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 provides behavioral health services for Medicaid recipients in collaboration with a managed care organization that sets and frequently changes provider and service-specific rates. We find that increasing Medicaid payments for mental health services increases the quantity of services provided, with an elasticity of around 0.16. This corresponds to the average increase in rates (20%) leading to a 3.2% increase in services. Payments mostly increase the number of services rendered for pre-existing patients, with a small increase in the number of unique patients, and are more effective for the largest providers.

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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.

This paper examines 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. 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. We use variation in the timing and size of these rate changes to estimate how Medicaid rates affect the supply of mental health services.

First, we document substantial variation in Medicaid rates, both relative to Medicare rates and within a service code. While the median provider and service is paid 20% less in Medicaid than in Medicare, the 25th percentile provider and service receives 30% less and the 75th percentile receives 4% more than in Medicare. For one-third of the services, reimbursement rates vary *across* providers within the same service and time period.

Our estimates are therefore based on averaging the results of hundreds of different rate changes for different providers and services. Much of the prior literature on the effect of Medicaid payments uses variation in average state-level Medicaid fees for a sample of services (e.g. Decker 2007; Zuckerman and Goin 2012) or focuses on rate changes due to the Affordable Care Act (ACA). We are able to document and use the variation in rates within a state and service code across a decade.

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.

First, we interviewed colleagues at Allegheny County's Department of Human Services who were involved in the rate-setting process. Discussions about factors that affected 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." This is supported in our data, where most rate changes are concentrated in only four quarters out of the 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 also spoke to individuals involved in setting Medicaid rates for behavioral health in a different but related context: rural Pennsylvannia (outside of Allegheny). They gave specific examples where they increased the rate for the 25% of providers with the lowest rates within a service, but could not do this for all providers because of budget concerns. 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."

Empirically, we analyzed characteristics that predict whether a provider and service recieved 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. Our main results 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 pretrends in our main results.

We use the changes in these Medicaid rates to examine how rates for mental health services affect the supply of services. We find a supply elasticity of around 0.16, with a 95% confidence interval of 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 low elasticity may stem from most Medicaid rates remaining below Medicare rates, making Medicaid patients less preferred by providers

The increase in mental health services is mostly driven by existing clients. The elasticity of unique clients to changes in rates is 0.067 and it takes about a year to see effects on the number of unique clients. In contrast, we find a larger elasticity of visits per client of 0.092 and this changes in the quarter immediately after the rate change. This suggests providers mostly increase visits for existing patients with smaller and more delayed impacts on new clients. We also find that the increase in supply is driven by the largest providers. We find an elasticity of 0.36 among the largest quintile of providers, compared to elasticities of 0.007-0.084 for the smaller providers.

Our main estimates are reported 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.

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 at different times for separate sets of providers.

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.

Third, we focus on behavioral health. 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

[1] An exception is Cabral et al. (2024), who use Medicaid claims in the Medicaid Analytic eXtract to analyze responses to rate changes for individuals dually eligible for Medicare and Medicaid.

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

2 Background

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 Data

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. Table 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.

Table 1, panel B displays figures 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 Comparison of Medicaid Rates with Medicare Rates

In table 2, we show the most common service codes in our data, along with their descriptions, and Medicaid and Medicare rates. The most common individual codes are behavioral health counseling and therapy, 15 minutes (38% of units in 2019), group therapy (20% of units), and individual psychotherapy 60 minutes (6% of units).[2]

We present the minimum and maximum rate for a Medicaid provider in Allegheny County in 2019. We compare this figure with the standard Medicare rate for Pennslyvannia outside of Philadelphia. 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 rate 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. This same service garners $126.28 under Medicare.

[2]These procedures have CPT codes H0004-HB, 90853-HE, and 90837-HE, respectively.

In some cases, Medicaid rates are actually 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. This is in part because Medicaid billing includes modifiers, while Medicare billing does not. "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.

Figure 1 displays the full distribution of Medicaid rates to Medicare rates. An observation is a combination of provider and service in the first quarter of 2019. These are compared with Medicare rates for 2019 obtained from the Center for Medicare and Medicaid Services. Each Medicaid rate is normalized as a percentage of the Medicare rate for that service. Services without Medicare equivalents, such as inpatient care, are dropped. 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. The most commonly used codes are more likely to pay less than Medicare rates, so the weighted median Medicaid service pays 76% of Medicare rates. In total 18% of all provider-service codes pay *more* for Medicaid than Medicare, but only 5% of all units are paid more in Medicaid than Medicare.

Our data offer a unique opportunity to compare Medicaid rates (which are typically difficult to access) with Medicare rates. We find that Medicaid rates are, on average, lower than Medicare rates, highlighting the potential to incentivize providers by bringing Medicaid rates closer to Medicare levels. However, key differences between Medicaid and Medicare, such as the populations served, fixed costs, and administrative burdens, may limit the extent to which aligning rates would translate into increased supply. Our data represent one of the first efforts to enable service-code level comparisons of reimbursement rates across these systems. We find substantial variation in rates, both within a service code and relative to Medicare rates.

3.3 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.

First, 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 2 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 receive 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 3 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.

Additionally, providers above median initial rates were more likely to receive rate changes than those with lower rates (27% versus 10%, respectively), and the smallest providers (by size) were less likely to receive rate changes. However, the size of the increase, both in levels or percentages, 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 in Figure 3 suggest no evidence of pre-trends leading up to rate increases. A robustness check in Figure B.5 uses only variation in the *size* of rate changes, not the timing. In that case, these is a negative pre-trend, indicating that providers who were experiencing decreases in supply received larger rate increases. This would bias our main elasticity estimate downwards. However, we don't see evidence of these pre-trends when we incorporate the timing variation as well.

