Performance Pay, Productivity, and Strategic Opt-Out: Evidence from a Community Health Center*

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Abstract

We use data from a health center serving primarily low-income patients to examine medical providers' output responses to a change from a salary-based compensation plan to one that rewards providers for seeing more patients each month. Providers working for piece rates produce 18 percent more patient encounters, but only a small portion of this increase was due to individual responses to the incentives. The remainder resulted from changes in workforce composition and from providers' strategic choices about when to join the piece-rate plan. The small incentive effect is consistent with experimental evidence that effort is less sensitive to financial incentives when individuals work for an organization whose mission is aligned with their values.

JEL: J22, J33

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1 Introduction

Performance-related pay was used in 37 percent of U.S. jobs in 2013 and for 49 percent of earners in the highest income quartile (Gittleman and Pierce, 2013). Compensation schemes that link pay to productivity may be especially attractive in jobs where employees have substantial independence over their time allocation. There are two main mechanisms by which such incentive pay can affect the aggregate productivity of a firm's workforce (Lazear, 1986). First, the incentives may induce the same employees to allocate more time or effort toward the metric rewarded by the incentive.[1] Second, offering performance pay can increase productivity through recruitment and retention because an employer who rewards highly productive individuals with more total compensation will be more attractive compared to competitors offering a traditional salary. Evidence for each channel exists in rote jobs requiring lower levels of education, but the evidence is more limited in high-skilled professions.[2]

In this paper, we use proprietary personnel data from a community health center serving primarily lower-income and often uninsured patients to determine the impact of piece-rate compensation on productivity among medical providers. In January 2008, this Multi-Site Community Health Center (MSCHC) changed its compensation plan from a pure salary system to an incentive pay scheme that pays providers more for seeing more patients while also rewarding the complexity of their patients' medical situations.[3] We focus on two key questions in evaluating the effects of this change: First, do providers see more patients when they are paid via piece rates? Second, how much of the change in observed productivity occurred due to sorting into the incentive plan, and how much occurred due to within-provider changes in productivity as a

[1] This approach has been shown to lead to unintended consequences, such as cheating, in some settings (Jacob and Levitt, 2003).

[2] As discussed in Prendergast (1999), the typical piece-rate setting involves "simple" jobs, in the sense that aggregate measures of performance are available. Lazear (2000) uses the gradual rollout of a switch from salary to piece-rate pay for windshield installers to provide evidence in favor of both channels, and Shearer (2004) uses an experiment at the individual worker level to isolate the incentive channel in tree planting.

[3] We use the terms "piece-rate" and "incentive pay" interchangeably throughout the paper. The non-salary compensation plan allowed each provider a minimum earnings level, so it was not a pure piece-rate system.

direct consequence of the incentives in the plan?

To answer these questions, we leverage the staggered rollout of the incentive-pay plan. While incumbent providers were all expected to switch to the new compensation scheme in a single month, providers hired after the implementation of the plan were given at least a year to build their panel of patients while collecting a traditional salary. These implementation details lead to two key components of our identification strategy. First, the timing of participation in the piece-rate scheme varies at the individual level, largely based on the provider's hire date. As a result, we are able to include very flexible time controls to absorb the influence of patient demand or other common time-varying unobservables that affect provider output. Second, we are able to observe output for nearly all providers under both the salary system and the piece-rate system. We can therefore make within-person comparisons to determine whether individual providers are more productive when their pay depends on their output.

After controlling for demand conditions and for new hires' gradual increase in output as they build their portfolio of patients, we find that providers on the incentive plan see roughly 18 percent more patients on a monthly basis. A substantial portion of this change, however, resulted from non-random compliance with MSCHC's assignment of each provider to the piece-rate plan. Specifically, provider-months that were scheduled for piece rates produced only 12 percent more patient encounters compared to months scheduled for salaries. Further, we present direct evidence that higher productivity workers were more likely to start the piece-rate plan on time while lower productivity workers were more likely to negotiate a delay. When examining the individual incentive effect using within-person changes in productivity, we find only a modest increase, with the same provider's output increasing by a little less than five percent when they work under the incentive plan. Finally, when we address the possibility of within-person selection based on time-varying unobservables by using a provider's scheduled participation as an instrument for their actual participation, we find a very small increase in output that cannot be distinguished from zero.

We conclude, therefore, that the largest mechanism behind the piece-rate plan's increased productivity was a change in MSCHC's ability to hire and retain high productivity providers. Although the individual-level incentive effect was small, the center as a whole was able to see more patients as a result of the new compensation scheme. We also find that the piece-rate plan did not lead to observable negative consequences such as lower quality coding of service provision for billing purposes or providers falling behind on administrative tasks, suggesting that providers did not prioritize patient encounters at the expense of these other job duties.

This analysis contributes to multiple strands of the literature. First, our results complement the findings of studies of similar compensation changes for workers with rote jobs (e.g., Lazear, 2000; Shearer, 2004; Bandiera et al., 2005). In contrast to the strong incentive effects in lower-paid occupations, we find only weak evidence that the incentives led to increases in output among high-skilled employees with substantial autonomy in how they complete their duties. The finding that piece rates allow firms to recruit and retain more productive individuals, however, is consistent with similar findings in Lazear (2000).

Second, our study contributes to a growing literature that examines the effects of incentives for medical providers in particular.[4] This paper is most closely related to other papers that focus on performance differences under piece rates compared to performance under salary-based compensation.[5] The vast majority of existing papers focus only on within-provider response to a change in incentives (e.g. Hickson et al., 1987; Hemenway et al., 1990; Dumont et al., 2008;

[4]There is a substantial literature considering what types of compensation schemes are theoretically optimal (Robinson, 2001) and documenting the variation in pay schemes along with factors that predict employers' choices of how to structure compensation (Robinson et al., 2004; Ryan et al., 2015). For careful reviews of the broader literature, including the related but separate literature examining provider-induced demand, see Chandra et al. (2011) and McClellan (2011).

[5]For a systematic review of this literature, see Van Herck et al. (2010). Other work has examined the effect of encouraging providers to meet quality metrics or other specific clinical targets (Mullen et al., 2010; Li et al., 2014). These papers find only modest effects of these incentives on provider behavior. Additional papers examine changes to how providers are compensated for different bundles of services, such as different pay schemes based on fee codes or for services provided outside of normal business hours (Zhang and Sweetman, 2018; Somé et al., 2019, 2020). Other closely related studies examine providers' responses to kinks in payment schedules (Douven et al., 2015; Einav et al., 2018), and how increasing providers' reimbursement rates from insurance affects their willingness to see patients covered by that insurance (Alexander and Schnell, 2019).

Helmchen and Lo Sasso, 2010; Hennig-Schmidt et al., 2011; Wang et al., 2011; Green, 2014; Brosig-Koch et al., 2016, 2017a, 2019; Green et al., 2020; Oxholm et al., 2021). Only relatively few studies consider sorting as an additional way providers could respond to an incentive plan (Barro and Beaulieu, 2003; Devlin and Sarma, 2008; Brosig-Koch et al., 2017b). Therefore, one of this study's main contributions is the ability to quantify both adjustment margins and to show that, at least in the community health center setting, the selection effect is substantially more important. Further, our empirical approach offers multiple methodological strengths relative to many previous papers evaluating similar changes in compensation scheme.[6] First, we use provider-level data for both physicians and advanced practice providers, and all providers are scheduled to work some months under both salaries and piece rates, even those who join the clinic after the change in compensation plan. Additionally, the staggered transition to piece rates allows us to control flexibly for unobservable changes in demand for medical services common across providers at the same clinic, strengthening the identification.[7]

The finding of a more limited within-provider response in a community health center setting provides an additional contribution to the strand of the literature on the differential impact of monetary incentives in settings where individuals have strong intrinsic motivation (Gneezy et al., 2011). Economic theory predicts that the impact of pay-for-performance incentives will be substantially diminished in settings where employees are working in an organization whose mission aligns with their values (Carpenter and Gong, 2016; Jones et al., 2018).[8] Many medical providers have prosocial motivations, and such providers are likely overrepresented in a community health center setting that exists to provide care to patients who are uninsured,

[6]The use of variation in providers' compensation plan due to a required change within the same clinic further differentiates our study from Devlin and Sarma (2008), and the quasi-experimental design of this study also complements the laboratory experimental evidence in Brosig-Koch et al. (2017b).

[7]Studies with a common date of switch across nearly all providers, e.g. Helmchen and Lo Sasso (2010) are limited to the use of linear trends.

