-quarter level (panel A), or the provider-service level (panel B). Rate Change ($) and Rate Change (%) are summarized conditional on having a non-zero rate change.

Table B.2: Medicare versus Medicaid Rate Examples

Service	**Description**	**Share of Units**	**Medicaid Min**	**Medicaid Max**	**Medicare**
H0004	Behavioral health counseling (15 min)	38%	\$24.00	\$24.00	
90853-HE	Group Psychotherapy	20%	\$8.90	\$10.00	\$25.04
90837-HE	Individual Psychotherapy 60 min	6%	\$72.00	\$106.15	\$126.38
99232	Hospital Care/Day for Evaluation	5%	\$46.20	\$57.75	\$72.71
90834-HE	Individual Psychotherapy 45-50 min	5%	\$72.00	\$75.00	\$84.13
..					
90834-HP	Individual Psychotherapy 45-50 min	0.3%	\$86.00	\$89.00	\$84.13

Note: Table 3 presents the 2019 rates associated with the most common five service codes in our data, and their corresponding Medicare rates. Behavioral Health Counseling (15 min) refers to codes H0004-HB, H0004-HN, and H0004-HR. Medicare does not allow billing for this code (in 15 min increments). Data on Medicare rates come from Center for Medicaid and Medicare Services. We used the facility price for the region of Pennsylvania (outside of Philadelphia). The Medicaid rate is the maximum rate observed in our data, while the Medicare rate is constant for all providers.

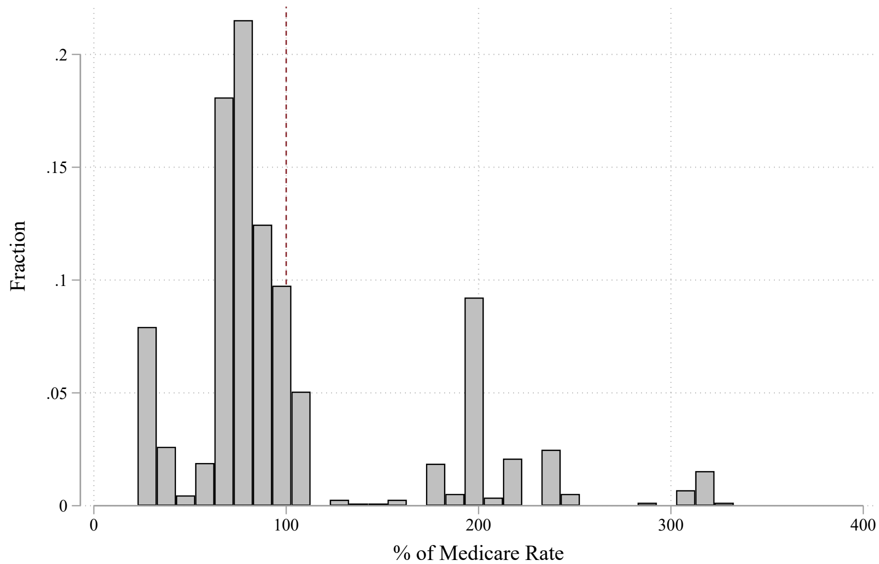
Table B.3: Impact of Rate Changes in First Two Years

	(1) Ln(Units+1)	(2) Ln(Units per Client+1)	(3) Ln(Unique Clients+1)
Post × Ln(RateChange+1)	0.156***	0.0919***	0.0668***
	(0.0236)	(0.0130)	(0.0151)
Post	-0.598***	-0.385***	-0.280***
	(0.0632)	(0.0348)	(0.0403)
Provider x Service Fixed Effects	Yes	Yes	Yes
Mean of dep. var.	0.807	0.411	0.510
Adjusted R^2	.56	.48	.59
Observations	171,013	171,013	171,013