3.4 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. We focus on the first price change within a provider and service as our event. We estimate the following event study equation:

$$y_{ist} = \beta_0 + \sum_{j=-39}^{38} \beta_j(\Delta_{i,s} \times D_{i,s,t-j}) + \delta_t + \alpha_{i,s} + \epsilon_{ist} \tag{1}$$

where y_{ist} is the outcome of interest for provider i, 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. $\Delta_{i,s}$ 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 β_{-7} to β_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.

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

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 3 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 0.16 (a 16% increase in supply in response to a 100% increase in rate).

The corresponding regression results are shown in Table 4. 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 3. As an alternative to the log specification, we also present estimates using Poisson regression in Appendix Section A.1 and Appendix Figure A.1 which are similar in timing and magnitude. Appendix Figure **??** shows similar estimates using levels of both rates and units.

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. In our sample, 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 the 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.

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. (2024) 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 eduction 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 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.3 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.

4.2 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 important robustness checks to address our continuous and staggered

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

treatment. First, Appendix Figure B.4 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 each panel, pretrends 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 pretrend 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.4 also show supply increases immediately after the rate changes, confirming the general patterns in our main results.

Appendix Figure B.5 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, there is a negative pre-trend, and the elasticity is about 0.4, rather than 0.16 in our main estimates. This suggests that treatment effects are sensitive to the *size* of rate changes. However, the general pattern mimics that of our main results.

4.3 Mechanisms: Unique Clients

There are several potential pathways through which outpatient services could increase after a rate change. Providers could accept additional clients or increase the number of services to existing clients (for example, increasing the number of appointments existing clients get per month). In both cases, the labor supply of psychiatrists can increase either by expanding the hours worked for existing psychiatrists or by hiring more psychiatrists at a given hospital or practice. We are unable to measure labor supply responses but are able to observe the number of unique clients served by providers in our sample.

In Figure 4, 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 table 4, column (2), we find that the elasticity of visits per client is 0.09.

In Figure 4, panel b, we plot the number of *unique* clients served by a provider as an outcome in our event study model. 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 of time.

The size of the increase in unique clients is smaller than the increase in total units. In table 4, 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 average of five units per patient per quarter. With an elasticity of total visits of 0.16, the average rate increase of 20% would result in 3.2% more units. For the average provider and service, that would be 1.6 more units (3.2% x 50 units). This roughly comes from 0.7 visits by new patients (20% rate increase x 0.07 elasticity of new patients x 9.5 patients x 5 visits per patient) and 0.9 visits by existing patients (20% rate increase x 0.09 elasticity of visits per patient x 9.5 patients x 5 visits per patient).

4.4 Heterogeneity: 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.

Figure 5 plots the elasticity estimates by quintile of provider size. There are significant differences in elasticity for large and small providers. That is, small providers are much less sensitive to price changes than larger providers. Figure 5 illustrates that there is a positive relationship between provider size and elasticity. For the largest providers (the top 20%), elasticity estimates hover around 0.35. For the smallest and medium providers, the estimates are indistinguishable from zero.

There are many reasons why small providers may be less responsive to rate changes. First, small providers may not be able to take advantage of economies of scale in the same way that large providers can. For instance, smaller providers may have to spread fixed costs of facilities over a lesser number of clients. In addition, hiring additional staff or increasing the hours of existing staff to meet increased demand may be more difficult for smaller providers. For example, a small practice with a few therapists may be unable to take on more patients, regardless of rates.

In general, many constraints, including administrative capacity, high fixed costs, and staffing capabilities, can make smaller providers less elastic to Medicaid 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 supply elasticities hover around 0.16 on average, with some differences by provider size and by particular years of our sample. We find evidence that the largest providers are most responsive to rate changes and that providers mostly increase units for existing clients rather than attract new clients. While there is substantial variation

in the rates paid to Allegheny County behavioral health providers, almost all rates are consistently below Medicare rates, limiting the financial attractiveness of serving Medicaid patients.

Our work suggests that, for Medicaid behavioral healthcare services, rate increases below Medicare rates have limited effects on provider supply. For behavioral healthcare, the elasticities are not high enough to address capacity constraints at the level of typical rate increase. ACDHS has latitude to assign a portion of total Medicaid funds to investments, which could be another pathway for increasing capacity. Additionally, we find heterogeneities by provider size that suggest rate increases may be more appropriate for a targeted group of providers. Our findings indicate that policymakers may need to consider alternative approaches, such as targeted rate increases for responsive providers or direct capacity investments, to meaningfully expand access to behavioral healthcare services for Medicaid recipients.

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Figures and Tables

Table 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 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	$84.90
..					
90834-HP	Individual Psychotherapy 45-50 min	0.3%	$86.00	$89.00	$84.90

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 3: Correlates of Rate Changes

	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. Hopsital Care/Day for Evaluation refers to code 99232. Mean initial rate and the rate change are given in dollars.