[8]Using data from lab experiments, Godager and Wiesen (2013) find that the majority of medical students place equal or greater weight on patient health relative to their own compensation. Further Kesternich et al. (2015) demonstrate experimentally that the Hippocratic Oath itself influences how providers consider the tradeoffs among patient health, their own compensation, and pooled costs to provide service.

underinsured, or otherwise underserved.[9] Our empirical results showing that mission-oriented medical providers' productivity increases only modestly under piece rates therefore complements much of the existing literature that has relied primarily on laboratory experiments. Notably, we do find substantial selection on permanent productivity, which suggests that, even in the absence of strong incentive effects, mission-oriented employers may use productivity-based compensation to increase output if they are willing to do so through turnover.[10]

Finally, and to our knowledge new to the literature, we show that lower-productivity providers with a reasonable amount of bargaining power responded to the piece-rate scheme by negotiating a delay in joining the piece-rate plan as scheduled even while remaining employed with the firm. Further, we find suggestive evidence that a portion of the observed within-provider differences in productivity are due to within-person selection, with providers managing to avoid being paid via piece rates when their productivity is lower than normal. These results suggest that compliance costs are likely an under-appreciated factor for employers considering implementing a similar incentive plan for higher-paid workers.

The remainder of the paper is structured follows: the next section provides more information on the incentive-pay plan, discusses the available data, and provides descriptive results; Section 3 provides the main empirical analysis; Section 4 concludes and discusses the implications of the findings.

[9] Li et al. (2017) find substantial variation in physicians' measured altruism, with an average level lower than average citizens', but Li (2018) shows directly that physicians with higher experimentally measured altruism are more likely to practice medicine in an underserved area.

[10] We are unable to determine whether sorting also occurs on the prosocial dimension, which has been shown in some experimental settings (Jones et al., 2018). It is certainly possible that prosocial motivation and productivity (as measured by number of patients who can be seen in a day) are negatively correlated. If that were true, the results in this paper would also be consistent with that experimental evidence.

2 Background and Descriptives

2.1 Community Health Centers and Piece-Rate Compensation

Community Health Centers (CHCs) form the core of the health care safety net in the United States for primary and preventative care, providing services to individuals regardless of their health insurance status or ability to pay. In 2018, there were more than 1,300 such centers employing more than 25,000 providers. Given their mission, CHCs must be located in federally designated medically underserved areas or serve medically underserved populations. As a result, a large share of CHC patients are insured through Medicare or Medicaid.

Importantly for our study, CHCs are designated as Federally Qualified Health Centers (FQHCs), which entitles them to special reimbursement rates for Medicare and Medicaid patients.[11] During the time frame of our study, FQHCs received a fixed all-inclusive reimbursement fee for each visit by a Medicare or Medicaid patient, regardless of the complexity of the visit (Ku et al., 2012). In contrast, private practices typically receive variable reimbursement payments that account for differences in resources used to resolve each visit.

Our analysis focuses on a single Community Health Center that employs about 100 medical providers across roughly ten office locations serving a mix of rural and urban locations, all within 100 miles of each other.[12] During our sample period, approximately 60 percent of MSCHC's patients were covered by Medicare or Medicaid. Although all of the clinics provide care to underserved patients, the rural patients are more likely to qualify for Medicaid while the urban patients are more likely to be uninsured.

To align the incentives of their healthcare providers with the federal reimbursement system, MSCHC revised their employee compensation plan away from a flat annual salary that had

[11] FQHCs are nonprofit or public clinics that provide comprehensive outpatient primary care to all patients regardless of their insurance status or ability to pay.

[12] This multi-site setup is very common among community health centers (National Association of Community Health Centers, 2020).

no direct relationship with output. The new piece-rate scheme paid providers based on two components: 1) the number of patient visits; and 2) the complexity of each visit. Providers transitioning to the piece-rate scheme were provided an initial guarantee of their previous base salary. If after one year on incentive pay the individual's piece-rate earnings were significantly below the salary guarantee, they would receive a corresponding cut to their baseline pay for subsequent years. If their piece-rate pay was above the guarantee, they received the difference with no cap on compensation. While provider compensation was directly tied to their provision of services through the piece-rate plan, providers continued to be employees, and MSCHC handled all patient billing. Further, although MSCHC's revenue from an encounter could vary based on the patient's insurance coverage, a provider's compensation for each encounter did not depend on the patient's insurance status.

The incentive plan was designed to encourage both physicians and advanced practice providers (nurse practitioners and physician assistants) to increase patient encounters, with targets based on national benchmarks from other Community Health Centers.[13] At the time the plan was implemented, roughly 30 percent of incumbent providers were in line to receive a raise if they maintained their prior productivity. Expectations for provider schedules remained constant, as each provider was expected to work 40 hours per week with 32 hours devoted to patient visits and 8 hours available for documenting each visit in electronic medical records and for other administrative tasks. Providers were encouraged to shorten the amount of time they spent with each patient in order to increase encounters. Unfortunately, the personnel records we use for the analysis do not contain any direct measure of time spent per patient, so we are unable to analyze it as a separate outcome.

Another goal of the new compensation plan was to attract new high-productivity providers.

[13]Specifically, the plan's goal was to have physicians and advanced practice providers produce 315 and 278 encounters per month, respectively. MSCHC is located in a full-practice state, meaning that advanced practice providers may evaluate and diagnose patients, initiate and manage treatments, prescribe medications, and order and interpret diagnostic tests. Like their physician counterparts, advanced practice providers at MSCHC see patients independently and maintain control over their daily schedule.

Potential new hires were informed of the compensation scheme during in-person interviews, and new hires' contracts included a detailed description of the piece-rate plan and example calculations. New hires were also assured that patient demand for services was essentially unlimited. The default contract states, "[MSCHC] has thousands of new primary care patients a year seeking medical care." MSCHC is located in a health professional shortage area (HPSA), bolstering the claim of unmet demand for healthcare services.

MSCHC leadership planned to implement the piece-rate compensation plan in a staggered fashion, with incumbents scheduled to transition to piece rates in January 2008. Providers hired after that date were to earn a salary for the first twelve months, with the switch to the piece-rate plan scheduled at the beginning of the next calendar quarter. For example, a provider hired April 12, 2008 would be scheduled to start piece-rate pay July 1, 2009. Finally, providers from a site acquired in 2013 were scheduled to transition in January 2014. The share of providers working on piece rates therefore rises over our analysis period, reaching a maximum of 78 percent in 2014. Importantly, the substantial number of provider-months in salary status throughout our analysis period allows us to include controls for patient demand and other time-varying unobservable determinants of productivity common to all providers at MSCHC.[14]

Not all providers transitioned to piece-rate compensation as scheduled, however, with non-compliance occurring in both directions. Providers were free to join the incentive plan early, and eleven providers did so. According to MSCHC's chief financial officer, providers could negotiate remaining on salary past the intended start date on a case-by-case basis, but all providers were expected to join the piece-rate plan eventually. These delays were common, especially among incumbents.[15] In the analysis section, we provide evidence that this noncompliance was

[14]Appendix Figure A-1 provides an annual breakdown of provider-months in each compensation status in each year from 2007-2014, showing the substantial within-year variation directly.

[15]While 80 percent of providers had completed the requisite year of work on salary, only 45 percent transitioned piece-rates as scheduled in January 2008. Appendix Section A-3 provides additional descriptive evidence showing the time pattern of compliance and demonstrating that most of the non-compliance took the form of a delayed start relative to schedule.

likely strategic behavior by employees selecting into the payment scheme that maximized their compensation.

2.2 Data Source

Our primary data source is personnel files that capture the number of patient encounters for each medical provider every month as well as their intended and actual compensation plan. Encounters make up the largest component of the piece-rate scheme because they are the output measure for which FQHCs are reimbursed when serving Medicare or Medicaid patients. To account for part-time workers, we normalize the output measure to encounters per full-time equivalent (FTE) when constructing our key dependent variable.[16] Thus, a full-time physician with 300 encounters in a month is treated as equally productive compared to a half-time physician with 150 encounters. The panel data on output and intended pay type is linked to a personnel record for each employee with time-invariant characteristics including gender, degree year, date hired, and provider type.

Our sample consists of all medical providers in positions eligible for piece-rate pay at MSCHC over the period from 2007-2014. We exclude employees who are primarily administrators and providers working at walk-in clinics who do not develop and maintain their own panel of patients. We drop observations missing provider characteristics, person-months of known leave, and presumably incomplete records of encounters (fewer than 30 monthly encounters for employees with more than six months tenure).[17] The cleaned sample consists of 3,921 person-months for 96 unique providers.

[16]Full-time equivalent status is missing for about 9% of the sample. Because changes to FTE for a given employee are exceedingly rare - occurring only five times during our sample period - we interpolate missing values in the following manner: missing FTE at the end of an employment spell is replaced with the last observed FTE for that individual. Missing FTE at the start of an employment spell is replaced with the first observed FTE. Missing FTE in the middle of an employment spell is replaced with average FTE for that employee.

[17]Only 2 observations are dropped due to exceedingly few encounters.