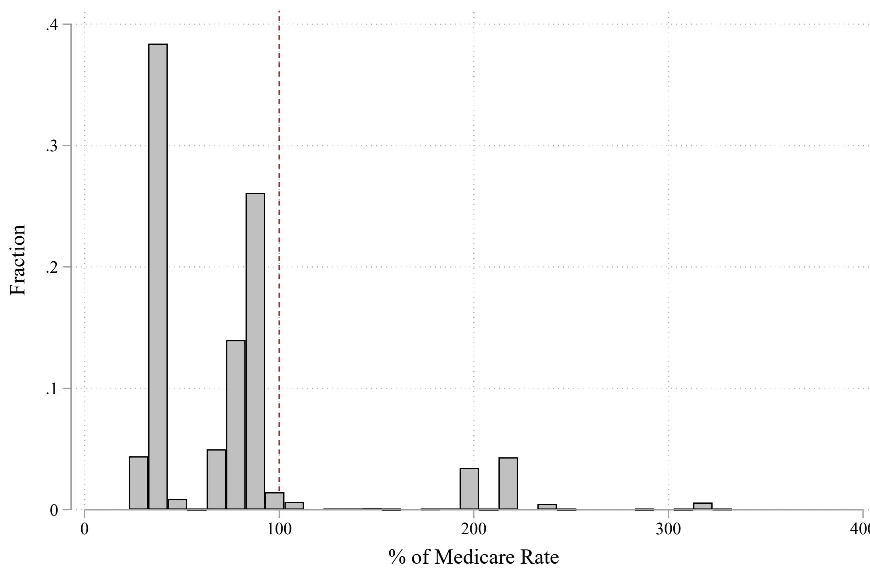
Note: Columns (1)-(3) present estimates from equation 2. The sample size is smaller than in Table B.1 because we restrict the sample to relative quarters between -7 and 7 to focus on the short-term effects of rate changes. In all specifications, we control for provider by service code fixed effects, quarter fixed effects, and the level or natural log of the rate change.

Figure B.3: Medicaid Rates Relative to Medicare

(a) Provider- and Service-Level

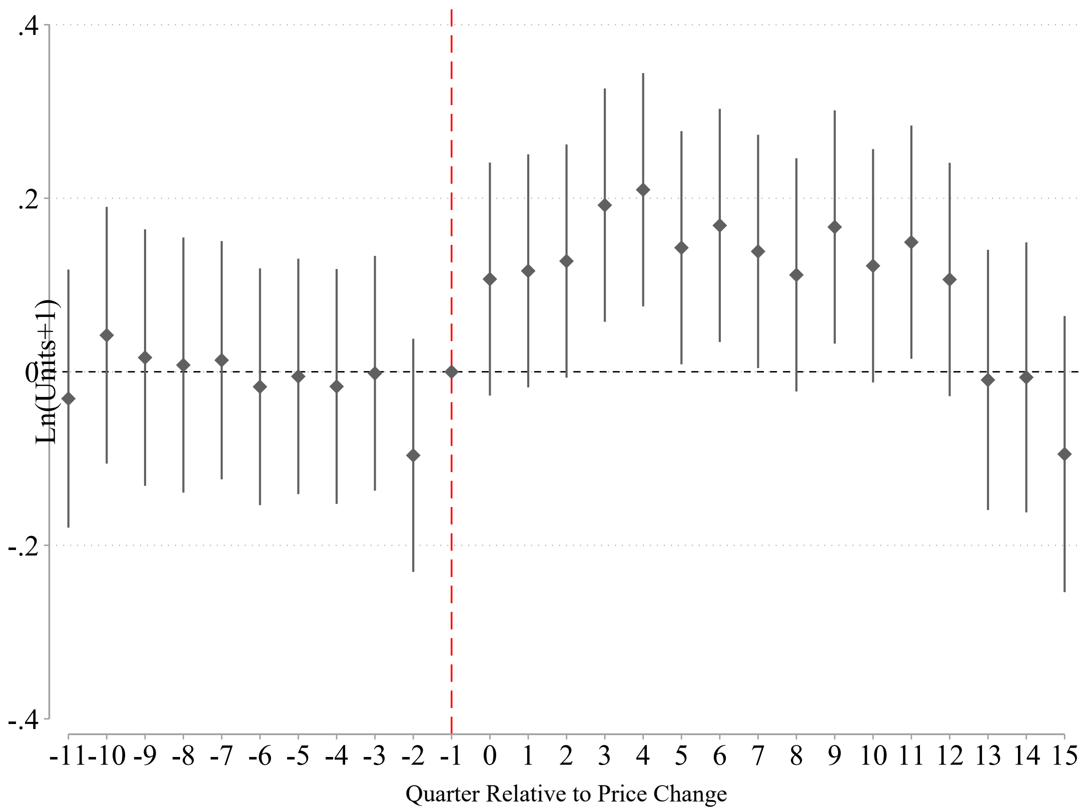


(b) Weighted by Units



Note: Figure presents Medicaid rates in the first quarter of 2019, as a percent of Medicare rates. Medicare rates were obtained from the Center for Medicare and Medicaid Services fee schedule. The fee schedule did not contain Medicare prices for nine out of forty-one 5-digit service codes. We used the facility price for the region of Pennsylvania (outside of Philadelphia). We drop service code 99211 ("Office/outpatient visit established") which only occurred five times but had a Medicaid price of $55 and Medicare price of $9.22.