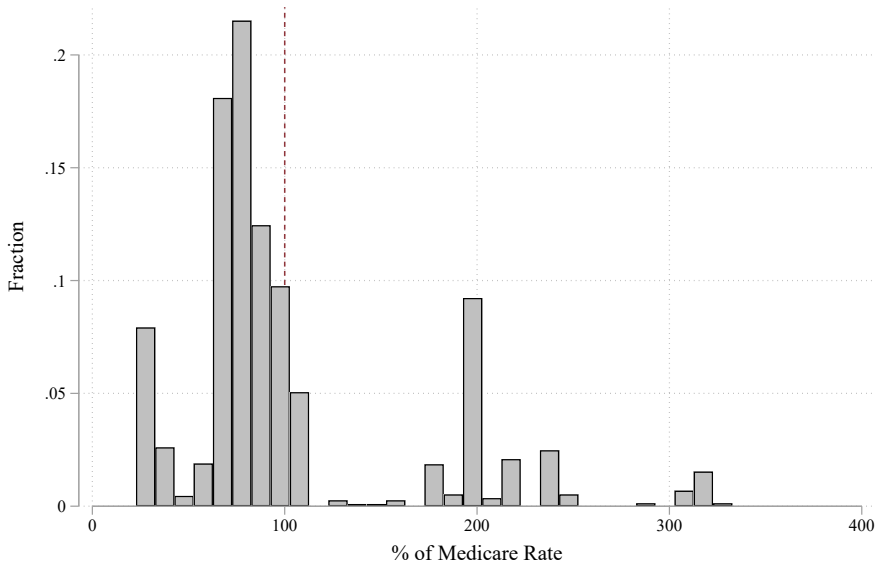
Table 4: Impact of Rate Changes in First Two Years

	(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

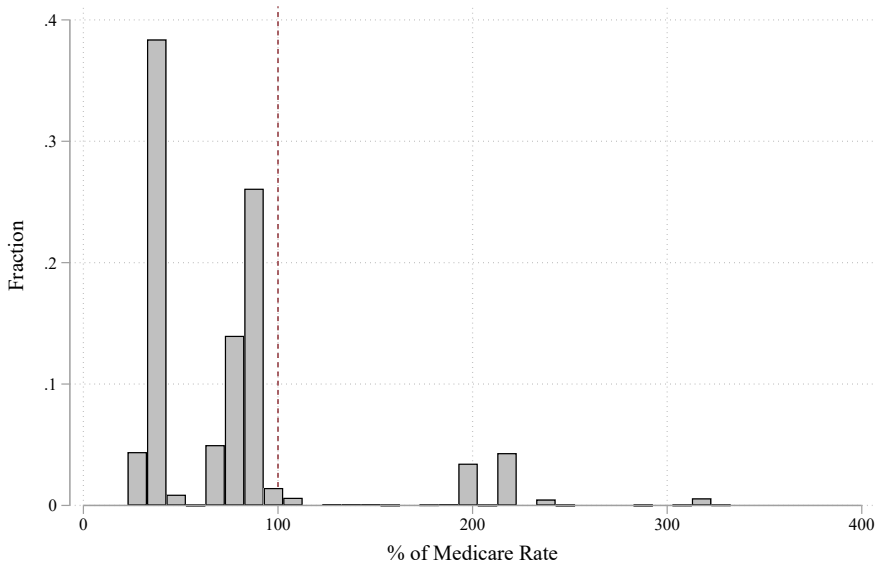
Note: Columns (1)-(3) present estimates from equation 2. The sample size is smaller than in Table 1 because we restrict the sample to relative quarters between -7 and 7 to focus on the short-term effects of rate changes. In all specifications, we control for provider by service code fixed effects, quarter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