2.3 Descriptive Analysis

Table 1 provides summary statistics for the variables used in our analysis, using data at the provider-month level. The typical provider has 220-260 patient encounters per month (the typical full-time provider sees roughly ten percent more than this average), and the unadjusted averages show that monthly encounters are higher when providers are paid via the piece-rate plan.[18] Table 1 further reveals that most covariates are reasonably balanced between the two regimes, with the notable exception of tenure ($p < 0.01$). Salaried observations are disproportionately from months when providers are relatively new to MSCHC. Even though patient demand was essentially unlimited, new providers nevertheless needed time to build a panel of patients, and properly accounting for this ramp up is a key component of our analysis. We control for tenure flexibly by including individual dummy variables for each month of tenure up to month 9 and grouping months higher than that into a single "experienced employee" category. Appendix section A-2 provides more detailed analysis supporting this empirical approach and demonstrates the robustness of the results to alternative ways of controlling for tenure, including quadratic and linear spline specifications.

Table 2 uses data aggregated to the provider level to examine the characteristics of those who comply with MSCHC's intended piece-rate schedule. To do so, we present average characteristics of providers in each of the three compliance categories: early adopters, on-time adopters who joined exactly on time, and late adopters.[19] Overall, just over half of providers (56/96) transitioned on time. Further, there are substantial differences in characteristics across the categories even though we are unable to reject equal means among on-time and late adopters for most characteristics due to the relatively small sample size. The providers eager to join the piece-rate

[18] Appendix Figure A-2 shows the entire distribution of productivity by regime with the piece rate distribution notably shifted to the right.

[19] There are a handful of providers with more complicated compliance paths, including providers who transition as scheduled but later return to salaries. A similar analysis omitting these providers yields qualitatively similar conclusions about the nature of selection into compliance.

plan were more likely to be advanced practice providers who joined MSCHC after the piece-rate plan was in place. These providers would have known about the intended compensation change at the time of their hire. In contrast, the providers who delayed were much more likely to be physicians, and they both had more overall experience (time since degree) and were more likely to have been incumbents who would not have anticipated the piece-rate plan at the time of hire. This combination of characteristics suggests that the late adopters had relatively strong bargaining power and used it to avoid switching to a less-preferred compensation plan.[20] There is also some suggestive evidence that some of these delayers chose to leave MSCHC rather than be subject to the piece-rate plan. Of the 29 late adopters, 17 left their position at MSCHC prior to end of our analysis period, and of those, 8 managed to remain on salary prior to their departure. Overall, the results in this table suggest that providers negotiated delaying entry to the piece-rate plan, likely when they thought it was in their interest to do so.

Figure 1 provides additional suggestive evidence that avoiding the piece-rate plan is non-random based on permanent productivity. The figure considers productivity for two groups of providers: those who always worked for piece rates when they were scheduled to do so and providers who had at least one month when they worked for a salary despite being scheduled to work for piece rates. The ever-avoiders include all of the Late Adopters from Table 2, along with a few additional providers who joined on time or early but then later were paid on salary, at least temporarily. The x-axis is measured in months with Month 0 corresponding to the month an individual was scheduled to begin the piece-rate scheme. The height of each point represents average residuals from a regression of log encounters per FTE on month $\times$ year dummies, with circles representing compliers and triangles representing the ever avoiders. In nearly every month, compliers are more productive, which suggests that higher productivity providers

[20] Although we do not measure bargaining power directly, Cahuc et al. (2006) show that higher-skilled workers and those with better outside options from other employers have more bargaining power. We think it is reasonable to consider physicians working in an area with a demonstrated shortage to fall into this category.

were more willing to participate in the compensation scheme that rewarded volume.[21] The next section considers how the piece-rate plan affected the productivity of MSCHC's workforce, both through changes in the composition of providers as suggested in this section and through individual-level responses to the incentives in the plan.

3 Main Results

3.1 Results for Number of Visits

Table 3 provides four different specifications that constitute the core of our analysis of the impact the piece-rate compensation plan on patient encounters. Column (1) presents OLS results from the following regression:

$$ln(\text{encounters/FTE})_{it} = \beta_1 \text{piecerate}_{it} + X_{it}\gamma + \lambda_t + \epsilon_{it}. \quad (1)$$

$ln(\text{encounters/FTE})_{it}$ is the natural log of the number of encounters produced by provider i in month t, normalized by the provider's FTE for that month.[22] The key independent variable of interest is piecerate_{it}, which is an indicator for whether provider i participated the piece-rate scheme during month t. We include a vector of controls X_{it} for observable characteristics including provider type, gender, and tenure, and we also include a set of (month $\times$ year) dummies (λ_t). The time dummies are especially important in this context because they control for changes in patient demand or other common shocks to provider productivity. We are able to include these key controls only because of the staggered rollout of the incentive plan, which is a

[21] The difference in productivity is 6.4 percent when controlling only for tenure and month x year dummies. It is slightly larger at 8.3 percent when adding controls for provider characteristics and whether the provider is scheduled for piece-rate work. Neither of these point estimates is statistically significantly different from zero, however, with t-stats of 1.05 and 1.52 respectively.

[22] We log the dependent variable because providers have different underlying productivity levels, and we therefore believe that the calendar time and tenure profile are more likely to have common percentage effects on output rather than common effects in levels.

relatively unique feature of MSCHC's implementation compared to other similar compensation changes for medical providers. The coefficient estimate on piece-rate participation means that the average provider-month compensated via piece rates produced 18 percent more patient encounters compared to the average salaried provider-month.

Column (2) provides the results from alternative specification that replaces the provider's actual participation in the piece-rate plan in Equation 1 with a dummy variable for whether the provider was scheduled to participate in the plan. The coefficient on this variable reveals that the average provider-month when a provider is intended to be paid on piece rates produces 12 percent more encounters compared to a provider-month when the provider is intended to be paid on salary. The difference between columns (1) and (2) reflects selective compliance with the piece-rate schedule. Specifically, it shows that months that are scheduled for piece rates but where the provider actually works for a salary are lower productivity compared to scheduled months where the provider complies.

Next, we turn our attention to identifying the causal effect of being paid via piece rates on a given provider's productivity. If all of the selective compliance shown in the first two columns were based on permanent productivity differences between the compliers and those who negotiate an exception, then the inclusion of individual fixed effects into the regression in column (1) would isolate the incentive effect of the piece-rate plan. Column (3) presents the results from this type of specification:

$$ln(\text{encounters/FTE})_{it} = \beta_1 \text{piecerate}_{it} + X_{it}\gamma + \lambda_t + \phi_i + \nu_{it}. \quad (2)$$

This regression therefore compares the same provider's productivity when they are paid on piece rates versus salary. On average, the same provider sees 4.8 percent more patients when on the incentive plan, suggesting a mild incentive effect.

Because exceptions to the intended piece-rate schedule were negotiated on a case-by-case

basis, however, it is also possible that selection into the piece-rate plan occurred based on unobserved within-person differences in productivity. As an example, perhaps providers who had temporary family obligations that prevented them from working at their maximum productivity negotiated to be paid via salary temporarily during some months when they were otherwise scheduled for piece rates. To estimate a causal incentive effect that adjusts for this type of selection, we also provide the specification in column (4), which, like column (3), includes provider fixed effects, but that uses a provider's intended piece-rate participation as an instrument for their actual participation. The goal of this specification, therefore, is to isolate the causal effect of working under the incentive plan by removing any portion of the column (3) coefficient that was due to a correlation between within-provider fluctuations in productivity and participation in the piece-rate plan.

In order for intended piece-rate status to be a valid instrument for actual piece rate status, three conditions must hold. First, a provider's intended status must be correlated with their actual status. This condition holds as the first-stage coefficient is 0.62 with an F-statistic of roughly 125. Second, a provider's intended status must be uncorrelated with other unobserved factors that affect the provider's output. We find this assumption reasonable given the inclusion of individual fixed effects, tenure controls, and monthly time dummies. Again, note that this rich set of controls is possible only because providers' scheduled compensation plan each month was a function of their individual hire date. In order for this assumption to be violated, there would need to be some other unobserved factor that caused a provider to see more or fewer patients than they normally do that systematically turned on or off at the same time that a provider was scheduled to transition from salary to piece rates. Finally, being scheduled to work on the incentive plan needs to affect a provider's output only by affecting the likelihood that they are on the incentive plan. We believe this assumption to be satisfied because it is difficult to think of other mechanisms through which the salary scheme schedule could affect productivity.

The estimated IV coefficient is small in magnitude – less than a 2.5 percent increase in

productivity – and not statistically significant. Further, the reduction in coefficients from column (3) to column (4) suggests that providers managed to be paid via salary in months when their production was lower than their typical output, which is again consistent with the interpretation that non-compliance was strategic rather than random. Although the coefficients in columns (3) and (4) are not statistically distinguishable from each other ($p > 0.50$), we interpret this pair of results as providing no evidence of a substantial individual incentive effect of the piece rate plan on performance.