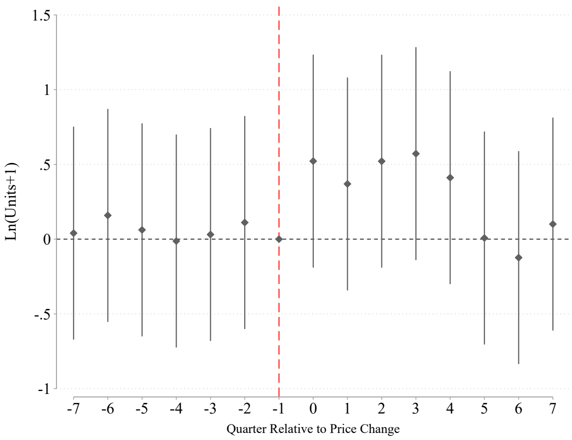
Figure B.4: Expanded Time Periods



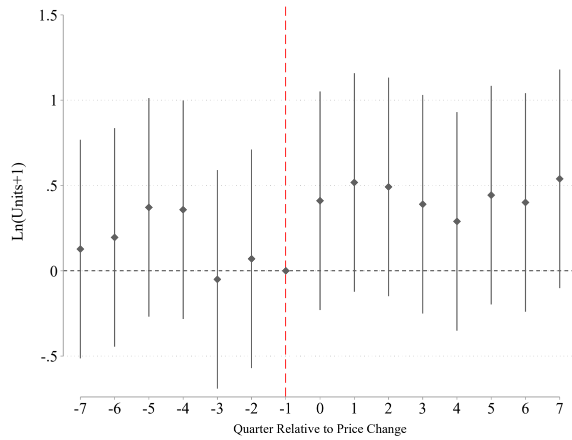
Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. This figure replicates the estimates from Figure 2 but plots additional relative quarter estimates.