Figure 1: Medicaid Rates Relative to Medicare

(a) Provider- and Service-Level

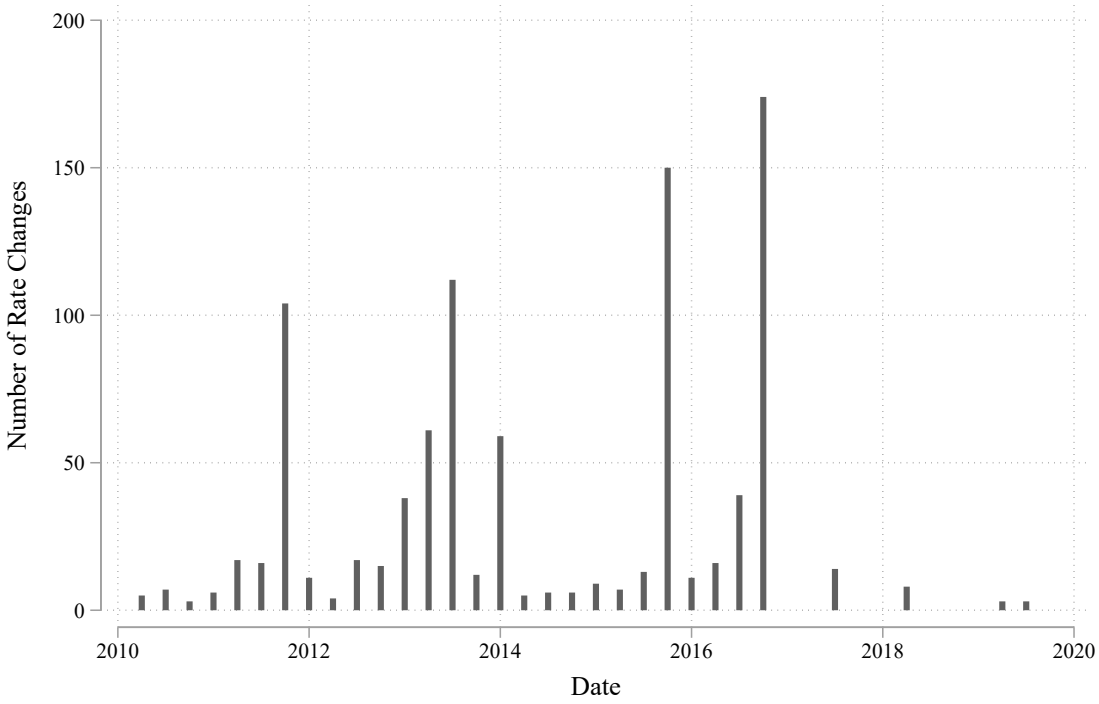


(b) Weighted by Units



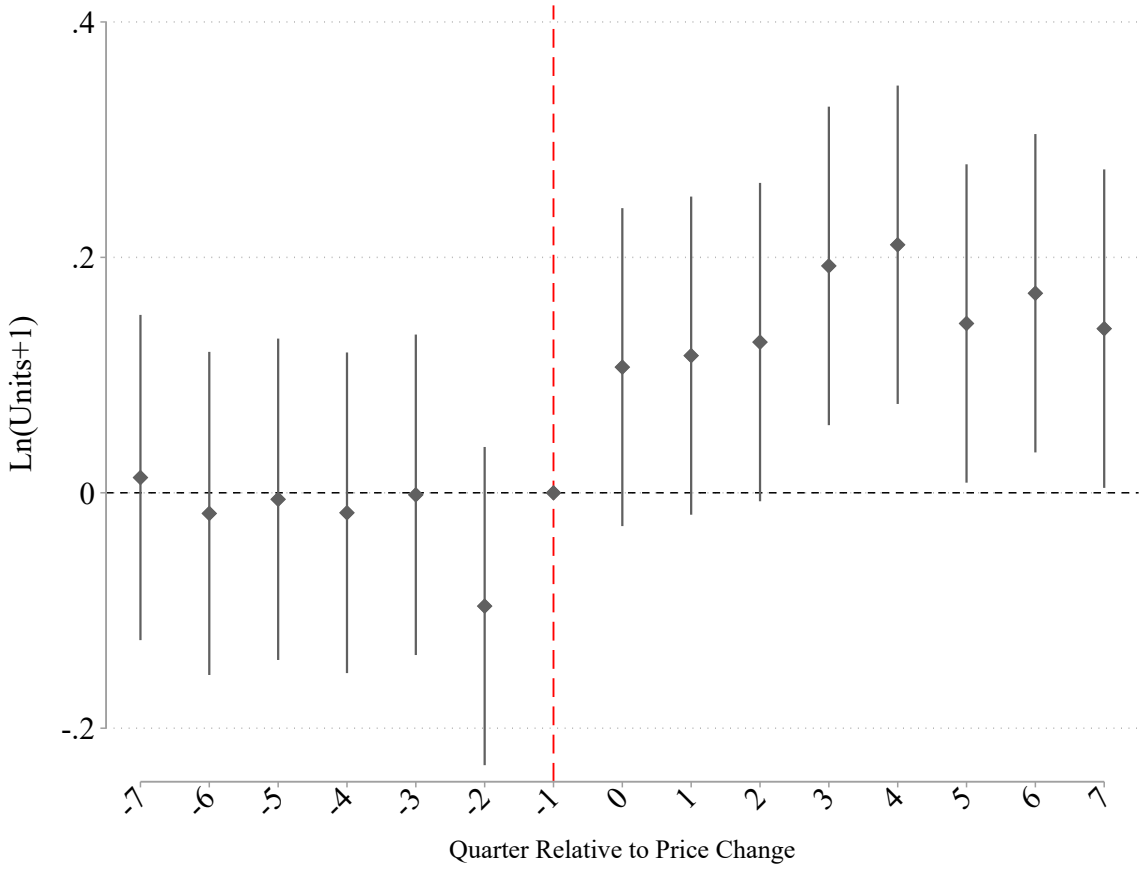
Note: Figure presents Medicaid rates in the first quarter of 2019, as a percent of Medicare rates. Medicare rates were obtained from the Center for Medicare and Medicaid Services fee schedule. The fee schedule did not contain Medicare prices for nine out of forty-one 5-digit service codes. We used the 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 2: 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.

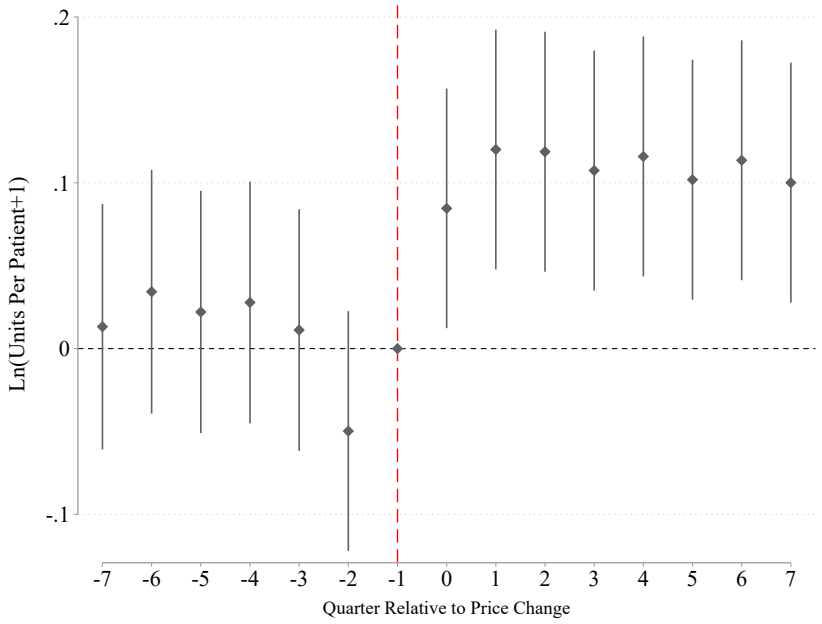
Figure 3: Impact of Rate Changes on Units