Figure 2 provides a visual representation of the data behind the reduced form of the IV specification in column (4) of Table 3. The figure is constructed similarly to Figure 1, but in this figure, the underlying regressions include individual fixed effects. Recall that there were two different schedules for when a provider was expected to leave the salary plan to join the piece-rate plan. For new hires, the provider was expected to join the piece-rate plan at the start of the first quarter following their completion of twelve months at MSCHC. Incumbents, who were all paid on salary at the time the policy change was announced, were expected to switch in January 2008. This figure therefore splits observations by incumbency because the expected switch to the piece-rate plan came at different points in a provider's tenure for these two groups. For the new hires, productivity is generally lower in months prior to the expected start of the incentive plan, but this difference merely mirrors the typical tenure profile (see Appendix Figure A-3). There is no discernible difference in productivity comparing observations to the right of zero to observations just to the left of zero when providers have built a panel of patients. Panel (b) shows similar analysis using incumbents. Typically these providers had built a panel of patients well before they were supposed to switch to the new compensation plan; thus, the tenure profile in productivity does not affect the mean number of encounters shown to the left of zero. As with the new hires, there is no noticeable change in productivity associated with a move to the right of zero, which again suggests that the individual incentive effects were small.

Together, the results in this section show that the implementation of the piece-rate plan

induced a variety of changes in behavior. First, the analysis confirms the typical result in the literature that introducing piece rates increased output as measured by the productivity metric directly incentivized. We find relatively weak support for the incentive effect, however; after correcting for selective participation on both permanent and time-varying uobserved productivity differences, we estimate only a small and not statistically significant positive causal effect of piece rates on a given provider's output. Second, and to our knowledge, new to this literature, we find strong suggestive evidence that providers strategically expended effort to avoid complying with the piece-rate plan. Some employees negotiated delays into the piece-rate plan, and the totality of the results suggests that this type of negotiation served to benefit lower-volume providers and those who had substantial bargaining power. This pattern suggests that the administrative costs of negotiating exceptions may be an especially important factor to consider for firms employing highly skilled workers with attractive outside options.

In Appendix Section A-4, we provide additional analysis examining heterogeneity in the causal effects estimated in columns (3) and (4) by provider type and gender. We find no evidence of differential effects by gender, but there is suggestive evidence that the individual incentive effect may be stronger among physicians than among advanced practice providers.[23] There are multiple potential reasons for this difference in responsiveness. First, physicians were at a greater risk of a reduction in salary because the target number of patient encounters encouraged by the incentive plan was higher for physicians and a smaller percentage of physicians were meeting their benchmarks prior to the switch in compensation scheme. Second, the piece-rate per patient encounter was higher for physicians than it was for advanced practice providers. Together, these two factors yielded a stronger financial incentive for physicians to increase their productivity.[24] Any other reason why physicians may have been more income-sensitive (e.g.

[23]The magnitude of the point estimate for physicians is closer to the effect found in Dumont et al. (2008).

[24]This difference in incentive strength is likely the most plausible reason for the stronger response among physicians in this setting. Laboratory studies using both physicians and medical students have found medical students to be more responsive to incentives (Brosig-Koch et al., 2016) or found no statistically significant difference but weakly stronger responses among physicians (Brosig-Koch et al., 2019).

higher educational debt service burden) may have further magnified these differences.

3.2 Adjustment on Other Margins

In a multitasking environment, employers face the risk that incentivizing one metric of output may decrease workers' effort toward other responsibilities (Holmstrom and Milgrom, 1991). Although data limitations prevent us from investigating all possible margins on which providers may have adjusted their effort, we are able to examine how well providers kept up with their administrative duties, specifically documenting visits for billing and keeping accurate patient records.[25] MSCHC was concerned that the piece-rate plan would encourage workers to produce more patient encounters at the expense of these other important aspects of their jobs.[26] MSCHC conducted coding audits and measured paperwork timeliness under both pay regimes, and we examined the impact of the piece-rate compensation plan on two additional outcome variables: an indicator for passing a coding audit and an indicator for completing paperwork on time. These results are included in Appendix Tables A-3 and A-4.[27] For both of these additional outcomes, the point estimates on piece-rate status (or intended status) are uniformly positive across specifications, although the standard errors are often too large to reject the null of no effect. We therefore conclude that there is no evidence that piece rates led to shirking on these other dimensions. This finding could result, in part, from the mission orientation of the jobs we study, with providers committed to quality job performance on all dimensions because the job aligns with their sense of mission. It is also plausible that additional monitoring reduced the

[25]One possibility we are unable to examine directly is that providers may have attempted to select patient encounters with lower complexity so that they could complete a patient visit in less time. Alexander (2020) provides compelling evidence of this kind of patient shopping among providers in response to incentives in a pilot program funded through Obamacare.

[26]There may also have been a related concern that providers may alter their coding of patient encounters to increase their compensation. Bastani et al. (2019) find that hospital-based providers changed their coding of patients to avoid penalties from Medicare.

[27]The analysis mirrors the specifications from Table 3 with two minor exceptions. First, data availability begins in 2009, resulting in a shorter panel. Second, coding audits occur quarterly, generating a panel with fewer observations per provider relative to the baseline monthly panel.

incentive response by limiting the degree to which providers could re-allocate their effort.

4 Conclusion

In this paper we found that an incentive-pay compensation plan changed the output of providers at a Community Health Center, with most of the adjustment occurring through selection. The plan attracted and retained providers who tend to produce more encounters, which were rewarded by the new plan. The results also revealed quantitatively small but positive incentive effects, although once adjusted for the possibility of within-person selection these effects are not statistically significant. Finally, we also find evidence that providers negotiated exceptions to the piece-rate plan in non-random ways.

Because this study focuses on only 96 providers working for a single community health center, the results are likely most directly generalizable to other Community Health Centers considering changes to their compensation plans. More broadly, these results also provide new evidence on the effectiveness of piece rates in a mission-oriented setting. Specifically, we find that the incentive effects are relatively weak but that the compositional effects are meaningful. One potential interpretation of this pair of results is that providers with prosocial motivations are unwilling to make substantial changes to the volume of patients they serve but that they are willing to move across employers to find a professional setting that rewards their preferred caseload size. The reluctance to see more patients could occur if, for example, providers recognize that they could increase quantity by reducing quality, but they are unwilling to do so because of the financial risks (e.g. malpractice lawsuits) or social costs (worse health outcomes for patients).

We also provide evidence of a much less studied aspect of piece-rate plans – strategic avoidance of piece-rate compensation among lower productivity providers and during lower productivity months. Nevertheless, we demonstrate that MSCHC was able to increase the number of patient visits it produced by attracting and retaining individual providers whose practice meth-

ods allow them to see more patients. Although we find no evidence that the incentive scheme selected providers who put in less effort on other dimensions of the job (coding accuracy and paperwork), we are unable to determine the effects on patient outcomes. Experimental evidence in Brosig-Koch et al. (2019) suggests that the choice of compensation schemes affects patient outcomes, however, and further research investigating this hypothesis could shed additional light on this highly policy-relevant question.