Figure B.5: Heterogeneity by Time of Rate Change

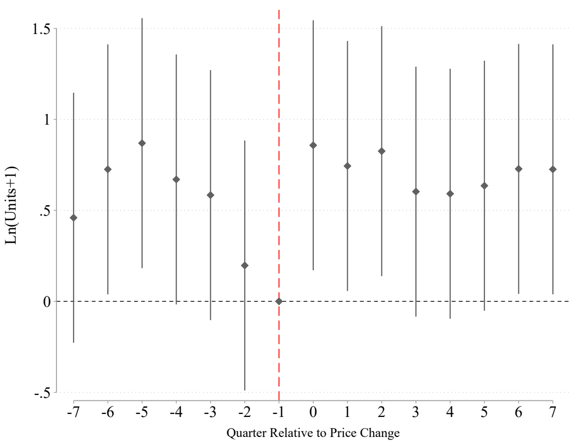
(a) 2011 Quarter 3



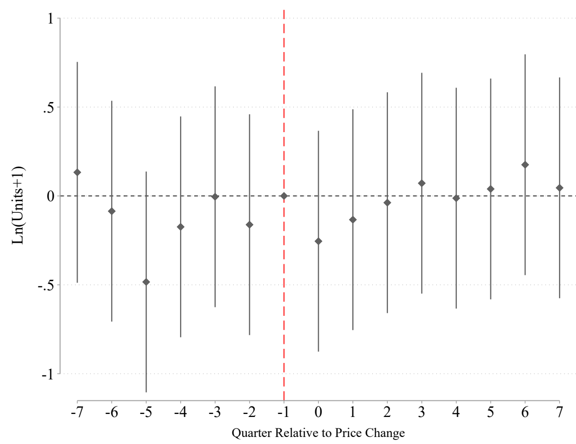
(b) 2013 Quarter 2



(c) 2015 Quarter 3

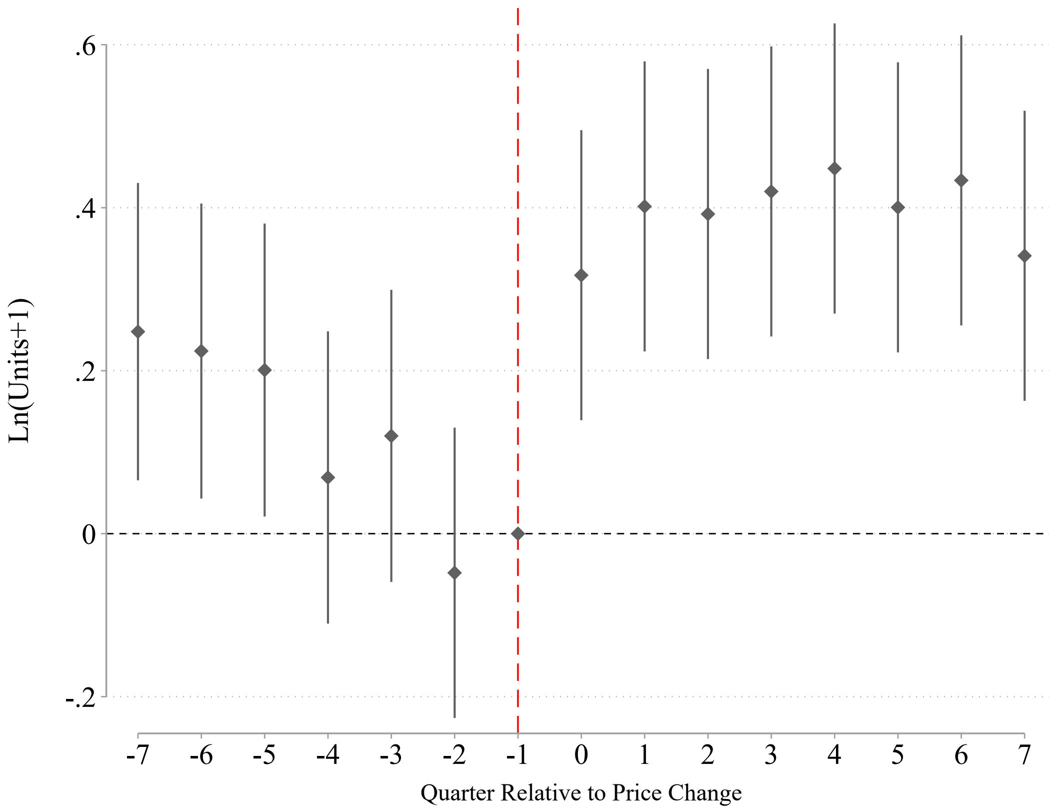


(d) 2016 Quarter 3



Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. Each panel restricts the sample to the subset of observations with a rate change in that quarter. These four quarters are the most common quarters for rate changes in our sample.

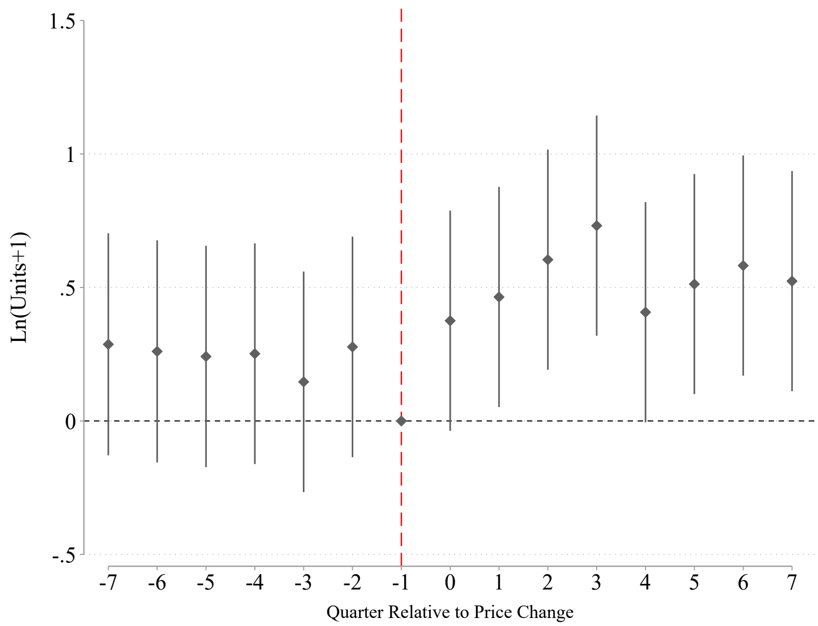
Figure B.6: Control for Timing Cohort by Quarter