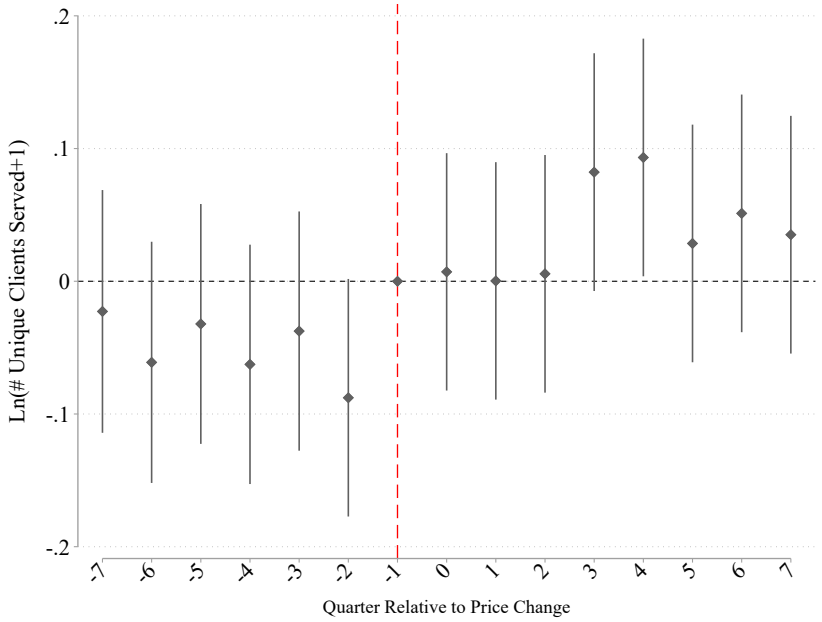
Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. An observation is a provider by service code by quarter. The outcome is the natural log of the number of 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 4: Impact on Intensive vs Extensive Margin

(a) Visits per Client

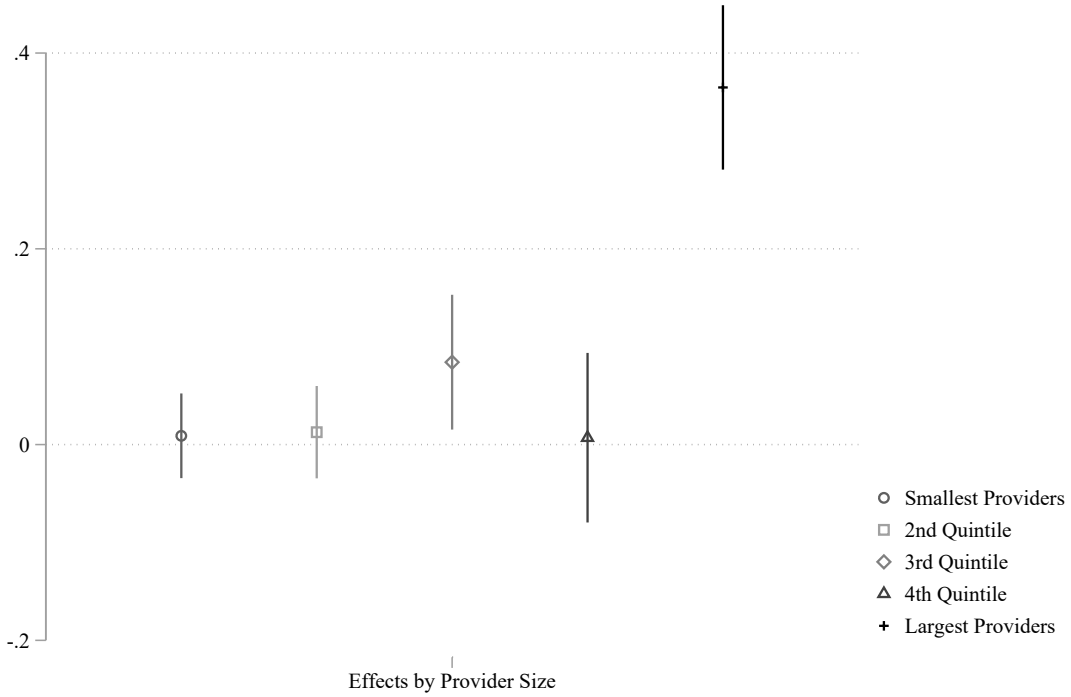


(b) Unique Clients



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 vists 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 5: Heterogeneity by Provider Size



Note: Figure presents event study coefficients from the estimation of equation 1 by provider size. β_j on the interaction between event time and the natural log of the rate change plus one. We estimate this equation separately for each quintile of providers in our data.