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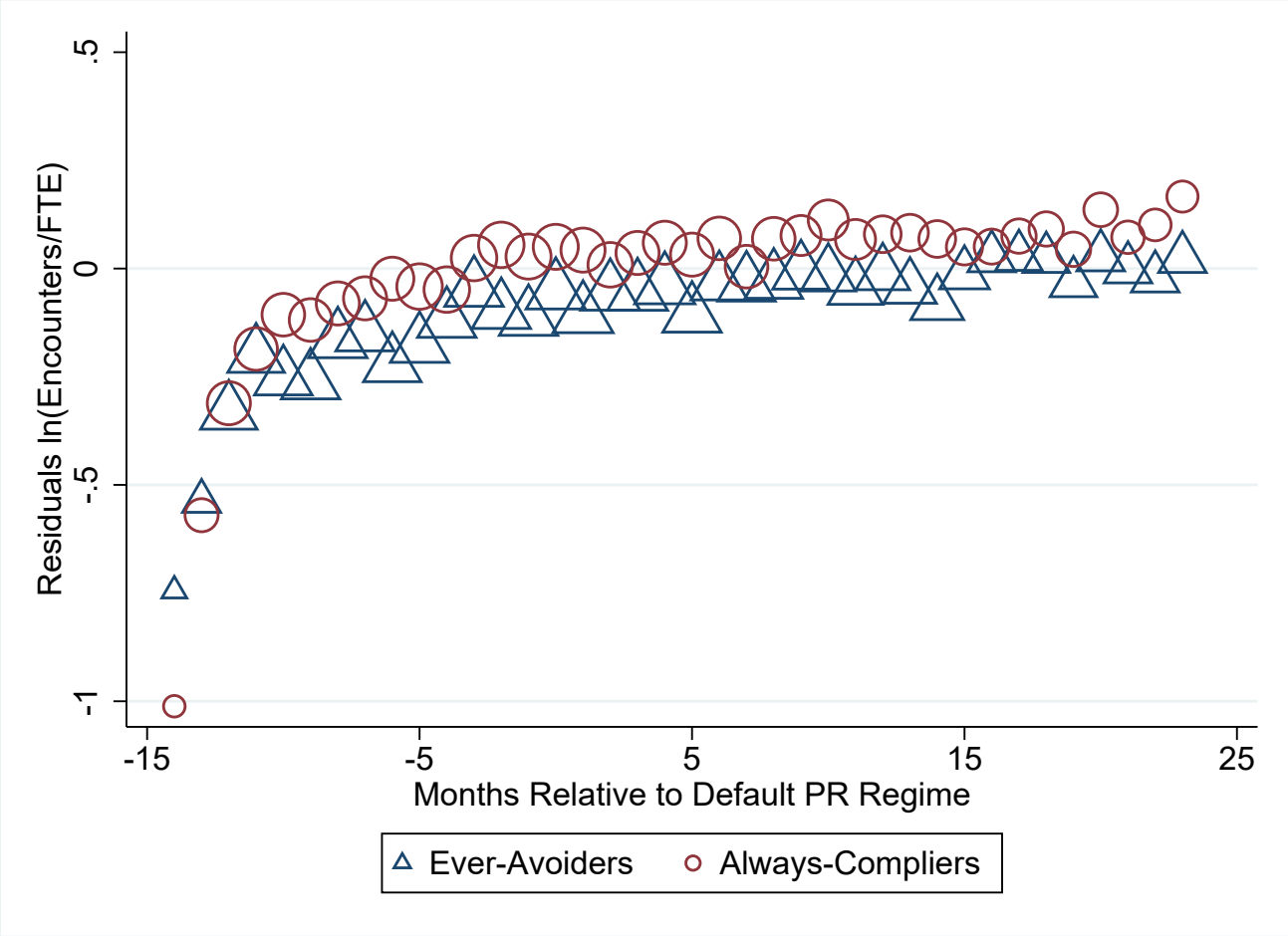
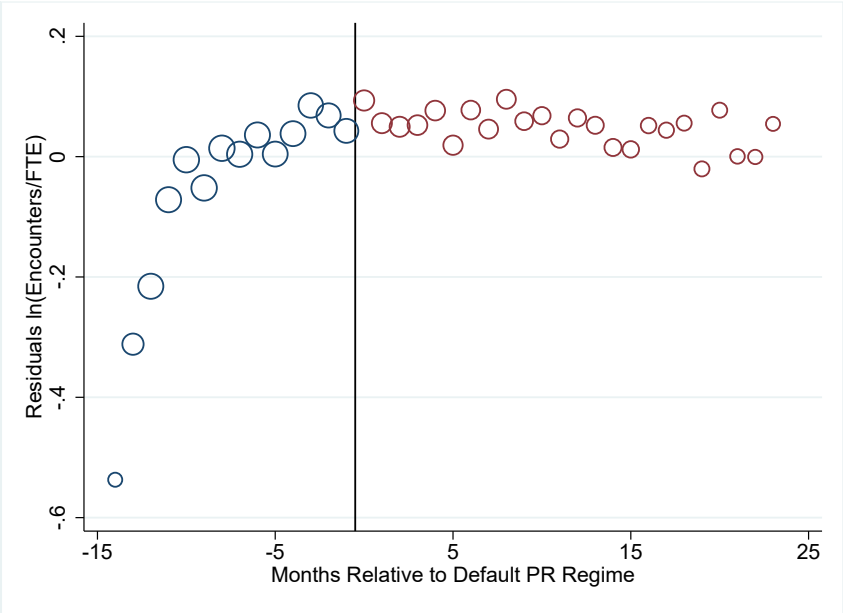
Figure 1: Adjusted Output by Avoiding Status: Non-Compliers Are Lower Productivity Providers



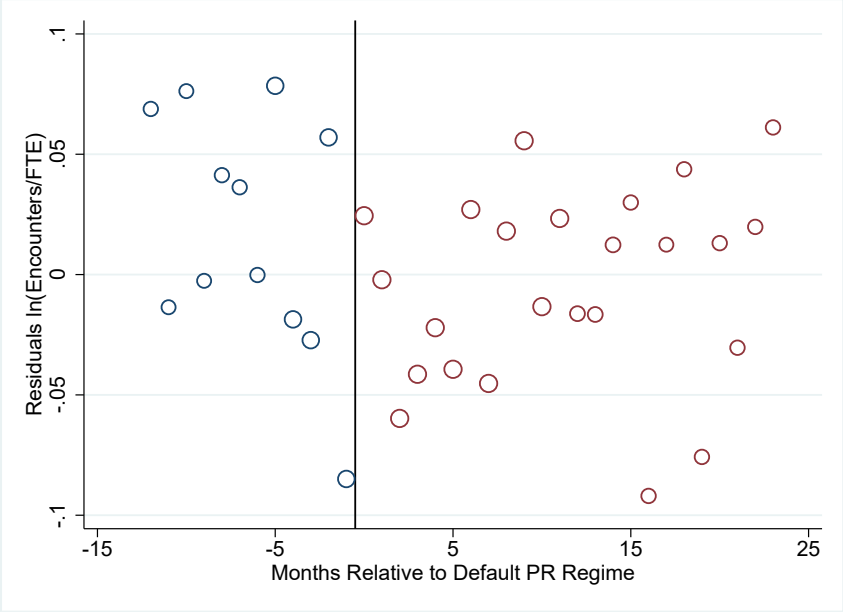
See the text for a complete description of data sources. Each dot represents the average of residuals from a regression of log(encounters/FTE) on month × year dummies. Larger dots indicate larger underlying monthly samples. The x-axis is measured in months and shows the time relative to when the rule of thumb suggests the provider should have transitioned onto the piece-rate plan. Ever-Avoiders are providers who had at least one month when they worked for a salary despite being scheduled to work for piece rates. Always-Compliers represent providers who always worked for piece rates when they were scheduled to do so.

Figure 2: Reduced Form Results - Productivity Relative to Rule-of-Thumb Start Date for Piece Rates

(a) New Hires



(b) Incumbents



See the text for a complete description of data sources. Each dot represents the average of residuals from a regression of log(encounters/FTE) on individual fixed effects and time controls. Time controls for panel A are month × year dummies. Time controls for panel B are month dummies because incumbents were scheduled to transition to piece rates on the same date. The x-axis is measured in months and shows the time relative to when the rule of thumb suggests the provider should have joined the incentive plan. New hires were hired after January 1, 2007. Incumbents already worked for MSCHC on December 31, 2006 or were existing providers at site acquired in 2013.

Table 1: Summary Statistics

Variable	**Overall Sample (sd)**	**Salary (sd)**	**Piece Rate (sd)**	**Difference [t-stat]**
Monthly Patient Encounters	239.0	219.5	250.7	31.1
	(98.6)	(103.0)	(94.0)	[4.0]
Monthly Encounters per FTE	262.9	238.4	277.6	39.3
	(91.3)	(99.61)	(82.6)	[6.0]
Months Tenure	74.9	49.1	90.4	41.3
	(89.6)	(80.5)	(91.2)	[5.4]
Female	0.74	0.72	0.76	0.04
	(0.44)	(0.45)	(0.43)	[0.87]
Physician	0.50	0.53	0.48	-0.05
	(.50)	(.49)	(.50)	[-0.89]
Degree Year	1995.7	1996.6	1995.1	-1.45
	(10.4)	(11.4)	(10.1)	[-1.24]
FTE	0.91	0.92	0.90	-0.02
	(0.18)	(0.17)	(0.18)	[-1.18]
Observations	3921	1474	2447	

Notes: Standard deviations appear in parentheses below the mean. Sample of all provider × months in jobs eligible for piece-rate pay with valid entries for every control variable. The Difference column provides the difference in means shown in the Piece Rate and Salary columns. t-statistics from tests of the null of no difference in means between these two groups, using standard errors clustered at the provider level, appear in brackets.

Table 2: Characteristic of Providers by Compliance with Scheduled Transition to Piece Rates

	Early Adopters	**On-Time Adopters**	**Late Adopters**	**Full Sample**	**Difference (3)-(2)**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Share of Months with Piece-Rate Pay	0.70	0.52	0.34	0.49	-.181
	(.27)	(0.29)	(0.31)	(0.31)	[-2.67]
Female	0.82	0.77	0.72	0.76	-.044
	(0.40)	(0.43)	(0.45)	(0.43)	[-0.44]
Physician	0.27	0.39	0.66	0.46	0.262
	(.47)	(0.49)	(0.48)	(0.50)	[2.34]
FTE	0.91	0.93	0.89	0.92	-.040
	(0.20)	(0.16)	(0.21)	(0.18)	[-0.96]
Degree Year	1999.1	1999.1	1995.6	1998.1	-3.50
	(10.2)	(10.0)	(11.5)	(10.5)	[-1.45]
Incumbent	0.18	0.27	0.31	0.27	0.042
	(0.40)	(0.45)	(0.47)	(0.45)	[0.41]
Left MSCHC in analysis period	0.09	0.41	0.59	0.43	0.175
	(0.30)	(0.50)	(0.50)	(0.50)	[1.54]
Observations	11	56	29	96	

Notes: Each provider contributes one observation to the analysis shown. Standard deviations appear in parentheses below the mean. Six providers who joined the incentive plan on time returned to salary for some months following their switch; they are classified as on-time adopters based upon their initial switch to piece rates. Column (5) provides the difference in means between Late adopters (3) and On-time adopters (2), with t-statistics from tests of the null that these differences are zero appearing in brackets.