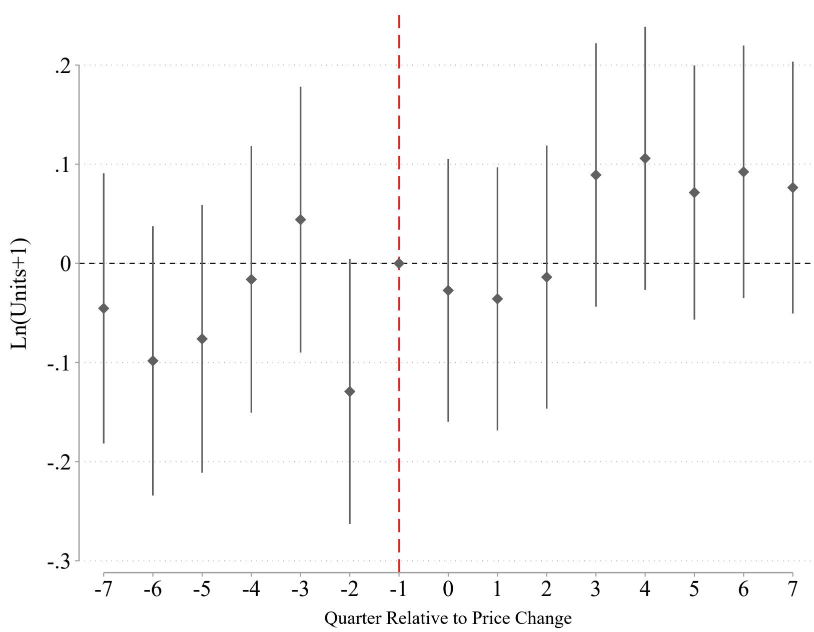
Note: We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one (panel (b)). In addition to the controls in Figure 2, panel (b), we control for each rate change cohort by quarter.

Figure B.7: Impact Relative to Medicare Rate

(a) Within 10% of Medicare Rate

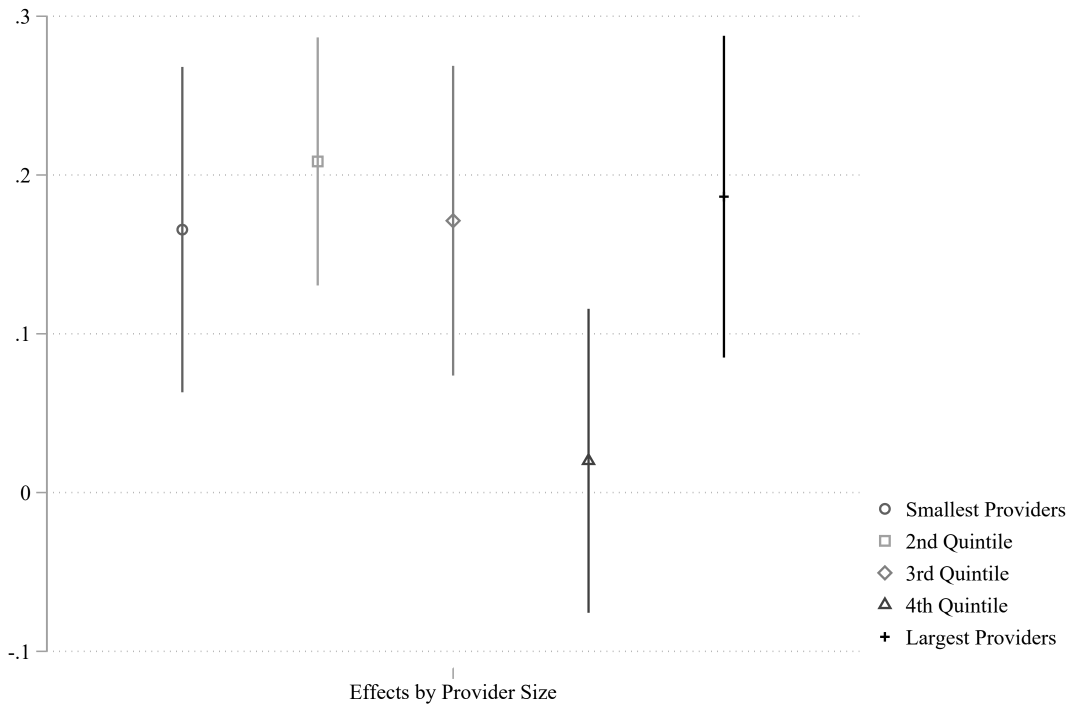


(b) Not Within 10% of Medicare Rate



Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. We estimate this equation separately by the Medicaid reimbursement rate relative to Medicare. In panel (a), we include all provider-services where the pre-change Medicaid rate is below Medicare and the post-change Medicaid rate is at least 90% of Medicare's rate. In panel (b), the post-change Medicaid rate is from 80-85% of Medicare rates. The relative rate is never a round integer so the ranges all exclude the endpoints. In the last estimate, the pre-change Medicaid rate is already above Medicare (these observations are excluded from the other estimates). In all specifications, we control for provider by service code fixed effects, quarter fixed effects, and the natural log of the rate change.

Figure B.8: Heterogeneity by Provider Size



Note: Figure presents coefficients from the estimation of equation 2 by provider size. We plot the coefficient β_j on the interaction between after the rate change and the natural log of the rate change plus one. We estimate this equation separately for each quintile of providers in our data.