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

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

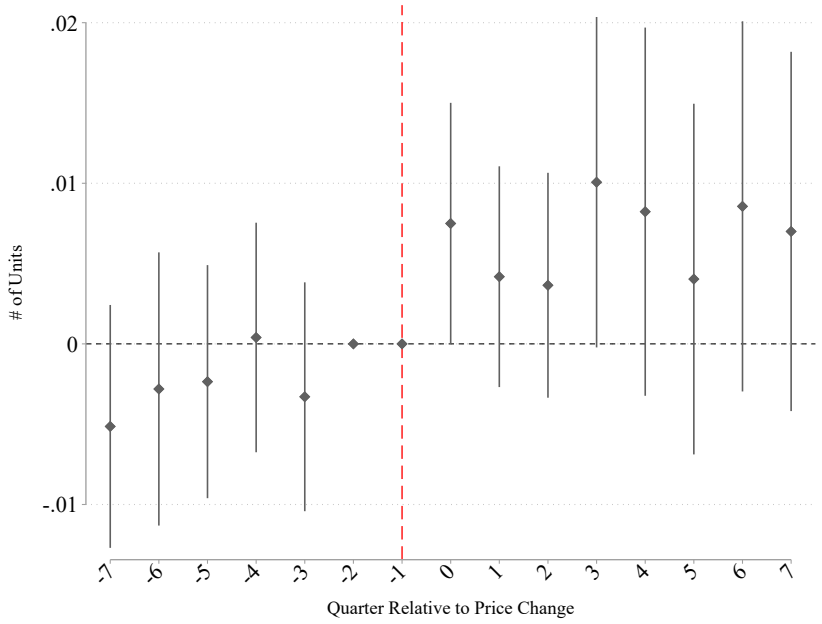
using maximum likelihood estimation. The outcome y_{ist} is number of units for provider i, for service s in quarter t. On the right-hand side, $D_{i,s,t-j}$ is an indicator variable for event time j, meaning that the first price change for provider i and service s took place j periods before this observation's calendar time. $\Delta_{i,s}$ 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 3, 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.

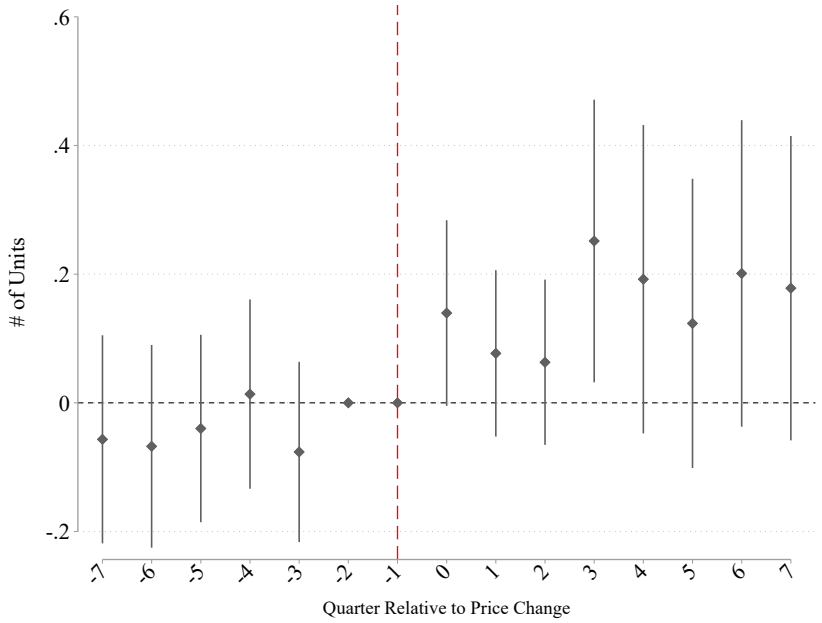
Appendix Figure A.1, panel (b) presents similar estimates except the size of the price change on the right-hand-side is measured in logs. The coefficients are stable and flat before the rate change but increase to about 0.2 after the rate change. This suggests that 100% increase in units corresponds to an $e^{0.2}$ or 22% increase in units. This is similar to the estimates from Figure 3, 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



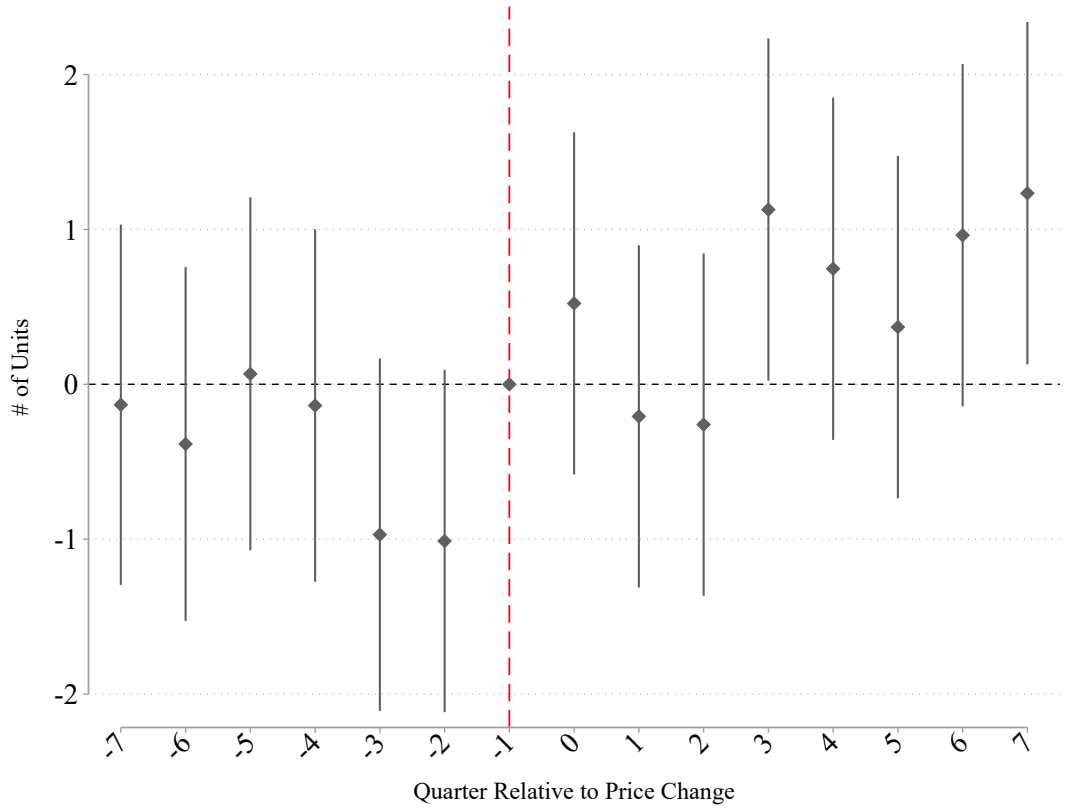
(b) Effect of Ln(Rate Change +1)