Table 3: Productivity Differences Due to Piece Rates

	OLS - Actual Participation	OLS - Intended Participation	Individual FE	Individual FE with IV
	(1)	(2)	(3)	(4)
In Piece-Rate Plan	0.177***		0.0478**	0.0235
	(0.0365)		(0.0237)	(0.0341)
Scheduled for Piece-Rate Plan		0.117***		
		(0.0388)		
Physician	0.0236	0.00959		
	(0.0436)	(0.0467)		
Female	-0.124	-0.114		
	(0.0797)	(0.0811)		
Observations	3,921	3,921	3,921	3,921
Month x Year FE	Yes	Yes	Yes	Yes
Individual FE	No	No	Yes	Yes
Tenure Control	Months 1-9 Dummies		Months 1-9 Dummies	
First Stage F-stat				124.8

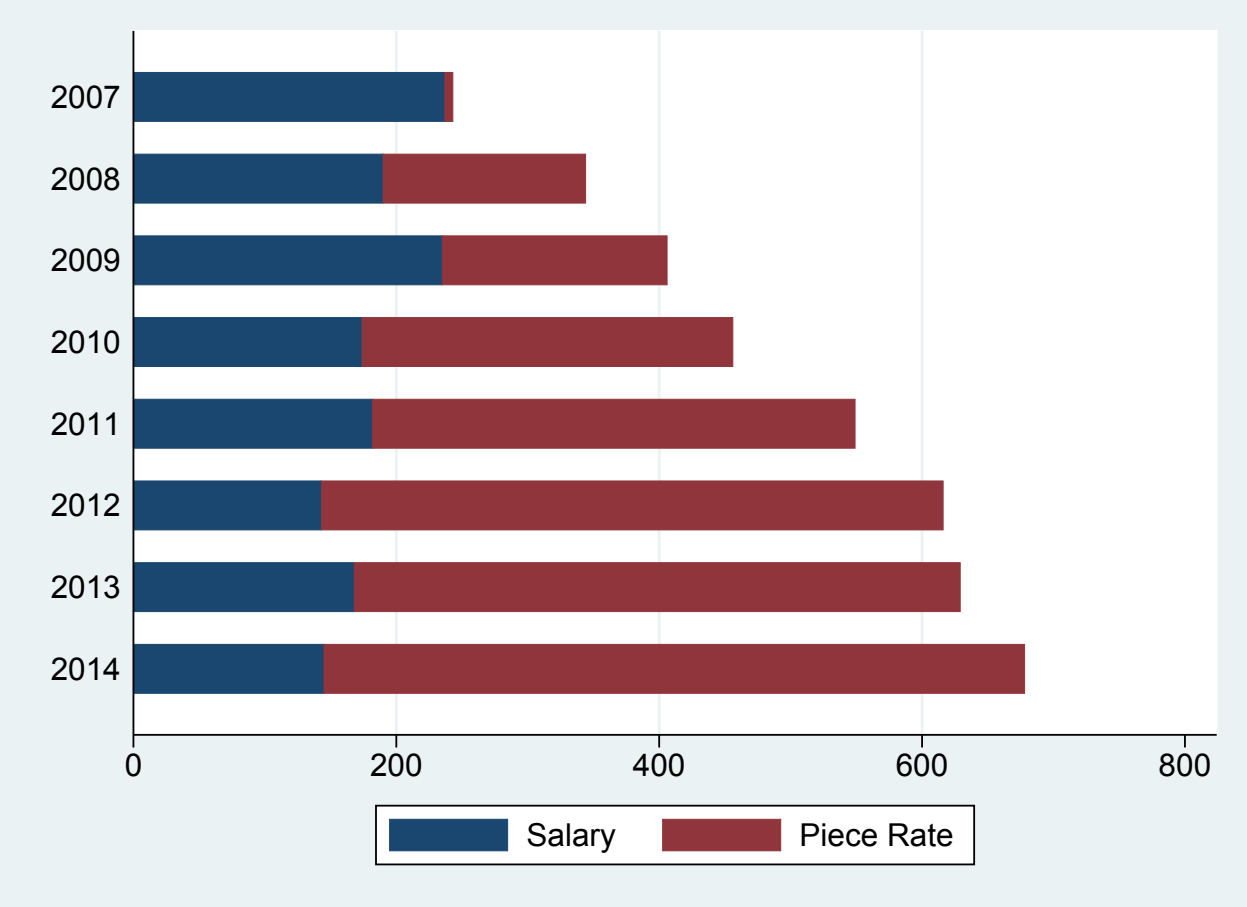
Notes: Dependent variable: Ln(Patient Encounters/FTE); Standard errors clustered at the provider level. The specification in column (4) uses a provider's scheduled piece-rate status as an instrument for their actual status. *** p<0.01, ** p<0.05, * p<0.1.

Appendix - For Online Publication

A-1 Additional Descriptive Statistics

Figure A-1 shows the annual count of provider months under each payment regime. The largest change occurs between 2007 and 2008 when most existing providers were transitioned onto the piece rate plan. Eventually nearly 4 out of every 5 providers are compensated via the piece rate plan.

Figure A-1: Timeline of Identifying Variation: Observations by Pay Regime



See the text for a complete description of data sources. The bars show the number of provider-months compensated under either the fixed salary regime or the piece rate regime.

Figure A-2 shows the distribution of encounters/FTE for provider-months under both compensation schemes, with the distribution for the piece rate scheme shifted noticeably to the right.

Figure A-2: Kernel Density of Output by Pay Regime

See the text for a complete description of data sources. The kernel densities show the distribution of productivity (measured as patient encounters per FTE) separately for each of the two pay regimes.

A-2 Controlling for provider tenure

Figure A-3 shows the tenure profile in productivity for provider-month observations in which the individual is expected to be salaried based on company policy. To construct this figure, we first regress the natural log of encounters per FTE on individual fixed effects. We then save the residuals and average them by month since hire date. Each circle therefore represents the average within-provider difference in productivity for individuals in a given month of tenure. In panel (a), we use only observations from provider-months when the provider was scheduled to receive a salary, i.e. when the value of instrument for piece rate is zero. This panel therefore has the advantage that it should not reflect any change in encounters due to the incentive effect of the piece rates. The disadvantage is that it ends at 14 months of tenure because all providers are scheduled to join the piece rate plan at the start of the first calendar quarter following their one-year anniversary. Panel (b) presents similar estimates using all provider-months during a provider's first 18 months, regardless of intended or realized participation in the piece-rate plan.

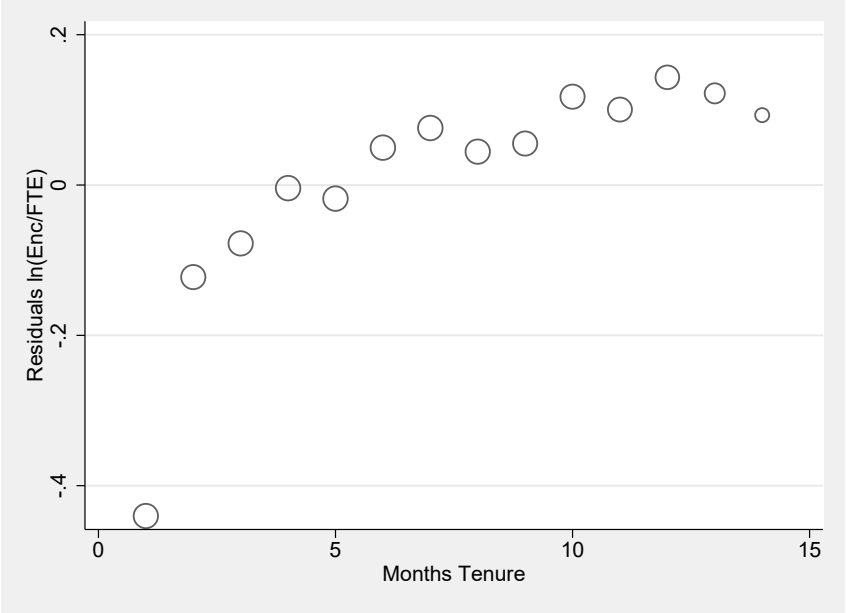
As expected, providers early in their tenure see many fewer patients, and encounters rise quickly over the first nine months. Beginning in month 10, however, encounters are roughly flat going forward. A similar pattern appears in both samples (panels). Therefore, in the main analysis, we control for tenure by including individual month dummies for the first nine months and then grouping later months into a single "experienced provider" category. The analogous figure using a sample of all provider-months (including piece-rate months) looks similar.

Table A-1 examines the sensitivity of the OLS results to the way in which we control for provider tenure. Columns 1 and 4 include no controls for tenure. Columns 2 and 5 include a quadratic control. Columns 3 and 6, which match columns 1 and 2 of Table 3, respectively, include dummies for each of the first nine months, treating later months as a single "experienced provider" bin. Columns 4 and 8 add a linear spline with knots at 6, 24, 48, and 96 months.

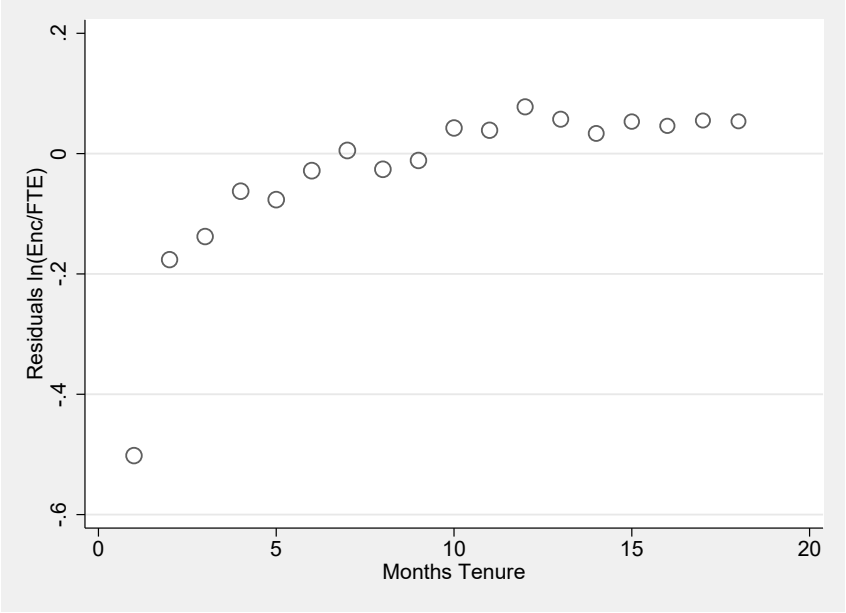
Controlling for tenure flexibly makes a noticeable difference in the estimated coefficient on piece-rate compensation. For example, in the first column, which includes no controls for tenure, participating in the piece rate scheme is associated with a roughly 28 percent increase in the number of encounters. Controlling for a quadratic in tenure reduces the coefficient somewhat, and including the individual month dummies motivated by Figure A-3 decreases the estimated difference to roughly 18 percent. Adding the linear spline further reduces the coefficients, although we include this specification primarily for completeness as Figure A-3 suggests that the key change in productivity occurs within the first nine months.

Figure A-3: Monthly Tenure Profile in Productivity

(a) Intended Salary Months



(b) All Provider-Months



See the text for a complete description of data sources. Each dot represents the average of residuals from a regression of log(encounters/FTE) on individual fixed effects. Panel A uses a sample of provider-months where the individual is expected to be under salary compensation based on company policy. Panel B uses all provider-months and can therefore show a longer duration of tenure. The x-axis is measured in months and shows the amount of time that has elapsed since the provider was hired.

Table A-1: OLS Results - Productivity Higher Under Piece Rates

	Cross-Sectional				Individual FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Piece-Rate Regime	0.282***	0.215***	0.177***	0.138***	0.115***	0.108***	0.0478**	0.0371
	(0.0349)	(0.0298)	(0.0365)	(0.0416)	(0.0231)	(0.0227)	(0.0237)	(0.0266)
Physician	0.0373	-0.000449	0.0236	-0.00883				
	(0.0444)	(0.0390)	(0.0436)	(0.0384)				
Female	-0.130	-0.0525	-0.124	-0.0566				
	(0.0812)	(0.0414)	(0.0797)	(0.0444)				
Observations	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921
Month x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	No	No	No	No	Yes	Yes	Yes	Yes
Tenure Control	None	Quadratic	Months 1-9 Dummies	Linear Spline	None	Quadratic	Months 1-9 Dummies	Linear Spline

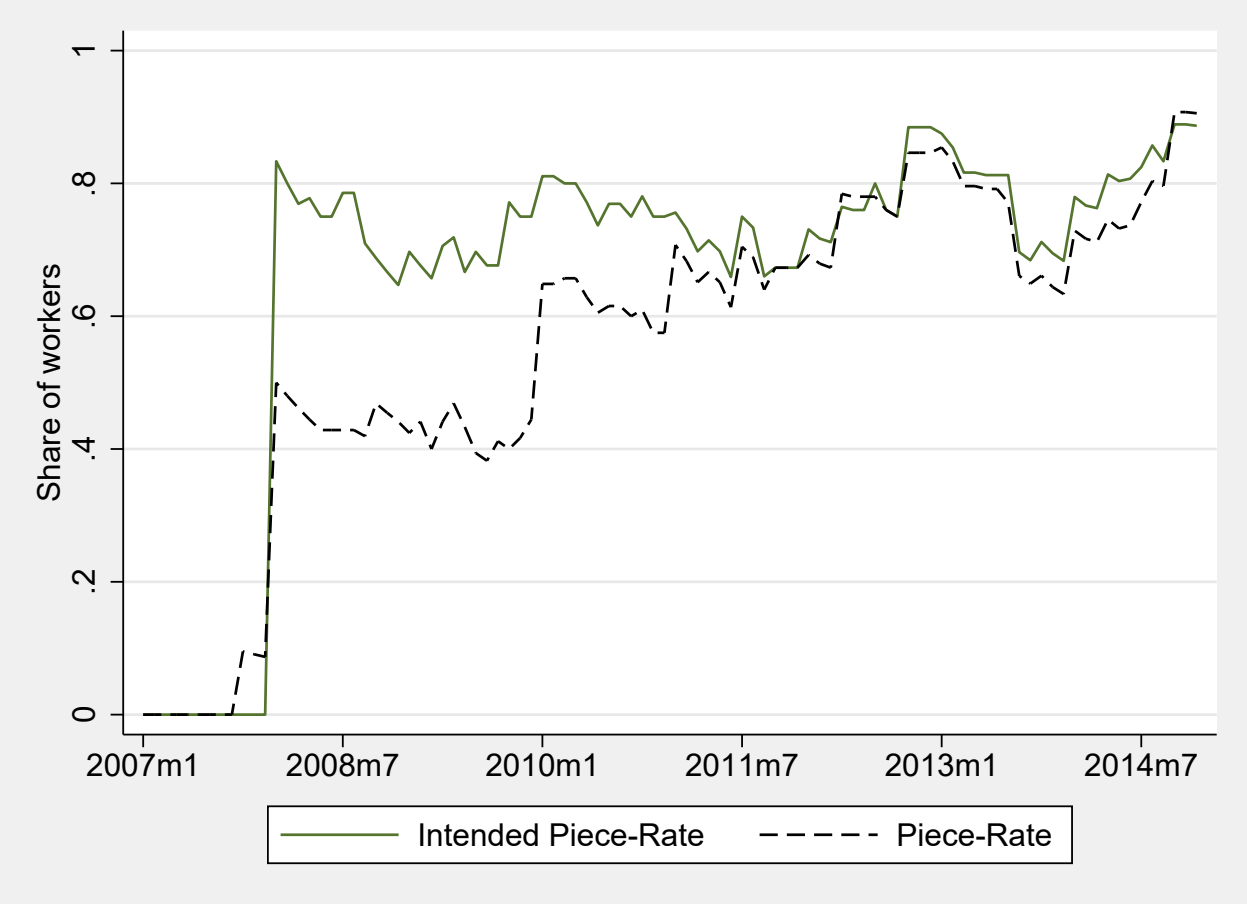
Notes: Dependent variable: Ln(Patient Encounters/FTE); Standard errors clustered at the provider level. Spline (columns 4 and 8) has knots at 6, 24, 48, 60, and 96 months. *** p<0.01, ** p<0.05, * p<0.1.

A-3 Supporting evidence for main results

Figure A-4 shows expected (solid line) and realized (dashed line) participation rates in the piece rate plan by calendar month. The observations underlying this figure include both incumbents (hired prior to January 2007) and new hires. Although the lines closely track each other, there are notable differences between the two. The gap between the two lines shrinks noticeably as time progresses, primarily because incumbents were unable to delay the switch indefinitely and either accepted the piece rate compensation plan or left MSCHC.