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.

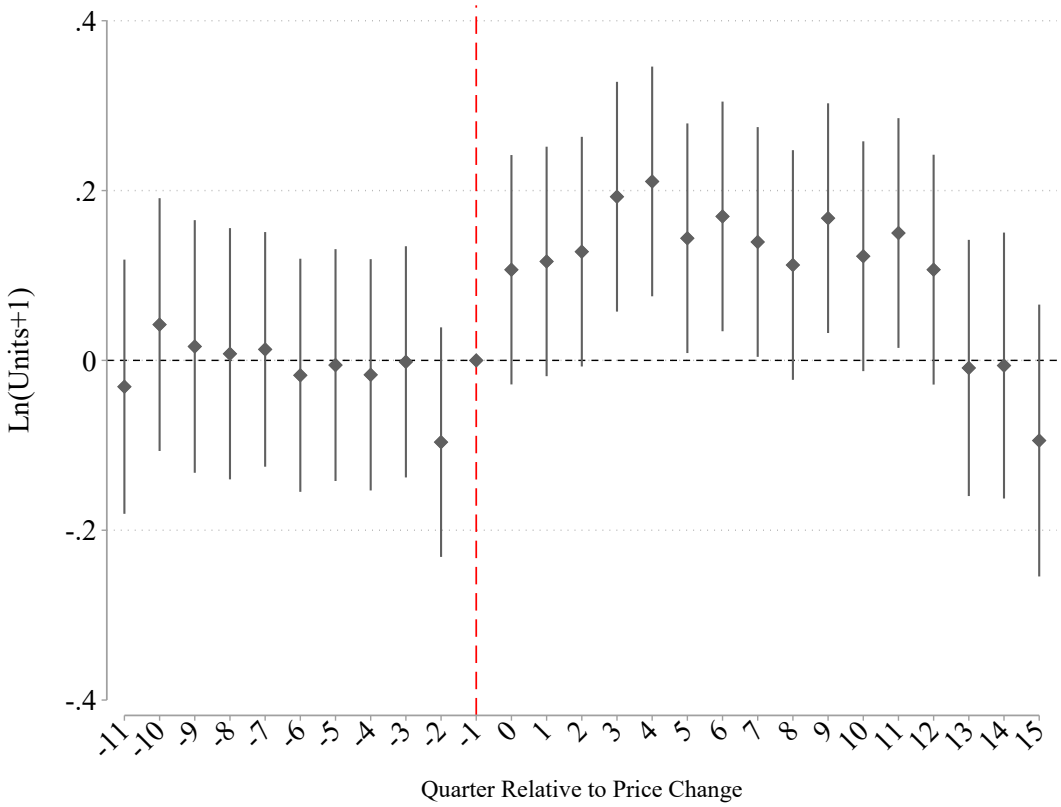
B Additional Tables and Figures

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



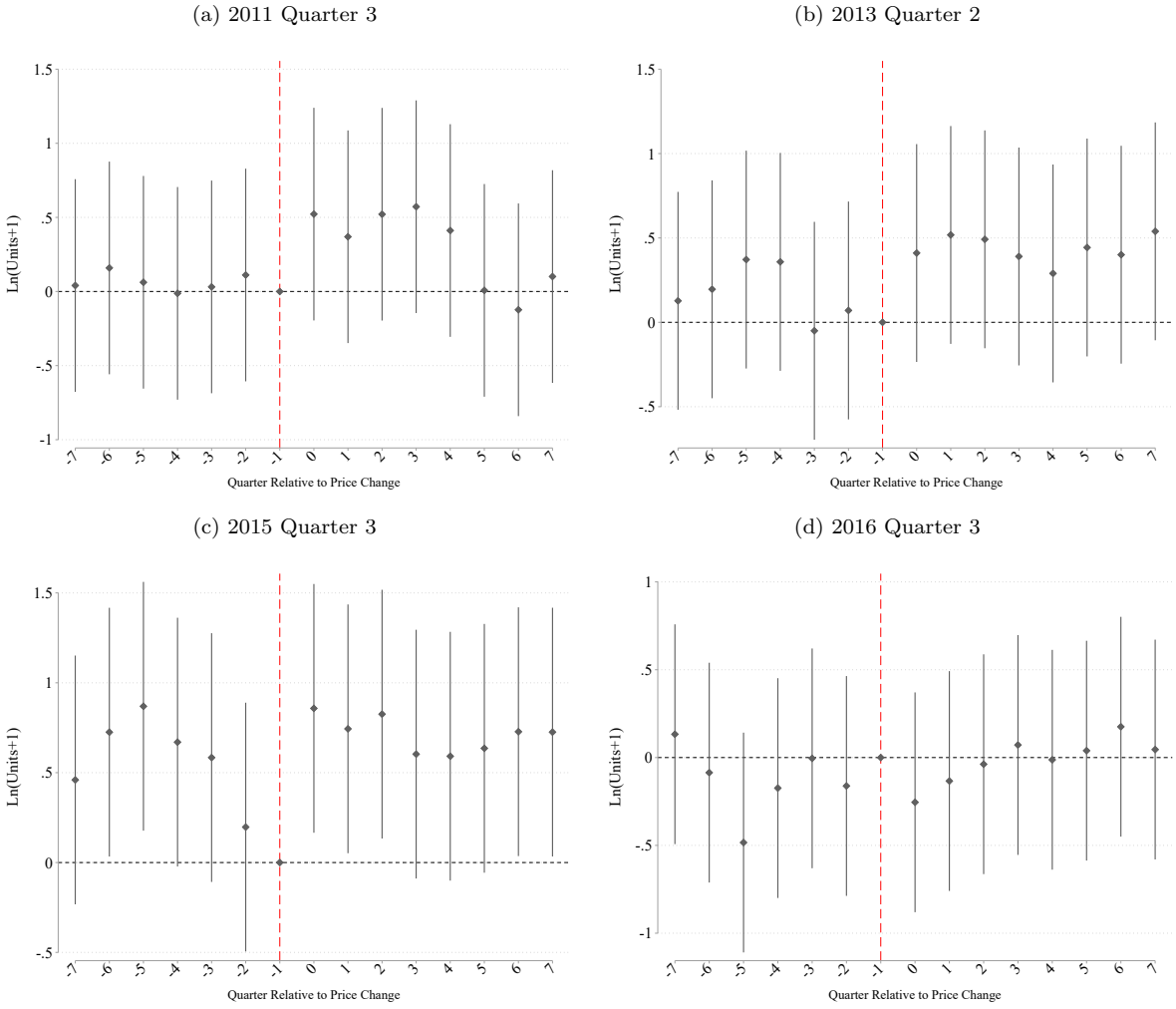
Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the rate change plus one. An observation is a provider by service code by quarter. The outcome is the number of units plus one. In all specifications,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

Figure B.3: Expanded Time Periods



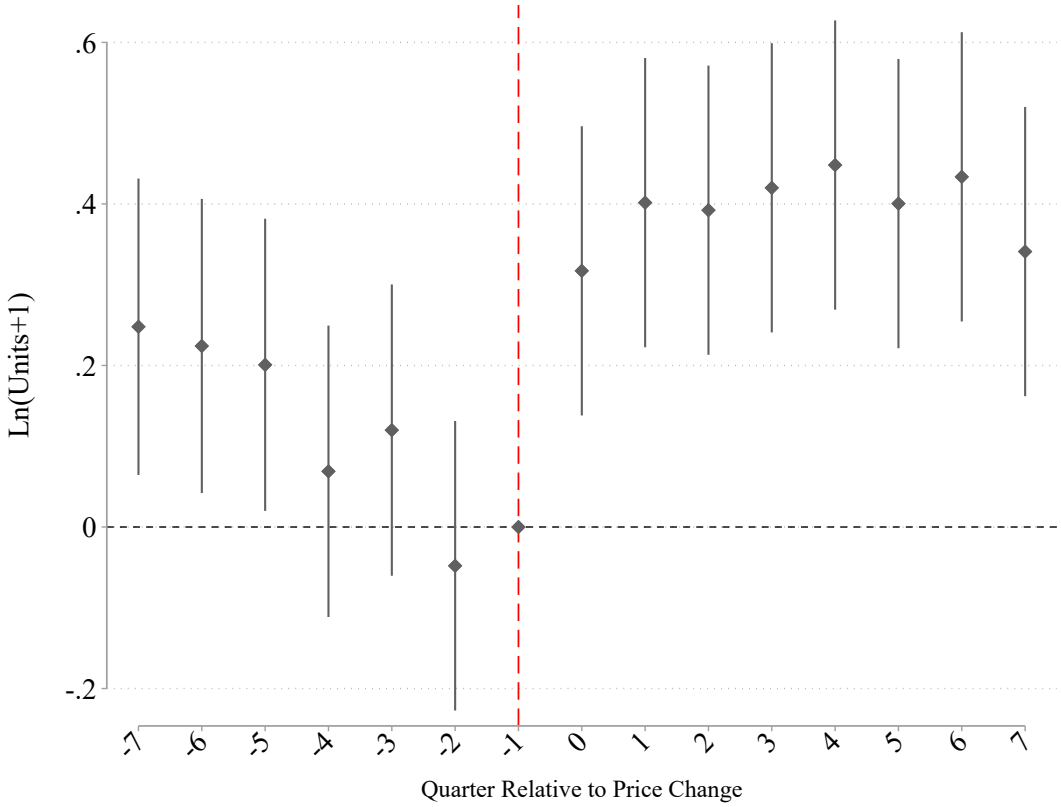
Note: Figure presents event study coefficients from the estimation of equation 1. We plot the coefficients β_j on the interaction between event time and the natural log of the rate change plus one. This figure replicates the estimates from Figure 3 but plots additional relative quarter estimates.

Figure B.4: Heterogeneity by Time of Rate Change



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.5: 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 3, panel (b), we control for each rate change cohort by quarter.