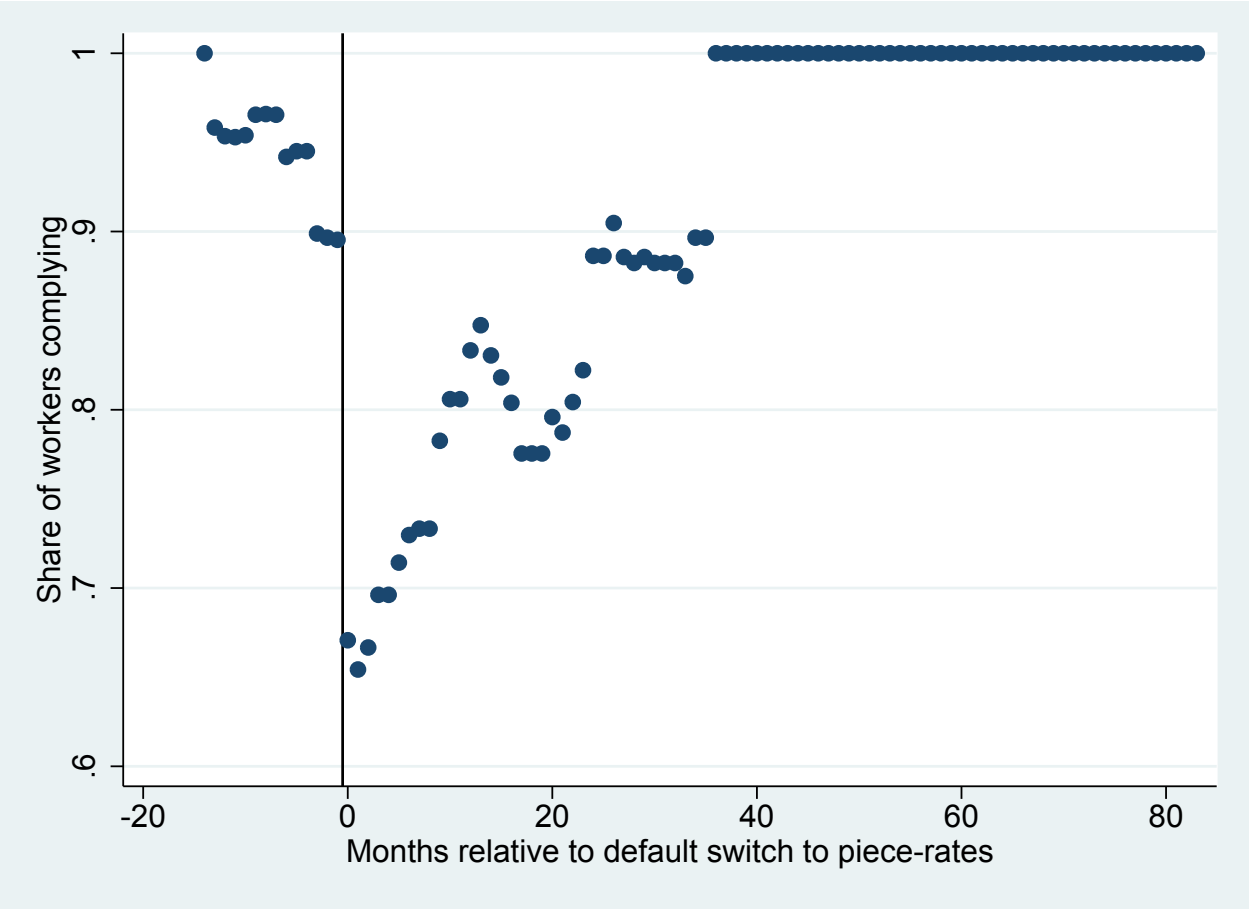
Figure A-5 provides insight into how individuals managed to avoid complying with the rule of thumb. The figure shows monthly non-compliance rates with the x-axis measuring time relative to when a provider was scheduled to switch to piece rates. Non-compliance for months to the left of zero means that a provider was on the piece rate plan ahead of schedule while non-compliance to the right of zero means that a provider was not yet on the piece rate plan despite have been scheduled to switch. Although there is a small amount of early adoption, most of the non-compliance results from providers delaying the switch to the performance pay plan.

Figure A-4: Planned and Actual Participation in Piece-Rate Compensation Scheme - Calendar Months



See the text for a complete description of data sources. Each line represents the share of individuals intended to participate (green line) or actually participating in (red line) the piece rate compensation scheme. The x-axis is measured in calendar months. Variation arises within calendar months because the individual-specific intended start dates for the piece rate scheme depend on the individual's hire date.

Figure A-5: Non-Compliance Usually Due to a Delay



See the text for a complete description of data sources. Each dot represents the share of providers complying with the intended assignment to salary or piece rates. The x-axis is measured in months and shows the time relative to when the the provider was scheduled to transition onto the piece rate compensation scheme. Non-compliance prior to month 0 represents early adoption of the piece rate scheme. Non-compliance after month 0 represents providers paid on a salary despite becoming eligible for piece rates.

A-4 Heterogeneous results by provider type

Table A-2 provides results from specifications that allow the effect of the piece-rate plan to depend on provider characteristics. Column (1) replicates the specification in column (3) of Table 3 in the main text, and column (4) replicates column (4) of Table 3. Columns (2) and (5) add interaction terms that allow the effect of the piece-rate plan to vary provider type. The results in column (2) reveal that the incentive effect is not appreciably different between physicians and non-physicians. Further, column (3) reveals no noteworthy heterogeneity by gender.

The point estimates in column (5) suggest that physicians may have a stronger incentive effect, with the effect among non-providers close to zero and the effect among physicians roughly an eight percent increase in output. This difference is not statistically significant, however. Finally, column (6) shows no meaningful difference in incentive effect by gender.

Table A-2: Heterogeneity in Incentive Effects

	Heterogeneous Effects					
	Individual FE			Individual FE with IV		
	(1)	(2)	(3)	(4)	(5)	(6)
In Piece-Rate Plan	0.0478**	0.0370	0.0193	0.0235	-0.00234	0.00150
	(0.0237)	(0.0276)	(0.0303)	(0.0341)	(0.0356)	(0.0511)
In Piece Rate x physician		0.0228			0.0827	
		(0.0403)			(0.0595)	
In Piece Rate x female			0.0388			0.0276
			(0.0397)			(0.0557)
Observations	3,921	3,921	3,921	3,921	3,921	3,921
Month x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Tenure Control	Months 1-9 Dummies					
First Stage F-stat				124.8	28.71	50.23

Notes: Dependent variable: Ln(Patient Encounters/FTE); Standard errors clustered at the provider level. *** p<0.01, ** p<0.05, * p<0.1.

A-5 Auxiliary outcomes unaffected by piece rates

Tables A-3 and A-4 present the results of linear probability models examining the effects of the piece rate plan on passing the coding audit and paperwork requirements respectively. The specifications used in these tables mirror the specifications from Table 3 with two minor exceptions. First, data availability begins in 2009, creating a shorter panel. Second, coding audits occur quarterly, generating a panel with fewer observations per provider relative to the baseline monthly panel.

Table A-3: Insignificant Changes in Coding Quality Due to Piece Rates

	OLS - Actual Participation	OLS - Intended Participation	Individual FE	Individual FE with IV
	(1)	(2)	(3)	(4)
In Piece-Rate Plan	0.0773*		0.0453	0.0733
	(0.0399)		(0.0422)	(0.0777)
Scheduled for Piece-Rate Plan		0.0282		
		(0.0437)		
Physician	-0.0419	-0.0451		
	(0.0393)	(0.0407)		
Female	-0.0264	-0.0216		
	(0.0424)	(0.0437)		
Observations	770	770	770	767
Individual FE	No	No	Yes	Yes
Quarter x Year FE	Yes	Yes	Yes	Yes
Tenure Control	Quarter 1-3 dummies		Quarter 1-3 dummies	
First Stage F-stat				82.26

Notes: Dependent Variable: Dummy variable equal to one if the provider passes the coding audit; Observations at provider-quarter level; Data spans 2009-2014; Standard errors clustered at the provider level. *** p<0.01, ** p<0.05, * p<0.1.

Table A-4: Insignificant Changes in Paperwork Timeliness Due to Piece Rates

	OLS - Actual Participation	OLS - Intended Participation	Individual FE	Individual FE with IV
	(1)	(2)	(3)	(4)
In Piece-Rate Plan	0.0785**		0.0571*	0.0977
	(0.0383)		(0.0313)	(0.0621)
Scheduled for Piece-Rate Plan		0.0573		
		(0.0424)		
Physician	-0.0195	-0.0249		
	(0.0370)	(0.0379)		
Female	0.0805	0.0837		
	(0.0606)	(0.0622)		
Observations	3,140	3,140	3,140	3,138
Month x Year FE	Yes	Yes	Yes	Yes
Individual FE	No	No	Yes	Yes
Tenure Control	Months 1-9 Dummies		Months 1-9 Dummies	
First Stage F-stat				96.93

Notes: Dependent Variable: Dummy variable equal to one if the provider passes the unsigned documents audit; Observations at provider-month level; Data spans 2009-2014; Standard errors clustered at the provider level. *** p<0.01, ** p<0.05, * p<0.1.